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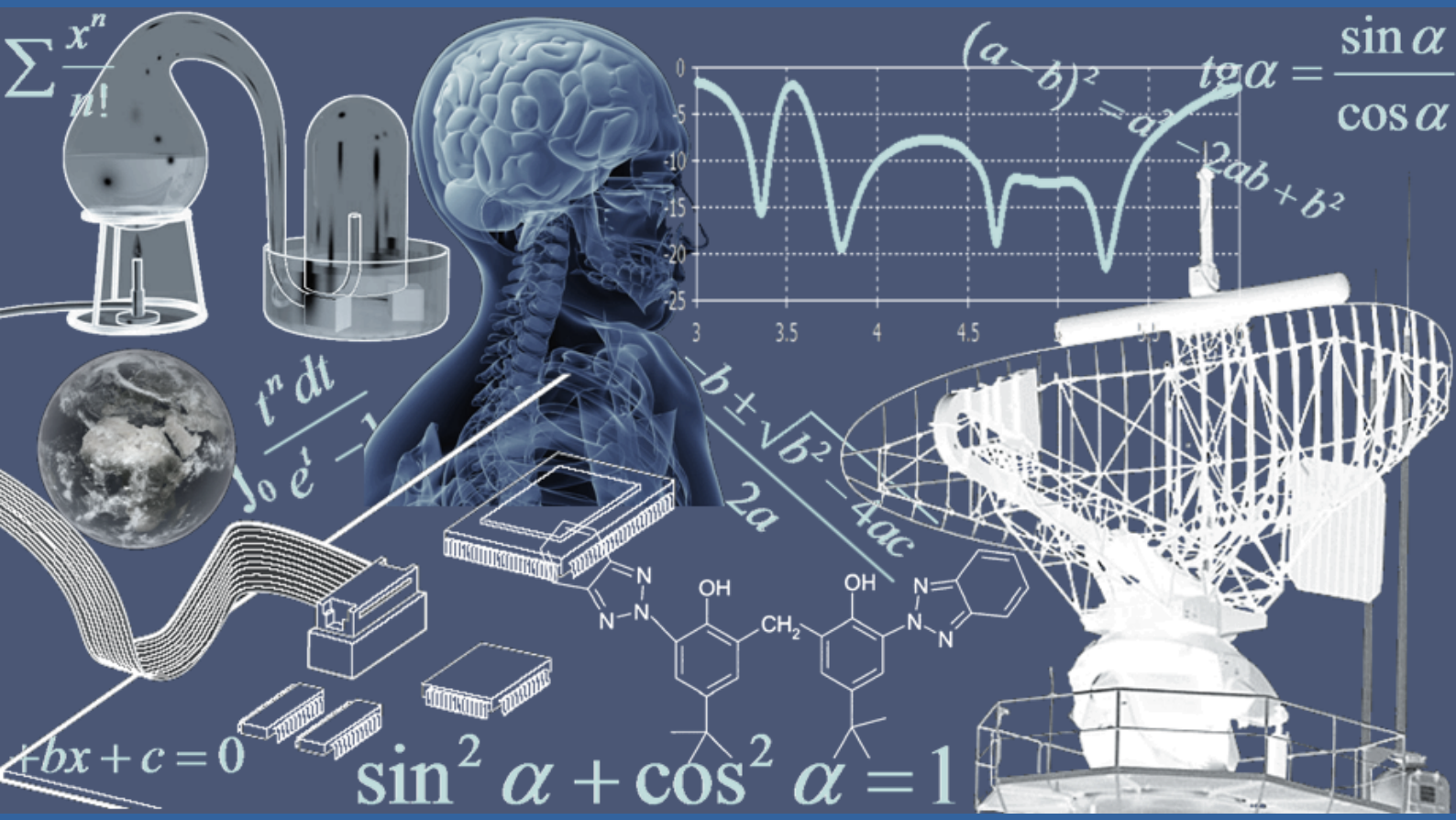

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Winning In the Tourism Marketing: The Case of Zanzibar Tourism Destination in Tanzania

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ABSTRACT: This investigation presents analysis of the Strengths, Weaknesses, Opportunities and Threats (SWOT analysis) in tourism sector of Zanzibar Tanzania, in order to find out the prospects for marketing policies and strategies for the sector with better strategic planning. Zanzibar possesses certain important and attractive historical, cultural and natural attributes that have made it a reasonable tourism destination. Using derivative information and identified SWOT variables, the paper critically reviews the relevant material for the sake of the analysis and discovered that Zanzibar tourism sector has been experiencing significant level of growth and expansion due to government policies and attention. The result shows that, the sector fuels the economy of the state and possesses certain important attributes that could help it in attaining the position of top most Indian Ocean tourism destination. However, the investigation found that, there is need of effective management of natural resources to assure their fair access and control to the tourists as well as local population. The paper also put forwards, possible strategies and approaches together with some recommendations to the government, policy makers and marketing managers to assist them in formulating adequate policies for the sector.

KEYWORDS: Tourism, Strategies, Marketing, SWOT-Analysis, Zanzibar.

1 BACKGROUND

Tourism has been more rapidly growing sector in the world of business with widespread economic benefits to the community, increased employment, infrastructure and superstructure improvement, economic diversification and environment preservation in countries and regions. Tourism destination management may be defined as a process of meeting objectives, using human, material, natural and information resources, and involving activities connected with planning, organization, motivation and control (Goranczewski & Puciato, 2010). Major cities, countries and regions have been struggling to resolve challenges and meet new expectations emerging in the world of tourism market aiming at rising visitation to and inside the tourism areas. Countries are trying to modernizing cooperative and more successful strategies that can foster growth of the industry and meet the requirements.

Zanzibar which is holding tourism potential and best tourist destination in eastern part of Africa is a semi-autonomous polity amongst the two east African sovereign states of Tanganyika and Zanzibar united (merged) in 1964 to form one country known as United Republic of Tanzania. It consists of two major islands including Pemba and Unguja. Zanzibar or Zanzibar Islands is blessed by nature with all world resources and attractions that the tourists usually look for like tropical beaches, palm trees, natural forest reserves, historical and cultural sites, fascinating and cheap markets for spices and handicrafts, historical stone town and adoring coastal sites (Makame and Boon, 2008). Zanzibar has become a favourite destination for the tourists coming from different countries and regions of the world due to which the tourism sector has evolved as top income generating sector for the economy of Zanzibar (Archabald and Naughton 2001)

The tourism sector of Zanzibar was not developed enough to meet the requirements of the tourists till 1980s however, the government of Zanzibar realized the importance of tourism sector as a source of generating foreign exchange due to which there is great emphasize being given to the development of this sector. The government has expressed its intentions

to promote the tourism industry of Zanzibar to make it top tourism destinations of the Indian Ocean (Luhanho, 2006). During the last few years there is considerable development observed in the tourism sector of Zanzibar. By 1990, there was no hotel present within the eastern coastal zone however, at present there are more than 237 accommodation facilities present at this coastal area that serve the tourists and provide them different leisure activities (Orjala, 2006).

With increasing significance of destination marketing, Zanzibar has to tactically analyze its interior and exterior environments in order to come up with logical approaches for a successful industry strategy formulation. This evaluation will help the region to recapitulate its current situation and therefore help to formulate a preparation for the competitive future tourism industry. The more globalised world of today necessitates organizations to depict to a greater and challenging extent of confusions in both its micro and macro environments. The process of environmental scanning allows an organization to arrange in a line its resources to take advantage of business opportunities at the same time defending against threats and intimidations. The process (the manager) will first analyze the internal environment by perhaps looking into inefficiencies inside the organization and will then look outside to the external environment and things happening independent of the organization. Environmental scans allow managers to use the knowledge gained during the scanning process to decide what strategic steps, or changes, the organization needs to take to create or maintain a competitive advantage.The micro-environmental factors are in the shortest or direct relationship with the organization as seen in fig.3 where the organization is competent of applying a certain extent of influence in adjusting the situation. Macro-environment on the other hand, impacts on the organization but related indirectly and therefore beyond the control of the organisation (Armstrong & Kotler 2000).

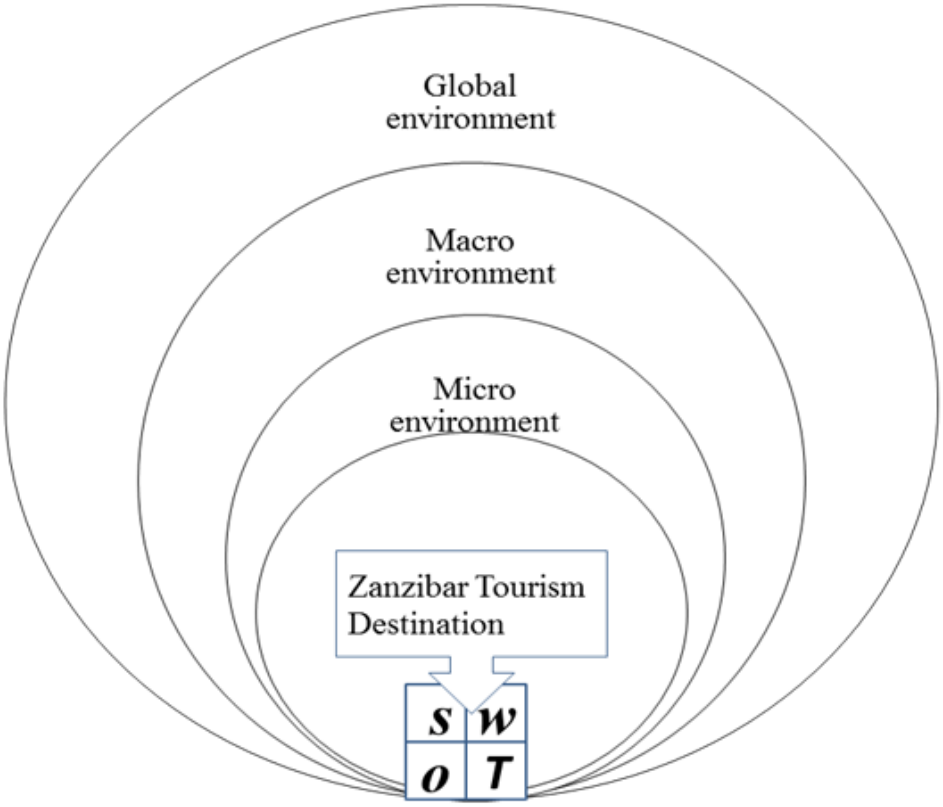

Fig. 1. The environmental scanning with SWOT analysis as related to Zanzibar

***Source**: Author, developed from N Wellman (2011)*

According to Boz et al., (2007), to gain the most viable advantage in destination, fundamental characteristics of destinations should be determined and evaluated and it is necessary to create specific tourism policies and strategies for developing a long term plan for tourism industry and to avoid the long term problems associated with imperfect tourism development. As SWOT facilitates a common understanding of what is called "reality" among different working areas within an organizations or between organizations and their clients, suppliers, peers groups, shareholders or superiors. It includes examination of the organization's existing condition and design of the strategy for the four types of strategic situation. The fig.4 shows algorithm of a procedure in SWOT analysis according to Weihrich.

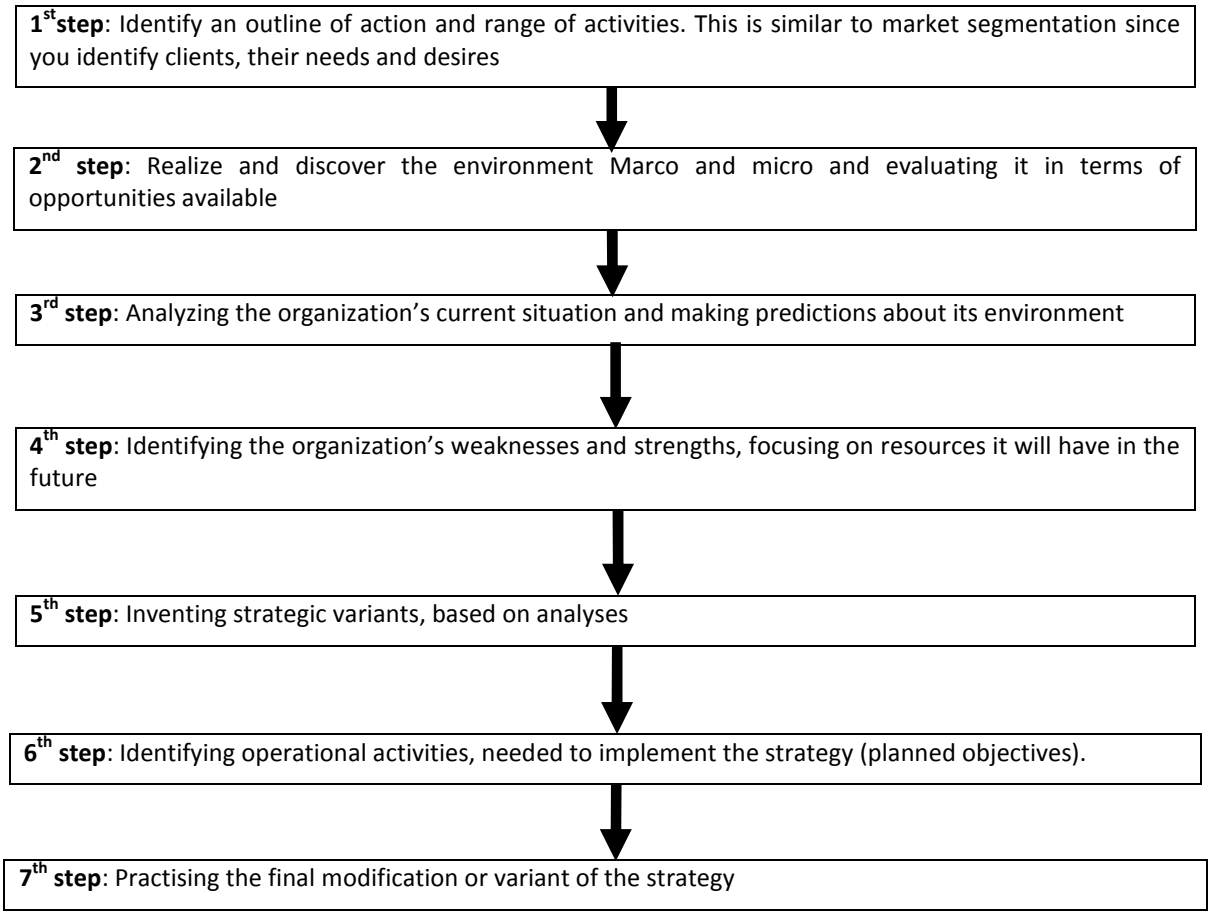

Fig. 2. algorithm of a procedure in SWOT analysis, according to Weihrich

This paper identifies the role of SWOT analysis in the formulation of best tourism improvement strategies for Zanzibar tourism destination. SWOT analysis as one of the most regularly used methods in strategic management can help providing basis for the manipulation of the current characteristics of Zanzibar tourism destination. Once SWOT results is identified and prioritized, it can be easier to develop temporary and continuing strategies for the business. The study material contains secondary data gathered from the literatures, bibliographic studies and relevant documents. The study uses a descriptive approach and sketch outs concepts in tourism development strategy using descriptions and manipulation of SWOT analysis.

2 MATERIALS AND METHODS

The tourism sector of Zanzibar has been examined with respect to its strength, weaknesses, opportunities and threats. SWOT analysis is a common and widely used method of strategic management and planning that allow specifying the business objectives and identifying the internal and external factors that act favourably or unfavourably while achieving the decided goals. This sort of analysis helps evaluating a changing environment in current businesses and induces reactions proactively.

For conducting the SWOT analysis, a detail environmental scanning of the Zanzibar tourism sector has been done and both the external and internal factors associated with this sector are examined. The internal factors affecting the Zanzibar tourism sector are analyzed to identify the strengths and weaknesses of the sector whereas the external environment analysis is carried out to point out the opportunities and threats related with the Zanzibar tourisms sector. Table 1 show the environmental scanning framework followed in the study for conducting the SWOT analysis of the Zanzibar tourism sector.

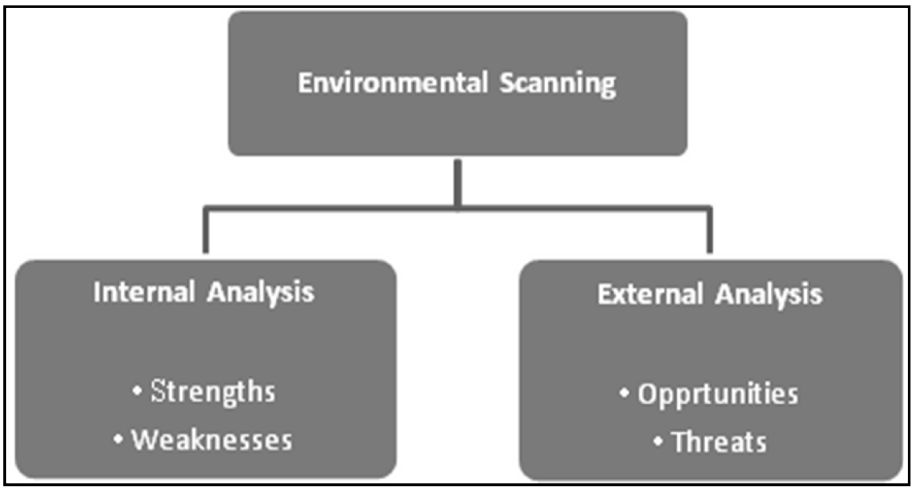

Fig. 3. SWOT Analysis framework followed in the study

This framework has been used for the SWOT analysis of the Zanzibar tourism sector. The environmental scanning has been conducted through the analysis of relevant information and literature relevant to the Zanzibar tourism sector that allows analyzing the potential of the sector to become a competitive and preferred tourism destination of the Indian Ocean. This examination reveals the prospects for marketing strategies for promoting Zanzibar tourism sector and allows having understanding the present situation as well as future direction of the Zanzibar tourism sector. The analysis basically aims to point out the areas where the marketing managers need to focus and it also spot the areas that possess great scope of marketing strategies and tactics. As in shown the fig.1, the more expanded SWOT analysis, it contains the logical combinations of factors relate to internal strengths or weaknesses with factors related to external opportunities or threats. The internal factors (strengths and weaknesses) are those that can be can be addressed or achieved on the tourism destination itself in accomplishing its objectives and targets. The external factors (opportunities and Threats) are those which are helpful (positive) or harmful (negative) in attaining the targets. Manipulating and identification of the factors and their interdependence helps clarify the steps needed to achieve the ending purpose. The logical combination of external and internal factors leads to four categories in the analysis. These are (1) External positive-opportunities (2) External negative-threats (3) Internal positive-strengths and (4) Internal negative-weaknesses (Gierszewska & Romanowska 2002, Goranczewski & Puciato 2010). Internal positive factors are actually the strengths which represent the most significant capital, skills and competences of the tourism destination which are applied to improve its economical situation. These possibly will include unique human impact on the environment with regard to tourism advantages, a powerfully built tourism network, transportation and communications as well as superstructures, highly skilled workforce and of course a high-quality destination brand name. The internal negative factors are the weaknesses that generally considered impeding development of the sector in the destination. The weaknesses may incorporate the reduced government support and funding, poorly improved infrastructures and weak perception of the workforce with regard to tourism sector and support in the destination. The threats or external negative factors are impediments or risks which block progress and the achievement of the targets such as adjustments in tourist favourites, cost-effective depression, problems in cross-border traffic, negative impulsive events (such as terrorism attack etc), and positive reception of the national currency etc.

External positive factors are opportunities and prospects such as improved transport connections to the area, which can be technically employed in accomplishing the targets. The constructive adjustments to tourism legislation, an increase in individual profits and disposable incomes and an improved situation on the tourism market are included as external positive factors.

The essence of SWOT analysis is the ability to take advantage of strengths and weaknesses, opportunities and threats, and to ensure compatibility between the destination's resources and conditions in its environment. In this respect, SWOT analysis has become a tool which allows marketers and users to look at the direction an organization may wish to move towards in the future. Therefore it has become a strategic evaluation tool which marketers use for assessing organizational strategic position. After the evaluation, the stakeholders have to make use of the identified strengths, remove or eradicate the weaknesses, seize the opportunities and neutralize the threats.

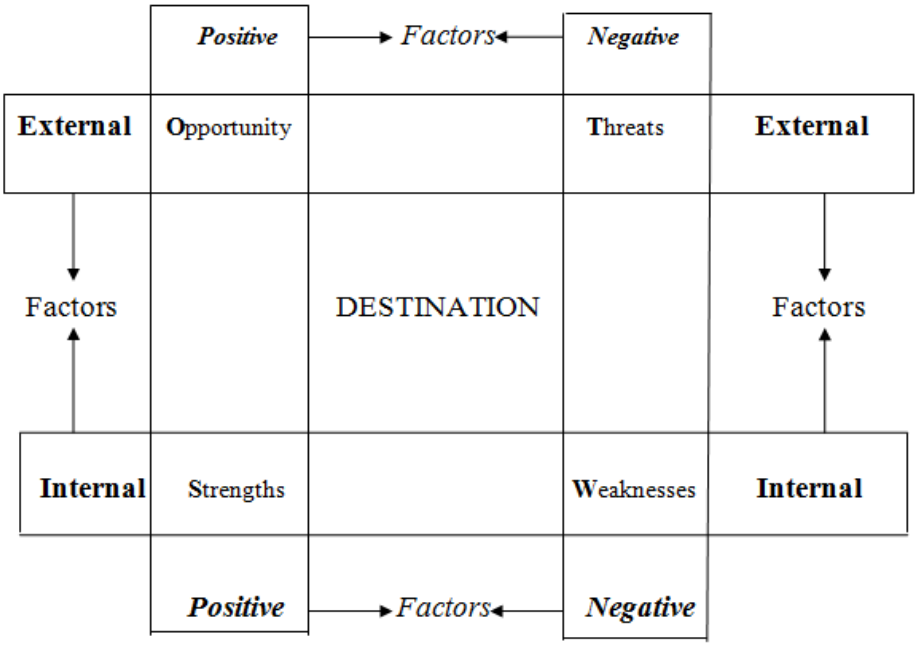

Fig. 4. The factors affecting the position of a tourism destination in SWOT analysis

***Source**: Author, developed from SWOT factors*

A procedure which involves SWOT scoring and the likelihood of strategic success can also help choosing the right strategy. The process engages the evaluation on an established scale of key internal and external factors, and arranging whether there are more strengths than weaknesses in the organization and more opportunities than threats in its environment. In this process, the list of strengths and weaknesses, threats and opportunities in the form of a table, and their evaluation on an accepted scale, e.g. 1-5 points, summarizing strengths and weaknesses is prepared. Then identification of an organization's strategic position, with one of the four strategies (SO, WO, ST, WT), as described above, ascribed to it. Subsequent to these steps then an estimation of the probability of strategic success (PSS) follows. (Berliński 2002; Berliński & Penc-Pietrzak 2004, Goranczewski & Puciato 2010). PSS as the chance of the considered strategy is computed mathematically as

$$PSS = \frac{SP + AS}{2}$$

SP = the organization's internal strength

AS = the organization's attractiveness in the environment The PSS (here, coefficient of Probability of a Strategic Success) varies from zero to one and the demand for attaining the success is to have the value greater than **0.5** [0 <PSS ≤1 and PSS >0.5]

The internal strength (**SP**) and external strength (**AS**) are computed using the following course of action based on the list of strengths (**S**) and weaknesses (**W**) as in internal strength and opportunity (**O**) and threats (**T**) as in external strength.

$$SP = \frac{\sum S}{\sum S + W}$$

$$AS = \frac{\sum O}{\sum O + T}$$

These are all probabilities which can be calculated or computed in a correct or an approximation format.

3 RESULTS AND DISCUSSION

The review of the related literature allows having clear picture of the Zanzibar tourism sector and there are certain important factors also identified that have the potential to influence the development of the sector in negative or positive manner. In the light of above review of the literature, the research paper presents the SWOT analysis of Zanzibar tourism sector to identify its strengths, weaknesses, opportunities and threats that could help in formulating marketing plans and strategies for this sector.

SWOT Analysis of Zanzibar Tourism sector

The study of external and internal environmental factors associated with the Zanzibar tourism sector allows having clear picture of the Zanzibar tourism sector and there are certain important factors also identified that have the potential to influence the development of the sector in negative or positive manner. Thus, the SWOT analysis of Zanzibar tourism sector is presented to identify its strengths, weaknesses, opportunities and threats that could help in formulating marketing plans and strategies for this sector.

Strengths

Zanzibar has been experiencing economic and political reformation for last few years that has resulted in the expansion and development of tourism entrepreneurs (Stephen and Joanne. 2006). The sector has shown significant signs of development and at present it offers competitive tourism services like secure leisure activities where the tourists can enjoy their vacations with privacy and safety. There are around 237 hotels operating in the state that provide tourists many options to stay for their tours and some of them are international standard hotels. There are wide ranges of activities that the tourists could get engaged in like diving, visiting historical and cultural sites, shopping for handicrafts, souvenirs etc. and visits to natural forest reserves with well trained guides. The strong point of the destination is the fact that Zanzibar is a native land of cultural heart and fun fields. Its town area is a UNESCO World Heritage site which has enabled some of the beautiful houses to get much needed renovation.The spice island of Zanzibar is a attractive and beautiful world of its own and its beautiful beaches and seashores are world-prominent.

Other strong points that may be considered standard for the entire forms of tourism (and tourism merchandise) for Zanzibar tourism destination include the Government commitment to the growth and development of tourism and recognition of the value of tourism, the appropriate geographical location within the famous deep Indian Ocean, the best position and entrance to the entire (core) African countries. Zanzibar Islands are closely positioned to other tourism regions such as Kilimanjaro Mountain, National Parks and Serengeti regions in Tanzania mainland as well as connection routes to Kenya, South Africa and Egypt with harmonizing tourism contribution and experiences. Also the natural scenery of the Zanzibar islands with its culturally diverse and peaceful community proves to be much more precise in comparison to other regions in eastern part of Africa. The recent investment in restoring historic sites in the Zanzibar municipality also considered to be another contributing strength point. Considering many strong points for the destination, it can easily be declared that the destination has a combination of natural potential and the cultural potential with forms of tourism that can still be practiced without massive hard works.

Weaknesses

The sector is in process of expansion and development and needs adequate plans to foster the pace of its growth (Stephen and Joanne, 2006). It has not been established as the top most tourism destination of Indian Ocean and needs effective management to attain this objective. The biggest weak point of this destination is that, at present the tourism industry of Zanzibar is immature and less groomed to serve tourists with expectations of high quality services. There are only few international standard hotels operating in the state and rest of the tourism facilities like accommodation, shopping, food and beverages are just of acceptable standard and do not offer relatively high quality products to the tourists. Due to this reason, Zanzibar seems to be attractive destination for low and medium spending tourists and the high spending tourists don't come here very often. Other weak points of the Zanzibar tourism destination include:- weak perception of tourism sector to the aged population of the region, inadequacy of skills in the business, weak awareness amongst visitors and residents of Zanzibar tourism experiences outside of major attractions such as unspoiled beaches.Weak understanding amongst residents of the tourism experiences available throughout the Zanzibar islands. Weak awareness of residents in neighboring suburbs as to the experiences available throughout the Zanzibar islands, transformation to tourism businesses are not fully and effectively communicated all the way through the industry.

Opportunities

There are several opportunities within the tourism sector of Zanzibar. The sector has been gaining the attention of the international community and the efforts of the government are resulting in increasing of foreign and local investment in the sector. There are so many different types of tourism attractions in the state that the marketing managers could focus upon them to attract the tourists. Zanzibar has been named as "land of exotic natural species, Romantic Island, paradise of Africa, Isle of harmony and the cradle of standard Kiswahili. These attributes possess great opportunities for the marketing manages because based upon these attributes, they could make effective and attractive marketing plans and strategies to influence the consumer decisions. The cultural and historical heritages of Zanzibar are very important aspects of the state that provide certain important marketing opportunities and the marketing plans could be based upon these attributes to attract the tourists. Another point is that, Zanzibar has still chance to reconsider the main role of the tourism association with the aim to enhance with relationships between the Zanzibar Tourism Association and the Tanzania mainland Tourism Association or sectors. This is consequently with supporting a strategic and targeted approach to destination marketing, promotion and industry development. The destination has an opportunity to capitalize and provide more training and development chances for tourism businesses

Threats

The partial government policies are the major threat confronted by the Zanzibar tourism sector because the policies mainly focused towards providing tourism facilities to the outsiders and overlook the demands and requirements of the local population. The negligence of local demands might also result in dissatisfaction among the people regarding the government policies that in turn become problematic issue and could threaten the peace and social stability of the state that is supposed to be major qualification of a tourism destination. Table 1 presents a brief synopsis of SWOT analysis of Zanzibar tourism sector.

Table 1. SWOT Analysis for Tourism Sector of Zanzibar Tanzania with the major SWOT factors

Strengths	**Weaknesses**
S1:Government Support **S2**:Easy Accessibility via airway and ships **S3**:Natural resources and attractive tourism sites **S4**:Wide range of tourism activities options	**W1**:Mismanagement of natural resources resulting in slow pace of expansion and development **W2**:Lack of adequate hospitality management training to local population **W3**:Lack of international level accommodation facilities

Opportunities	**Threats**
O1: International attention **O2**:Increased foreign and local investment **O3**:Cultural and historical heritage	**T1**:Negligence of local population's interest in government policies **T3**:Generation of dissatisfaction regarding government policies and plans **T3**:Risk of social instability

Considering the dynamic tourism environment, awareness of and demand for a unified and coordinated tourism industry, awareness of and demand for tourism experiences from local residents as well as visitors to Zanzibar remains as the most excellent approaches to be integrated This should go sequentially with endorsing the Zanzibar city as a desirable and safely reachable destination. There should be strategies that help creating knowledge and up to date tourism industry described by reliable, most excellent values of business best practice, well-built client service, and easy communication between and within business facilitators. The more integrated strategies and action plans based on the analysis are predetermined in the tables 2 to 5 below

A strategy1: To smooth the progress and the opportunity for tourism businesses and then strengthen ties across the tourism industry in Zanzibar

Table 2.

Plan of action	*Accountability*	*Resources*	*Implementation/measure*
Develop a familiarization program for business operators within the Zanzibar city	Tourism Ministry and or Tourism Commission	Among presented resources	A small group of tourism facilitators to host the first familiarization program
Discover the prospects to work with Tanzania mainland and neighbouring countries such as Kenya so as to encourage visitation to Zanzibar islands	Tourism Ministry and or Tourism Commission	Among presented resources	Systematize frequent congregation with Tourism officials from Tanzania mainland and neighbouring countries such as Kenya
Discover opportunities to work with environmental stakeholders to encourage most proficient use of the Natural attractions available in Zanzibar	Tourism Ministry and or Tourism Commission	Among presented resources	Tourism officials or commission meet with key representatives from the environmental officials to talk about opportunities.

A strategy 2: To enhance the use of mass media for marketing in promoting Zanzibar as a potential and competitive tourism destination

Table 3.

Plan of action	*Accountability*	*Resources*	*Implementation/measure*
Use of community and societal media to market the Zanzibar tourism destination	Tourism Ministry and or Tourism Commission	Among presented resources	Social media(both public and private) has to be utilised as frequent as possible per year campaigning in promoting the destination
Guarantee the supply of the tourism DVDs to local businesses, visitor and tourism information entrances in Zanzibar area	Tourism Commission	Among existing resources	Tourism DVDs, flyers and all adverts are displayed at all public places
Supply and utilise market research to sustain future marketing activity. Also discover opportunities for involvement in state or local research by the Zanzibar city and tourism operators	Tourism Commission	Some supplementary resources needed in addition to the existing resources	Future marketing activities are supported by industry research. The Zanzibar City here is also fully involved in the development of future destination RD initiatives

Strategy 3: To implement procedures to accurately measure tourism progress and trends within Zanzibar City.

Table 4.

Plan of action	*Accountability*	*Resources*	*Implementation/measure*
Performing a review of existing data collecting processes.	Tourism Commission	Among presented resources	examination of current data collecting processes has been undertaken and areas for improvement have been identified
Discover and work with business leaders to encourage data collection across tourism locations within Zanzibar	Tourism Ministry and or Tourism Commission	Among presented resources	Several locations across Zanzibar tourism locations for visitor data collection.
Perform yearly review of visitor trends and processes.	Tourism Ministry and or Tourism Commission	Among presented resources	Yearly report dispersed to stakeholders demarcating visitor figures, trends and adjustments

Strategy 4: To intensify development and growth opportunities for businesses and individuals and groups providing services to visitors so as to increase industry ability and attitude.

Table 5.

Plan of action	*Accountability*	*Resources*	*Implementation/measure*
Implement a complete survey of tourism and tourism-related businesses within Zanzibar tourism destination so as to ascertain needs and opportunities for growth and expansion	Tourism Commission	Among presented resources	Various operators participate in survey and with participation from different business categories
Introduce a chain of networking events with stakeholders to join with the tourism commission and meet one another in a productive and informal atmosphere	Tourism Ministry and or Tourism Commission	Among presented resources	Yearly networking events with representation from many businesses-(twice a year)
Enhance presence of tourism operators at existing Zanzibar tourism business events, workshops and tutorials	Tourism Ministry and or Tourism Commission	Among presented resources	In any case two tourism representatives attending events each neighbourhood.
Founding from industry demand, enhance the business events, schedule to include events specifically targeting the tourism industry.	Tourism Ministry and or Tourism Commission	Within existing resources	At least 2 tourism-specific events run each year and almost fully packed.

4 CONCLUSION

It is revealed from the above discussion that the tourism sector of Zanzibar possesses great scope for marketing because the sector is progressing significantly and is also gaining the attention of international community. The entire discussion could be sum up with the conclusion that the marketing strategies for Zanzibar tourism sector should be focused towards informing people about the ongoing expansion and development. Zanzibar could win the tourism market through adequately focusing upon certain important issues like training of hospitality management to the local population, improving the image of Zanzibar tourism sector, building of international level accommodation facilities and provision of high quality services to the high spending tourists along with low and medium sending consumers.

The tourism sector of Zanzibar possesses great scope for the marketing managers because the sector has been evolving as attractive tourism destination. At the same time, there are certain critical issues identified that needs the attention of all the stakeholders. The sector is under the development process and the marketers, tourism policy makers and government need to emphasize towards certain important issues. The local population must be provided with high level training of

hospitality management so that they could serve the tourism in better way. There is also need of establishing international level accommodation and food facilities to attract the high spending tourists. The hotel and tourism training centres must be established and strengthen to provide adequate hospitality management to the local population. There is also need to preserve the historical and cultural integrity of the place.

Zanzibar could win the tourism market by focusing towards tourism capacity building. The marketing policies must adequately address the expectations and demands of international tourism. The cultural and historical heritage of the state must be highlighted and promoted to position it as an important cultural and historical worth seeing place. There are many attractions in Zanzibar that must be promoted adequately to bring them in front of international tourism community. The marketing strategies much also emphasize upon improving overall image of Zanzibar tourism sector and establish its image as peaceful place that provide quality tourism services to induce upper scale market tourists. Internet, email and other advanced marketing tools must be used to capture the attention of the target consumers and the travel agencies must provide the information and offer the facilities of online booking of flights and accommodation to alleviate the tourists.

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STAKEHOLDERS' PERCEPTION OF FOREST AND ITS IMPLICATIONS FOR SUSTAINABLE FOREST MANAGEMENT IN GHANA

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ABSTRACT: The objective of the study is to examine stakeholders' perception of forest and its implication for sustainable forest management in Ghana. This has become necessary in the light of the fact that operational application of forest management remains troublesome leading to the development of inconsistent forest management practices in the country. The study was approached using a cross-sectional design imploring semi-structured interviews and questionnaires as data collection method and instrument respectively in Juaso Forest District in the Asante Akim Central Municipality of Ghana. The research findings indicate that stakeholders' participation in sustainable forest management in the Juaso Forest District has been met with a myriad of challenges. These challenges are deeply rooted in the stakeholders' perceptions of what constitute forest in the communities. These perceptions have defined the conditions required for sustainable forest management at the local level. It is noted that sustainable forest management is a collaborative efforts, hence at the local level efforts should be made to ensure participation of all stakeholders in the decision making, policy design and implementation.

KEYWORDS: Stakeholders; Forest; Access; Nature; Right; Management; Collaborative; Ghana

1 INTRODUCTION

Stakeholders as those who are likely to be affected by a policy or project and who have the power to help or obstruct its acceptance at the decision making level [1]. These can range generally from entities of national and local government, civil society organizations, private organizations, citizens and international donors. Stakeholders are found in every sector of the economy.

The situation is similar in the forestry sector where there are many stakeholders involved in various forestry activities. The stakeholders in the forestry sector come from different background including foresters, rangers, policy makers, farmers, and local communities (traditional leaders, assembly members, community-based organizations among others). The roles and position of these stakeholders are defined based on their distinct expertise. In this connection, the diverse activities in the forestry sector, for instance management, are carried out by individuals who have expertise in management. The local communities however involved in any forest active also have expertise in forest management based on local knowledge and adaptation since their livelihoods are predicated on forest resources.

Forests in general are complex and contested spaces, not fixed entities whose nature can be stated in an absolute way This is because the way forests are understood and valued is inextricably linked with the ideas of these diverse stakeholders who view or lay claim on them [2].

According to [3], a forest is defined as an ecosystem characterized by more or less dense and extensive tree cover, often consisting of stands that vary in species composition, structure, age, class, and associated processes. The United Nations Environmental Programme (UNEP) explains that to understand what constitute forests, two criteria can be used and these

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include the crown cover threshold and land use criteria. The UNEP highlights a 10% minimum threshold of crown cover for defining both opened and closed forests. In using the land use criterion forests are defined in line with the "main purpose or use" of the forest resources. And this perspective is similarly shared by [4] who claim forests as tree covered areas not predominantly used for purposes other than forestry. Based on this opinion, they have distinguished forests into two types; natural forests and planted secondary or plantation forests.

It is also important to emphasize that the various perceptions of the stakeholders within the forestry sector influence their contribution towards sustainable forest management. In Ghana, forest ownership and management is fraught with the imbalances of trust. Governmental institutions such as the Forest Services Division (FDS), in collaboration with the local communities, present options for collaborative forest management. However, lack of absolute trust and positive expectations, particularly from the local people have invariably derailed the motive of such drives and efforts. Again, the fact of the ad hoc programmes by forestry institutions in curbing rapid deforestation from over-exploitation have usually marginalized the local people in the planning processes. Since the lack of trust in forest ownership and management is a major drive of deforestation, the next section of the paper reviews the trajectory of forest tenureship and management in Ghana.

2 THE TRAJECTORY OF FOREST TENURESHIP AND MANAGEMENT IN GHANA

Forest power including tenureship in Ghana has a long history dating back to the pre-colonial era, where forests were owned in common by families, clans, and stools (communities) [5], [6]. However, subsequent forest reforms such as the Forest Ordinance of 1927 authorized the colonial government to put part of Ghana's forest into reserves [6]. After the reservation was completed in 1939, a forest policy was adopted in 1948 (Forestry Commission [7]. This policy was criticized by the World Bank preparatory missions for the Forest Resource Management Project (FRMP) as being inadequate in dealing with the problem of deforestation in Ghana [8].

The ownership and management of forest reserves were solely the preserve of the Government of Ghana in trust for the local people. These functions were entrusted into the hands of Forest Services Division at the local level. The 1927 Forest Ordinance also provided an alternative mode of forest management by the owner(s) under the direction of the then Forestry Department (now known as Forest Services Division). Thus, the local communities saw the creation of the reserves as a complete removal of their rights and benefits, and an expropriation of their land and forests [8]. Subsequently, the Concessions Act of 1962 vested the right to grant timber concessions and the management of all timber resources, both on and off reserves, in the central government. In addition, through the Forest Protection Decree of 1974, the management of trees within forest reserves and the rights to own, plant, use, and dispose of trees are controlled by the State [9].

The subsequent forest reforms and policies in Ghana aimed at protecting the forest resources, particularly timber both on and off reserves with no or limited involvement of the local communities. In view of the over-centralization of forest management without any decentralized role for communities and industries, the non-integration of rural production systems into forest management, and the demise of off-reserve forests, the government in the 1980s and early 1990s, called for "social forestry" or "rural forestry" (was promoted by the then Forestry Department) as a way of encouraging communities to establish village, communal, individual or family woodlots [10].

Successive postcolonial governments in Ghana continued the colonial legacy of forest management, which excluded the local people and focused on commercial interests [11]. Currently in Ghana, the chieftaincy institutions exercise resource ownership functions on behalf of the local people whereas the government exercises administrative and management functions of forested lands by holding the lands and trees on them in trust [12]. In this case, people do not have any control over forest resources, particularly the economic species, on their own parcels of lands, which may form part of a concession leased out by the government to timber companies. Victims of such a situation may feel excluded from sharing the benefits of forest resources and may cause damage to these resources.

However, forest communities in Ghana have their livelihoods predicated on the availability, access, and utilization of products of the forest [13], [14]. The exclusion of the local communities in forest management in Ghana denies them the right and ability to access forest resources, including NTFPs, upon which their livelihoods subsist [15]. Consequently, concerns raised by major stakeholders along with increasing international attention on deforestation stirred the revision of the 1948 Forest Policy, which culminated in the adoption of the new Forest and Wildlife Policy (FWP) in 1994 (1994-FWP) [16].

The overall aim of the 1994-FWP was conservation and sustainable development of the nation's forest and wildlife for maintenance of environmental quality and perpetual flow of benefits to all parts of society. It provided a framework for some important legislative reforms including the Forestry Commission Act (Act 5), which consolidates sector agencies [17]. The 1994-FWP also emphasized collaborative forest management (CFM) by enhancing the role of communities in forestry at

policy, managerial and implementation levels [18], where the government, led by the Forest Services Division, partnered with forest communities to manage the forest [19]. Thus, the policy emphasized the decentralization of forest management responsibilities to communities. The FC therefore created a Collaborative Natural Resources Management Unit (CNRMU) and, at the community level, the Community Forest Committees (CFCs) and Community Biodiversity Advisory Groups (CBAGs) [17]. Despite the fact that the 1994-FWP recognized the importance of Collaborative Natural Resource Management (CNRM) and Community-based Natural Resource Management (CBNRM), these had no legal backing [18], [17]. Thus, communities do not participate in forest management as of right but as licensees, and also CFCs do not participate in planning or policy formulation about important issues like access rights or benefits sharing [17].

More recently it has been noted that one key factor perpetuating deforestation is the changing perception of stakeholders on forest delineation or reserve. Thus, the perception of forest delineation particularly by the local people varies based on the nominal attention given to trees on off-reserves as compared trees in on-reserves by the FSD. This has become a disincentive towards sustainable forest management. Consequently, the various stakeholders namely, the local government entities in charge of forests and the local communities perceived forest from a different angle, which has influenced their roles in sustainable forest management. It is therefore necessary to identify the position(s) and role(s) of every stakeholder(s) but more importantly how effectively they participate in the pursuit of the objectives of forest management. The understanding of participation per this study is a process through which stakeholders have influenced and share control over the development initiative, decisions and resources, which affect them [20]. Theoretically the research opines that, stakeholders' perceptions of forest influence the position and/or value they place on the resources. This in turn also influences their role in forest management and usage.

Figure 1 is a flow chart showing the interrelationship between stakeholders' perception and the implication for sustainable forest management in Ghana.

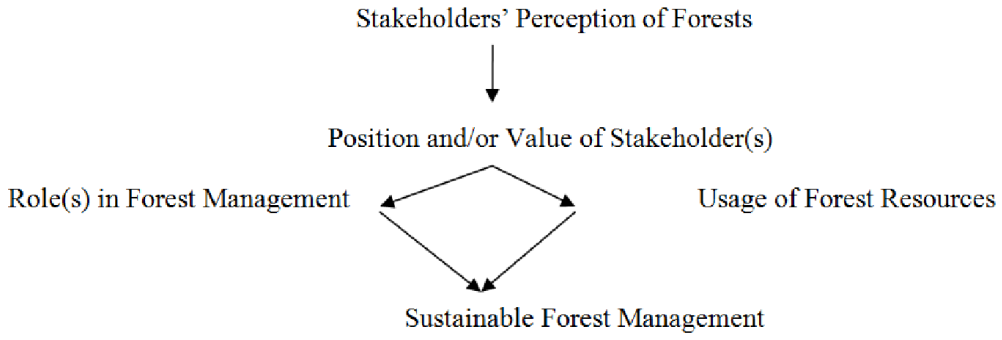

Figure 1: Stakeholder Perception and Sustainable Forest Management

3 STUDY AREA

The study was conducted in two communities: Dwease and Praaso in the Juaso forest district in the Asante Akim Central Municipal Assembly (AACMA) of Ghana. The Municipality lies between latitudes 6^0 30' North and 7^0 30' North and longitudes 0^0 15' West and 1^0 20' West. It shares boundaries to the north with Asante Akim North district, to the east and to south with Asante Akim South and to the west with Ejisu-Juaben municipality. The populations of the two communities are estimated at 5160 and 5148 for Dwease and Praaso respectively [21].

The vegetation type of the Municipality can be categorized under the moist semi-deciduous forest belt. The vegetation pattern is distributed in three dimensions; Open Forest which covers 576 km^2 and spreads over the highlands of the municipality. The other two include the Closed Forest covering 230 km^2 on the range and the Wooded Savannah covering 246 km^2. The different tree species produce tropical woods such as Wawa, Ofram, Sapele, Sanfina, Okyere (Kofo), Onyina, Kyenkyen, Otie and Yaya, which have high economic value. Apart from wood products, foodstuffs (delicacies such as snails and mushroom) and other raw materials are obtained from the forest for industrial and domestic use [21].

About 82% of the population in the municipality is engaged in private informal occupations like agriculture, trading, vocational services (hair dressing, sewing and driving), carpentry and masonry. Agriculture stands out as the major occupation employing 53.9% of the people especially those aged 15 years and above. The major staple food crops produced include maize, cassava, plantain, cocoyam and yam while cocoa is the major cash crop. Agricultural production is however largely on subsistence basis (72%) of the farmers cultivating less than 3 acres of land) while about 6% engaged in large-scale farming [21]. Figure 2 is a map of the Asante Akim Central Municipality with the studied highlighted in the shades.

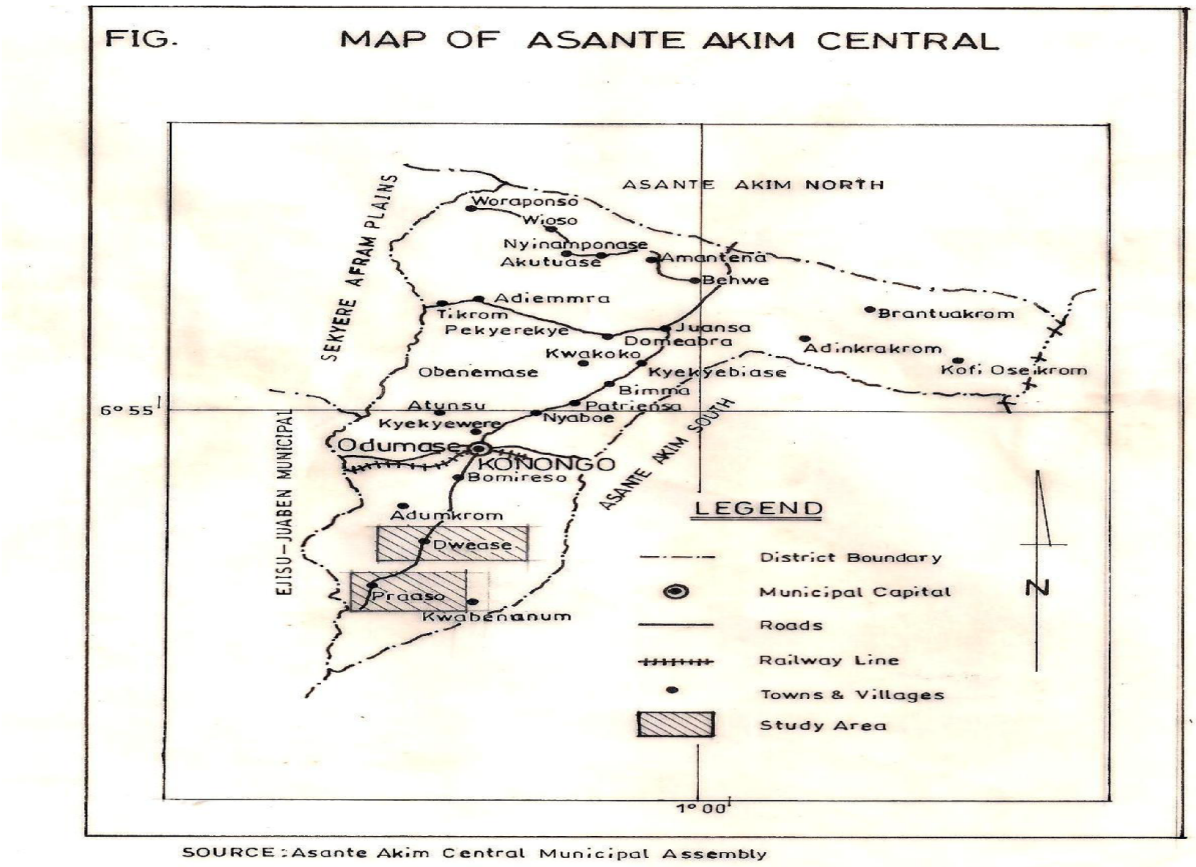

Figure 2: Map of Asante Akim Central Municipal Assembly indicating sampled communities in shades

4 RESEARCH METHODS

The cross-sectional design was used for this study because of its suitability. The focus was to indicate the pattern of association between and among the key variables, which were sought, and the cross-sectional design is a good choice in that regard. A cross-sectional design entails the collection of data on more than one case and at a single point in time in order to collect a body of data in connection to two or more variables, which are examined to detect a pattern of association [22].

With regard to the sampling technique, both stratified random and purposive sampling techniques were used because of the mixed research strategy adopted. The stratified random sampling was used to select household heads for the questionnaire administration. The stratification was based on gender (male and female strata), and respondents were then randomly sampled from these strata depending on who expressed interest of being involved in the research. The purposive sampling was used to select subjects based on their relationship with the research questions [22] and this included key informants like Forest Services Division, traditional rulers and assemblymen to conduct the interviews. The total sampling frame consisted of two staff from the Forest Services Division (Assistant manager and a forest guard based in Dwease), Chief of Dwease and the Assemblyman of Praaso. In addition, a total of One Hundred and Ten (110) households respondents were sampled and this consisted of Sixty (60) from Dwease and Fifty (50) from Praaso.

Both primary data and secondary information were collected for this study, with the primary data resulting from a two month field survey in the two communities while the secondary information resulted mainly from peer-reviewed articles, books, magazines and other sources with relevance to the study. Semi-structured interviewing was used for the key informants (traditional rulers, assembly and the Forest Services Division). Though different interview guides were used for the various informants, the content of each basically covered the demands of the key research question. Self-administered questionnaire was also used to solicit the individual views of heads of households regarding the key research question and this was augmented by personal observations, in which the researchers adopted the overt role of being "observers-as-participants".

The pre-coded questions from the questionnaire administration were analyzed using the Statistical Package for Social Sciences (SPSS) and the result presented in frequency tables. The qualitative data was analyzed thematically, by identifying

key themes in the interviews and these were outlined through indexing or coding the data and reflecting and interpreting the data. The major ethical consideration observed was with regards to informed consent; however, the essence of the research was explained to each participant before engaging him or her either in an interview or questionnaire administration. But this does not eliminate the fact that, they did not have detailed knowledge about the outline of questions (the way the questions were to be asked and how). The need to preserve such information became necessary in order not influence the perception of respondents and to reduce biases, which could jeopardize the reliability of the research findings.

5 RESULTS AND DISCUSSIONS

5.1 STAKEHOLDERS' PERCEPTION OF FOREST AND FOREST TYPES IN GHANA

In due recognition of the fact that forest ownership in Ghana is considered to be dual (legal estate in the government and the beneficial estate in the local communities), the key stakeholders identified were broadly delineated into state and local partners. In terms of the state partners, forest governance and management is officially vested in the Forestry Commission of Ghana (FC) who carries out this responsibility through its decentralized body; the Forest Services Division (FSD) in addition to other public bodies and agencies like the Wildlife Division, Timber Industry Development Division, Wood Industries Training Centre; and the Resource Management Support Centre. It was however discovered that the FSD is the only a functional body within the state apparatus with recognized role(s) towards forest management.

From Table 1, it is identified that 77 of the total household respondents (70.6%) stated that the Forest Services Division (FSD) is the major institution of forest governance and management while the remaining 33 respondents (26.6%) indicated that local partners including the Chiefs, Assemblymen and local residents are responsible for forest governance and management.

Table 1: Respondents' views on the stakeholders of forest governance and management

Stakeholders	Frequency	Percent (%)
Forest Services Division	77	70.6
Local partners	33	29.4
Total	110	100

Source: *Authors (Fieldwork, 2013).*

The understanding of forest as perceived by the various stakeholders involved in this study unanimously connotes tree-dominated environment. The study identified the individual responses on the perception of forest to be directly in line with the two most critical factors; *crown cover threshold* and *land use criteria* used in distinguishing forest types as highlighted by the UNEP. Based on these factors four categories of viewpoints were identified in relation to the understanding of forests in the studied communities. These include "*Crown cover threshold only"; "Land use criterion only"; "Both Crown cover threshold and Land use criteria";* and *"Other, please specify"* as shown in Table 2.

Table 2: Household Respondents' Criteria for defining Forest

Criteria	Frequency	Percent
Crown cover threshold only	39	35.5
Land use criterion only	24	21.8
Crown cover threshold and Land use criteria	37	33.6
Other, please specify	10	9.1
Total	110	100.0

Source: *Authors (Fieldwork, 2013).*

It is identified from Table 2 that, 39 respondents (35.5%) defined forest using the crown cover threshold criterion only. Based on this, their perception of forest is expressed as *"a land with large and closed association of tree covering and interaction of other biodiversity"* (Personal interviews, 2013). Though the local people do not necessarily understand the

technicalities of what constitute the crown cover threshold to distinguish between opened and closed forest types as indicated by the UNEP, their descriptions is congruent with the perception of forest by [23] as the associations of large, woody, perennial tree species, generally several times the height of a human, and with a more or less closed canopy of leaves overhead.

A total of 24 respondents (21.8%) also explained their understanding of forest following the land use criterion only. By this criterion, forest is *"a land that has never or is partially being cultivated"*. The focus of this perspective is informed by the role of human intervention in the regeneration or degradation of the forest environment and this clearly relates with the definition of forests by [24] as tree covered areas not predominantly used for purposes other than forestry. Majority of the household respondents identified that a greater proportion of the forests can be classified as plantation or secondary forests because they have their farmlands located within the forested area. Even respondents argued that the Dome River Forest reserve located in Dwease can be classified as secondary forest because parts of it had been used for agro-forestry under the Modified Taungya System (MTS).

For the 37 respondents (33.6%) who defined forest using both the crown cover threshold and land use criteria, a forest "*is any land with closed covering of trees and other biodiversity that has never or is partially being cultivated"*. It is observed and also indicated by respondents that because much of the forests have been cultivated or are still being cultivated and this has essentially affected the crown cover development of trees and caused the loss of indigenous trees and other vegetative species.

While the crown cover and land use criteria seem to dominated in the expressions on what constitute forests among the local residents, as pointed out in Table 2, it was also observed that, 10 respondents (9.1%) defined forests based on different factors. One of such factors highlighted was the *"maturity of the trees"*. By this the respondents meant the *"size"* of the trees measured in terms of the thickness of the trunk, which they use to determine whether a tree is ready to be harvested. Based on this view, it was common to hear some respondents argue that there is no forest in the area. This is because logging especially the operation of chainsaw has destroyed if not all, majority of the trees needed to classify the tree-dominated ecosystem as forest(s).

Again, some indicated the institutional policy framework that defines the tree ownership and management. Under this, forests can be a land owned and managed solely by "the government" (herein defined as the Forest Services Division) or jointly owned and managed "the FSD and traditional rulers" for a given community. This is confirmed in the definition of forest by the FSD. According to the FSD;

> *"A forest is a piece of land earmarked and set aside by prescribed policy with the minimum height of the trees being 5meters that involves a complex interaction of biodiversity, water bodies, and other physical land characteristics"* (Personal interview 2013).

The *"5meters"* height of trees within a forest can be used to define the crown cover threshold as indicated by the household respondents. The definition of height measured in "meters" partially relates with the understanding of forest as advanced by [25]. According to FAO, forest refers to as a land spanning more than 0.5 hectares with trees higher than five (5) meters and a canopy cover of more than ten (10) percent, or trees able to reach these thresholds in situ; it does not include land that is predominantly under agricultural or urban land use. The use of height is a suitable denominator to delineate forests from other terrestrial biome and more specifically, other plant communities. Forests for that matter are easily recognized by the height and tree crown cover.

Even though the FSD perceives the height of trees as a necessary factor in defining forest, the emphasis is placed on whether the land has been demarcated by policy to be protected. In addition, the responsibility of governance and management must be vested with the Forest Service Division and this could be in trust for one or more communities. Based on this explanation a forest is connoted same as a forest reserve. In relation to the two communities, Dwease has a forest because it shares in the ownership and management of the Dome River Forest Reserve while Praaso does not because there is no forest reserve located in this community. In addition, it also has no share in the ownership and management of the reserve at Dwease. The import is that, even though Praaso has extensive trees dominated vegetative species above the minimum threshold of 5 meters, such areas are not regarded as forests according to the understanding of forests as inquired at the local FSD office.

It is realized generally that the perception of forest as an ecosystem characterized by more or less dense and extensive tree cover, often consisting of stands that vary in species composition, structure, age, class, and associated processes clearly captured the fragmented ideas expressed by the research respondents. The distinction of forest types into primary and secondary forest types seeks to examine whether the forest has undergone succession and to what extent the indigenous forest resources have been maintained in terms of species composition, structure, age, and class. It is observed and also

indicated by respondents that much of the forests have been cultivated or are still being cultivated and it has essentially affected the crown cover development of trees and has caused loss of indigenous trees and other vegetative species.

Based on this analysis, a permutation of the varied perceptions of forest by the household respondents revealed that the forest types in the study area can be categorized into primary-opened forest; primary-closed forest; secondary-opened forest; and secondary-closed forest as indicated in table 3.

Table 3: Forest types (delineated using both crown cover and land use criteria)

Forest type	Frequency	Percent
Primary-closed forest	15	13.6
Primary-opened forest	18	16.4
Secondary-closed forest	4	3.6
Secondary-opened forest	73	66.4
Total	110	100.0

Source: *Author (Fieldwork, 2013).*

From Table 3, majority of the respondents perceived the predominant forest type in both communities to be secondary-opened and this implies that the forest is being cultivated and has opened canopy. Majority of the respondents noted that, most of the forested areas in the communities is being used to cultivate both tree and food crops however, the local people did not necessarily understand the technicalities of what constitute the crown cover threshold to distinguish between opened and closed forest types.

This was explained by staff of the FSD to be determined using the conditional score, which refers to the degree of visibility under the trees canopies for a distance of 800 meters long. The scores are ranged from 1 to 5 with a score of 1 being the highest; this is equivalent to 100% and 5 being the lowest score. Forests with highest condition score often lack undergrowth which aids clear visibility under the canopies and such category are classified as closed forests. Those with low scores have more undergrowth, which produces visibility under the canopies, and these are defined as opened forests. Based on this, the Dome River forest reserve located in Dwease is argued to have a conditional score between 3 and 4, which is low and thus is classified as an opened forest. Also, since it has been used for agro-forestry, it is obviously classified as secondary-opened forest type.

5.2 IMPLICATIONS FOR SUSTAINABLE FOREST MANAGEMENT IN GHANA

It is necessary to highlight that the various understandings of the forest as expressed by respondents reveal some critical issues which are pertinent for inquiring into the conditions for local level sustainable forest management. It is realized that the interpretation of the concept of sustainable forest management by different actors and institutions vary. Notwithstanding, a common consensus is the need to recognize the participation of all stakeholders in forest management activities. The views expressed particularly by the local people in both communities are congruent with [26] who stressed that for forest management to be participatory there is the need to involve local people in decision-making and in the control and management of the forests.

It is pertinent to state that the local stakeholders duly recognize their positions and roles towards sustainable forest management nonetheless they argued that in practice, forest governance and management in their communities has been solely handed by the state apparatus. For instance the chief of Dwease remarked that;

> *"Though the Forest Services Division is supposed to foster collaboration with us for forest management (FM), I have realized our efforts are not appreciated. We suggested a voluntary forestry team from the community to help monitor the chainsaw operations but it has been refuted by the FSD. Yet most of the forest guards used by the FSD cannot read and write and this has promoted ineffective data collection, which is a great challenge towards sustainable forest management in this community"* (Personal Interview 2013).

This observation confirms [27] who notes that, the Forest Ordinance No. 13 of 1927 (Cape 157) along with subsequent enactments in the Forestry sector have operated to expropriate all forest lands from the communities (both the legal estate and management powers) to the government. This has often created conflicts regarding the sharing of forests benefits as well as issues relating to ownership and management.

From the above analysis, it is realized that, management of forests in Ghana is characterized by disputes and disoriented ideas. This orientation has critically affected the conditions and practices required for sustainable forest management especially at the local level. As a result, if Ghana is to achieve the objectives of sustainability in the forestry sector, then fundamental issues relating to the positions and roles of the various stakeholders on forest management and governance ought to be addressed. In the case of the studied communities, the critical issues, which should be looked, include *"access to", "nature of"* and *"right to"*.

On the issue of *access to*, those who explained their understanding of forest based on the ownership criterion indicated that the Dome River Forest Reserve is *less accessible.* This is because by definition, such a land has been earmarked by the Forest Services Division (FSD) as a reserve and access to such forest type is highly regulated. This contrasts greatly with access to the off-reserves forest types. It is explained that, because these are generally being cultivated, they are more of de facto open-access resources widely open to any entrepreneur and individuals in the communities who are able to negotiate unofficial access to the forests independently of an official legal regime in place.

In order to ascertain this claim, the heads of households were questioned on the kind of forest resources they mostly extract. The respondents opined that, they either extract Non-Timber Forest Products (NTFPs) only or Timber Forest Products (TFPs) only or a combination of both NTFPs and TFPs as shown in Table 4.

Table 4: Household Responses on the Type of Forest Products extracted

Type of forest products extracted	Frequency	Percent
NTFPs only	85	77
TFPs only	3	3
Both NTFPs and TFPs	22	20
Total	110	100

Source: *Authors (Fieldwork, 2013).*

The findings in Table 4 indicate that about 77 % of household respondents stated that they extract NTFPs only, 3% extract TFPs only while the remaining 20% extract both TFPs and NTFPs. It was noted that the extraction of NTFPs is more likely to contribute more importantly to household livelihoods than TFPs. Most respondent explained that they engage more in the extraction of NTFPs because it is difficult to obtain a logging permit in order to have a concession for TFPs. It is confirmed at the Forest Services Division, that there are stringent measures to regulate the extraction of timber products. The management explained that, before giving concession to any individual or company or groups of companies, some criteria are sought. These include that prospective person or company should be formally registered; posses a letter of tax clearance from the Ghana Revenue Authority; letter from the Ghana Timber Association (GTA) indicating registration as a member; and should also poses a track record of good conducts and not owing the Forestry Commission in anyway.

Moreover, because most of the local people cannot meet the terms of these criteria, they tend to extract more of the NTFPs because these are easily accessible within the fringes of the forests as compared to TFPs. Access of TFPs by the local people is done mainly through chainsaw operation which is considered illegal. Even though some of the local people indicated that they have taken measures to manage the off-reserve forests against fire and illegal logging, these measures are however dependent on the economic value they place on the particular tree species located on their lands. It is argued that Mahogany (*Khaya senegalenis*) and Odum (*Milicia excels*) are more likely to be preserved because these are considered to be economic species.

Therefore individuals with these trees on their farmlands assumed that they could receive some share of the monetary benefit when the tree is being logged for sale and for that matter they take good care of the trees. The challenge however is that, such individuals could lose the supposed benefits because they may not know when these trees may be harvested especially with the increased illegal logging. As a result, it is highlighted by some farmers that in some cases they would rather prefer to cut down all timber species, (even when these trees are not matured) because apart from the fact that they do not get the monetary benefits from logging, the process also sometimes destroys their crops and there is also often less or no compensation for the losses.

Another issue to guarantee effective conditions for local level sustainable forest management in Ghana is the definition of the *nature of* forest types. This is quite necessary because it has implications for the kind of strategies adopted for sustainable management of the forest within an area. The study discovered that there are a number of strategies which have been adopted to ensure sustainable management of forests in the two communities: Dwease and Praaso. These strategies,

which are being adopted, varied in the context of the *nature of* the forest types. For instance, it is identified that the strategies adopted by the FSD are mainly used in the management of forests within reserves. The outcome of these strategies directly connects with the institution's perception of what constitute forest(s).

It is discovered at the FSD that there are three working cycles; protection, production and research and regulation which defines the strategies adopted to promote sustainable forest management. However in practice, it is identified the real and workable strategies currently being employed by the FSD within the two communities which include the "Enrichment planting; and the conventional administrative function of regulating illegal logging".

The Enrichment planting involves the process of introducing some trees species (both indigenous and exotic) into a degraded forest and these are inter-planted amidst the already existing trees. The activity was being carried out in the Reserve located in Dwease and this involved the planting of eight indigenous tree species namely, Wawa (*Triplochiton scleroxylon*), Mahogany (*Khaya senegalensis*), Mazonia, Kokrodua (*Pericopsis elata*), Kusia (*Nauclea diderrichii*), Edinam (*Entandrophragma angolense*), Amire (*Terminalia ivoresnsis*) and Framo (*Terminialia superb*). The choice is influenced by the belief that these species are being threatened to extinct.

A key concern is that this strategy is practiced only within the forest reserves and not the off-reserve zones. Also, since this activity is solely championed by the FSD through its Plantation department, there is therefore no cooperation with the local communities and no benefits through income generation or losses for smallholders in the either of the communities. Based on this, it is evident that currently there is no real strategy in terms of tree planting which is being adopted by the FSD to ensure the sustainability of off-reserve forests which are even more extensive in the two communities.

In terms of its regulatory responsibility, it was ascertained the FSD has established research plots to monitor tree growth and development. In addition, there is also regulation of timber extraction, and the Division carries out this responsibility by providing the legal framework or guidelines to determine which trees are harvested, where they can be obtained and by whom. These regulatory policies particularly with regard to timber forest products are also now keenly being emphasized because Ghana is a signatory to the Voluntary Partnership Agreement (VPA). Moreover, the FSD in collaboration with Trophenbos International Ghana (TBI) is helping to register chainsaw operators within the Jauso forest district, which is currently operational in Juaso and yet to be extended to other communities including Dwease and Praaso. The specific aims include helping them to understand the consequences of their activities on the sustainability of forests, enhance their knowledge on branding and marketing their wood products and capacity building in business and financial management.

It is also conclusive that the *nature of* forest types as understood by the FSD is linked with its management strategies that are directly geared towards the management of Timber Forest Products (TFPs) rather than Non-timber Forest Products (NTFPs). Such approach compromises local participation in sustainable management efforts because the local people often have less access to the TFPs and/or the resulting benefits accruing from their development. This makes them feel cheated and excluded from benefit sharing of forest resource and influences their attitude and perception on policies towards sustainable forest management.

Whiles the issue is far beyond the mere refusal on the part of the FSD to implement policies of forest management in off-reserves, the challenge is rather linked with the *"right to"* management. This defines the benefits and responsibilities of the appropriate stakeholders, especially on tree tenure. Though sustainable forest management should be collaborative according to the 1994 Forest and Wildlife Policy (FWP), the research findings reveal that policies on forests' governance have expropriated the *right to* management solely to the state apparatus (FSD) and this has narrowed the effective role that could be played by the leaders and individuals at the community level. According to the Convention on Biological Diversity (CBD), local empowerment of resource users is a potential key strategy to achieve long-term sustainability [28]. This transfer of right however, must also include transfer of responsibilities for the protection of the resources.

According to [29], they view the security of tenure of natural resources as an important issue if local communities are to use the natural resources in their localities sustainably. In their study in three forest fringe communities; Nkawie, Juaso and Goaso, they identified that tenure determines in large part, whether the local people are willing to participate in the management and protection of forest and tree resources. It must not be forgotten however that throughout the world communities use and manage their forest in diverse ways, and forest use rights and management responsibilities vary widely, depending on historical factors, social and political contexts and national policies [30].

Therefore the failure of the state apparatus to effectively manage national forests is evidenced in Dwease and Praaso because chainsaw operators and agriculturalists continue to negotiate illegal access to the secondary opened forest types and causing tremendous loss of tree cover and other biodiversity. Thus, to foster sustainable management of forests at the local level, it is recommended that the tree tenure in off-reserves should be reviewed in order to critically consider the stakes

of the local leaders and individual especially land owners. This could redefine how local perception on the *"nature of*" and *"right to*" have influenced the condition towards sustainable management of forests.

6 CONCLUSION AND RECOMMENDATIONS

The study has discovered that the call to sustainable management of natural resources particularly in the forestry sector is highly needed in Ghana especially in the Juaso forest district. However, the research findings have also confirmed that stakeholders' participation in sustainable forest management in both communities has been met with a myriad of challenges. These challenges are deeply rooted in the stakeholders' perceptions of what constitute forest and the classification of forest, which are present in the communities. These perceptions have defined the conditions required for local level sustainable forest management. The conditions for the ineffective sustainable forest management in these communities have been determined by three factors; "access to"; *"nature of*" and *"right to*".

The discussion has pointed out that, the FSD, which is the major stakeholder, has a limited number of workable management strategies or policies which are currently been used to promote the sustainability of forests in the Juaso forest district. In addition, the adopted strategies have not really promoted collaboration with local partners that have **challenged effective stakeholder analysis** for policies on forest management. Also, because these strategies and regulatory polices of FSD are directly geared towards the sustainable management of TFPs to the neglect of NTFPs, it has therefore hindered sustainable management of forests in off-reserves regions in the district. On the part of individuals in the communities, it is recognized that, they practice the sustained-yield ecological principle as their way of promoting sustainable forest management. Even though this strategy has not led to the regeneration of forests; especially in off-reserves, it has bridged the gap in the form of compensation for environmental benefits or advance payments for future sales of products.

It is therefore recommended that, with the re-launch of the National Forest Plantation Development Programme (NFPDP) and its redirected focus to cover private lands located outside forest reserves [31], the FSD should adopt formidable yet realistic strategies to sustainably managed forests in both on-and-off-reserves. In this regard, the concept of community forestry, which seeks to give greater control and management of forest to communities, is a formidable strategy to ensure sustainable forest management in the Juaso forest district. In this connection, revitalizing the Collaborative Forest Management strategy at the community level will be a step in the right direction since it promotes effective participation of all the stakeholders especially the traditional leaders and local people in decision-making processes. Even though in some areas, the institutional framework and regulations may be weak, the key concern of the Forestry Commission and its diverse bodies should be to strengthen these because in many cases they have still proven to be effective in managing forests sustainably at local level.

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Printed Eastern Arabic Noisy Numerals Recognition Using Hidden Markov Model and Support Vectors Machine

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ABSTRACT: This research presents a comparison between two methods of learning-classification, the first one is a probabilistic and unsupervised which is the Hidden Model Markov (HMM), while the second is a statistic and supervised that is the Support Vectors Machine (SVM). These techniques are used for printed Eastern Arabic numerals recognition, in different situation: rotated and translated or resized and noisy. In the pre-processing phase we have used the thresholding technique while in the features extraction we exploited the Krawtchouk Invariant Moment (KIM). In fact, in order to make a precise comparison between these two methods, we have introduced two new concepts which are the threshold and the interval of stability of each numeral and for each of these two methods. The simulation results that we obtained demonstrates that SVM is more performing than the HMM technique in this recognition system.

KEYWORDS: The noisy printed Eastern Arabic numerals, the thresholding technique, The Krawtchouk invariant moment, the hidden Markov models, the support vectors machines.

1 INTRODUCTION

Character recognition is one of classical problems in Optical Character Recognition (OCR). Its goal is to predict the class of the input character using its features. There are in fact a several approaches for solving these problems such as that we have opted in this study which are both methods, the first one is a stochastic and unsupervised which is the Hidden Model Markov(HMM) while the second is a statistic and supervised which is the Support Vector Machine(SVM).

On the other hand, an OCR system is a very active and dynamic field of researches and developments in terms of innovation and creativity. It covers really a broad scope of activities like medicine, marketing, machine vision, robotics, remote sensing, and so on. In fact it is formed in general from tree principal phases which are the pre-processing, in this context different operations scan be used such as segmentation, binarization, and noise removal would be done to enhance the quality of input character, then the second phase is the features extraction that serves to extract the primitives from the input patterns such a way that having a great discrimination between characters which will enable realize efficiently the third phase which is the classification that is used to assign a unknown character in a given class.

In this study, we have pre-processed all numerals by the thresholding technique. In the features extraction phase, we have used the Krawtchouk Invariant Moment (KIM) that are used to convert each numeral image to a vector that will used as an input vector of HMM and of SVM which are exploited to train the images of the training database and then to classify those of the test database.

In another context, many studies have been carried on Latin, Arabic numerals and characters by using the hidden models Markov [1-4], the support vectors machines [5-10] or the invariant moments [11-14]. However, this study is focused on printed Eastern Arabic degraded numerals recognition.

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Anyway, this paper is organized as follows: In first section the introduction is given then the pre-processing technique is presented in second section then in third section the features extraction explained. While the fourth section describes the recognition process. In fifth section the experimental results are presented, finally this work is ended by a conclusion.

Moreover, the recognition system that we have used is presented in the following figure:

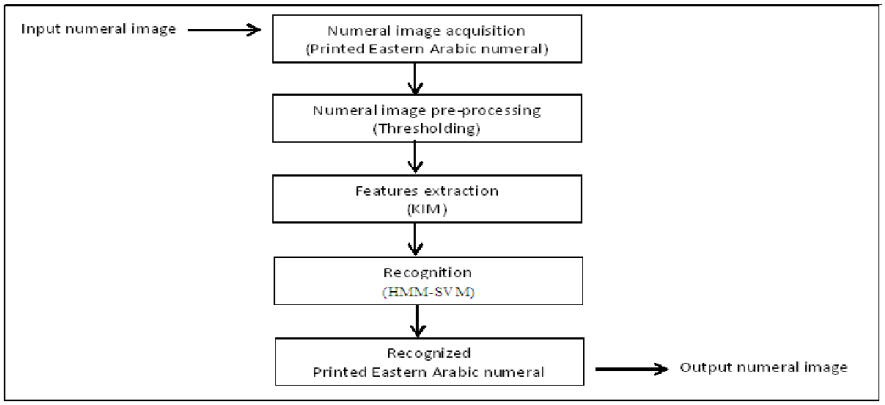

Fig .1. The proposed system recognition

2 PRE-PROCESSING

The first phase of Latin numerals recognition system is the pre-processing that serves to noise removal and to produce a best quality of numeral image which will enable to use it efficiently by the features extraction phase. In this study, we have pre-processed each numeral image by a thresholding technique in order to construct all images contains a black and white colors no more according a preset threshold.

3 FEATURES EXTRACTION

The extraction of image features is the fundamental step for image classification. In fact selecting appropriate features extraction method is one of the most important factors to archive high classification performances in characters recognition systems, in order to achieve this phase, we have opted the Krawtchouk invariant moments [15].

3.1 THE KRAWTCHOUK INVARIANT MOMENT

3.1.1 THE KRAWTCHOUK POLYNOMIAL

By definition, the Krawtchouk polynomial of order n is given by:

$$K_n(x;p,N)=\sum_{k=0}^{N} a_{k,n,p}\,x^k = {}_2F_1\left(-n,-x,-N;\frac{1}{p}\right) \tag{1}$$

$$x, n = 0,1,2 \ldots N, N \succ 0, p \in [0,1].$$

${}_2F_1$ is the hyper geometric function defined by:

$${}_2F_1(a,b;c;x)=\sum_{k=0}^{\infty}\frac{(a)_k(b)_k}{(c)_k}\frac{x^k}{k!} \tag{2}$$

And $(a)_k$ is the pochhammer symbol (rising factorial) defined by:

$$(a)_k = a(a+1)\ldots(a+k-1)=\frac{\Gamma(a+k)}{\Gamma(a)} \tag{3}$$

The Γ function is defined by:

$$\Gamma(x)=\int_0^{\infty} t^{x-1}e^{-t}dt \tag{4}$$

$$\forall\, n \in N, \Gamma(n+1) = n! \tag{5}$$

The set of Krawtchouk polynomial {kn (x; p, N)} forms a complete set of discrete basis functions with the weight function:

$$w(x; p, N) = \binom{N}{x} p^x (1-p)^{N-x} \tag{6}$$

And satisfies the orthogonally condition:

$$\sum_{x=0}^{N} w(x;p,N) K_n(x;p,N) K_m(x;p,N) = \rho(n;p,N)\delta_{nm} \tag{7}$$

ρ(n; p, N) is the squared norm defined by:

$$\rho(n; p, N) = (-1)^n \left(\frac{1-p}{p}\right)^n \frac{n!}{(-N)_n} \tag{8}$$

And δ_{nm} is the Kronecker symbol defined by:

$$\delta_{nm} = \begin{cases} 1 & if \quad n = m \\ 0 & else \end{cases} \tag{9}$$

3.1.2 THE KRAWTCHOUK MOMENT

The Krawtchouk moment have the interesting property of being able to efficiently extract local features of an image this moment of order (n+m) of an image f(x,y) is given by:

$$Q_{nm} = \sum_{x=0}^{N-1} \sum_{y=0}^{M-1} K_n(x; p_1, N-1)\, K_m(y; p_2, M-1) f(x,y) \tag{9}$$

The NxM is the number of pixels of an image f(x,y).The set of weighted Krawtchouk polynomial $\bar{K}_n(x,p,N)$ is:

$$\bar{K}_n(x; p, N) = K_n(x; p, N) \sqrt{\frac{w(x; p, N)}{\rho(x; p, N)}} \tag{10}$$

3.1.3 THE KRAWTCHOUK INVARIANT MOMENT

The geometric moment of an image f(x,y) is given by:

$$M_{pq} = \sum_{x=0}^{N-1} \sum_{y=0}^{M-1} x^p y^q f(x, y) \tag{11}$$

The standard set of the geometric invariant moments that's independent to rotation, scaling and translation is:

$$V_{nm} = M_{00}^{-\gamma} \sum_{x=0}^{N-1} \sum_{y=0}^{M-1} [(x-\bar{x})\cos\theta + (y-\bar{y})\sin\theta]^n * [(y-\bar{y})\cos\theta - (x-\bar{x})\sin\theta]^m f(x, y) \tag{12}$$

The Krawtchouk invariant moment is:

$$\tilde{\Omega}_{nm} = \Omega_{nm} \sum_{i=0}^{n} \sum_{j=0}^{m} a_{i,n,p_1} a_{j,m,p_2} \tilde{V}_{ij} \tag{13}$$

$$\Omega_{nm} = [\rho(n; p_1, N-1).\rho(m; p_2, M-1)]^{-1/2} \tag{14}$$

$$\tilde{V}_{ij} = \sum_{p=0}^{i} \sum_{q=0}^{j} \binom{i}{p} \binom{j}{q} \left(\frac{N^2}{2}\right)^{\frac{p+q}{2}+1} \left(\frac{N}{2}\right)^{i+j-p-q} V_{pq} \tag{15}$$

$$\binom{x}{y} = \frac{x!}{y!(x-y)!} \tag{16}$$

4 RECOGNITION

4.1 THE HIDDEN MARKOV MODEL

The hidden Markov model is a stochastic process [16] can after a learning phase, estimate the probability of observation was generated by this model. The hidden Markov model can be seen as a set of discrete states and transitions between these states; it can be defined by $\lambda = (A, B, \pi)$, where A is the matrix of the probabilities of transitions, B is the matrix of the probabilities of observations, and π is the vector probability of initial states.

N : The number of states $s_1, s_2 \ldots\ldots s_N$.

T : The number of observations.

q_t The state of the process at the time t ($q_t = \{s_1, s_2, \ldots, s_N\}$).

o_t The observation at the time t ($o_t = \{v_1, v_2, \ldots, v_M\}$).

M : The size of observations $v_1, v_2 \ldots\ldots v_M$.

$$A = \{a_{ij} = \Pr ob(s_j / s_i)\} \; ; \; \sum_{j=1}^{N} a_{ij} = 1 \tag{17}$$

$$\pi = \{\pi_i = \Pr ob(s_i)\} \; ; \; \sum_{i=1}^{N} \pi_i = 1 \tag{18}$$

$$B = \{b_j(k) = \Pr ob(o_t = v_k / o_t = s_j)\} \; \sum_{k=1}^{M} b_j(k) = 1 \tag{19}$$

In the case where observation is continuous, the HMM is defined by $\lambda = (A, \pi, \mu_i, \sigma_i)$ where μ_i and σ_i are respectively the mean and the standard deviation of the state i of the Gaussian function:

$$b_j(k) = \Pr ob(o_t = v_k / o_t = s_j) = \frac{1}{\sigma_i \sqrt{2\pi}} e^{\frac{(o_t - \mu_i)^2}{2\sigma_i^2}} \tag{20}$$

In our work we used the HMM with the continuous observation. In this context of the learning-classification phase, it carried as follow :In the learning phase, each numeral image that is converted to a vector in the features extraction phase by KIM; this vector is used as an observation vector of an initial own HMM of this numeral just for determining the probability that generated this observation. Then this model is trained for maximizing this probability by using the Baum-Welch algorithm. All these trained models (optimal models) of all numerals are saved for to form a learning base. In the classification phase, an unknown numeral (test numeral) is presented as a vector of observation. then the probability generated by this observation is calculated by all the optimal models already recorded in the learning base by the forward algorithm. The recognition will be given to the numeral with highest probability.

4.2 THE SUPPORT VECTORS MACHINE

For a set of vectors $x_i \in \Re^n$ and both classes which the first contains a party of these vectors that labeled by 1, and the second includes other vectors and bears a label -1. The SVM [17] consists to find a decision function that separates in an optimal manner between these classes that is to say maximizes as much as possible the distance between them.

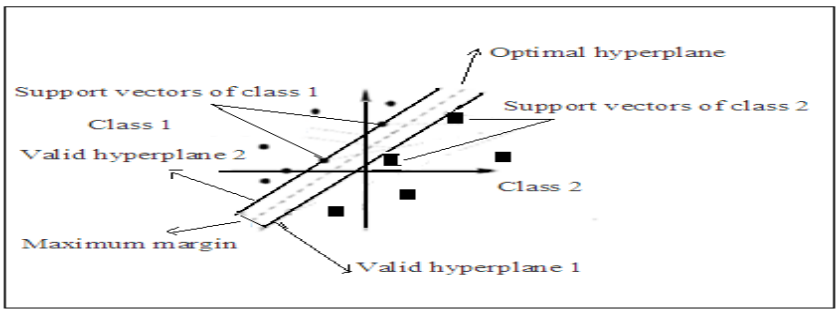

Fig. 2. Determination of optimal hyperplane, support vectors, maximum marge and valid hyperplanes.

This decision function defined by:

$$f(x, w, b) : x \rightarrow y \tag{21}$$

With w and b are the parameters of the classifier y is the label. Maximization of distance between these classes is equivalent to minimization of w under constraints (UC) in that called the primal problem:

$$\text{To minimize} \quad \frac{1}{2}\|w\|^2 \tag{22}$$

$$\text{Subject to} \quad y_i(wx_i + b) \geq 1, \quad \forall i = 1,2,.....n$$

The dual problem can be obtained by using the Lagrangian operator:

$$L(w,b,\alpha) = \frac{1}{2}\|w\|^2 - \sum_{i=1}^{n} \alpha_i [y_i(wx_i + b) - 1] \tag{23}$$

Where the variables α_i are called Lagrange multipliers. The dual problem is therefore:

$$\text{To maximize} \quad D(\alpha) = \sum_{i=1}^{n} \alpha_i - \frac{1}{2}\sum_{i,j} \alpha_i \alpha_j y_i y_j K(x_i, x_j) \tag{24}$$

$$\text{Subject to} \quad \sum_{i=1}^{n} \alpha_i y_i = 0, \quad 0 \leq \alpha_i \leq C \quad \forall i = 1,2,.....,n$$

The parameter C is a positive constant fixed in advance; it's called the constant of penalty. The decision function is:

$$f(x) = \sum_{i=1}^{n} \alpha_i^* y_i K(x, x_i.) + b \tag{25}$$

Where α_i^* are the nonzero variables, the K is called a kernel function.

Kernel linear: xy

Kernel polynomial of degree n: $(xy + 1)^n$

Gaussian Radial Basis Function (GRBF): $e^{-\frac{\|x - y\|^2}{2\sigma^2}}$

The method presented above is designed only for a problem of two classes; in fact several studies have generalized of the SVM to N classes [18]. Among these studies, we have used in this research a strategy called one against all that is based to use N decision functions allowing to make a discrimination of a class having a label equal to 1 and containing a one vector against all other vectors included in a other class opposite that is labeled by the value -1. In the classification phase, the value image of an unknown vector X (test numeral) is calculated by all N decision functions which are already obtained in learning phase. The recognition will be assigned to numeral that the decision function separates its class to another class containing the rest of numerals which gives the highest value.

$$Class(X) = \arg\max_{i=1,2...N}(f_i(X)) \tag{26}$$

5 EXPERIMENTS AND RESULTS

We choose the sizes of all images 30x30 pixels.

Firstly, we present the test numeral translated, rotated or resized and not noisy, then we add more and more a quantity of noise of type 'salt & pepper' for to know the effect of noise on the rate recognition of each numeral also to that of all numerals called global rate. We have chosen the KIM parameters: p=q=0.96. The noise values are [0, 0.01, 0.02……0.30].

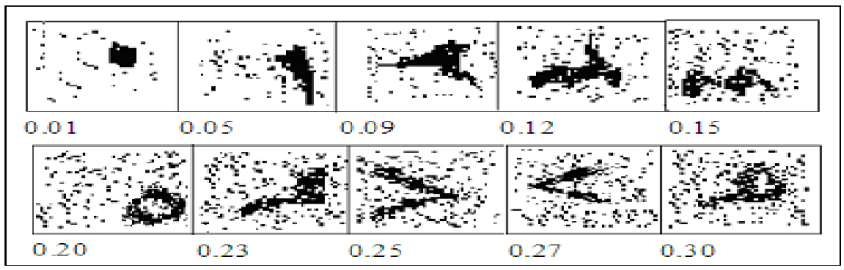

Fig .3. Eastern Arabic numerals rotated, translated or resized and noisy by different values of noise 'salt & pepper'

We group the values of the recognition rate τ_n (given in %) for each numeral that we obtained in the following table:

Table 1. The recognition rate for each numeral using HMM and SVM.

Numeral	τ_n (HMM)	τ_n (SVM)
٠	80.64	100.0
١	100.0	100.0
٢	83.87	90.32
٣	100.0	100.0
٤	87.09	93.55
٥	100.0	100.0
٦	93.55	96.77
٧	100.0	83.87
٨	100.0	100.0
٩	61.29	67.74

And the associated graphical representation to this table is:

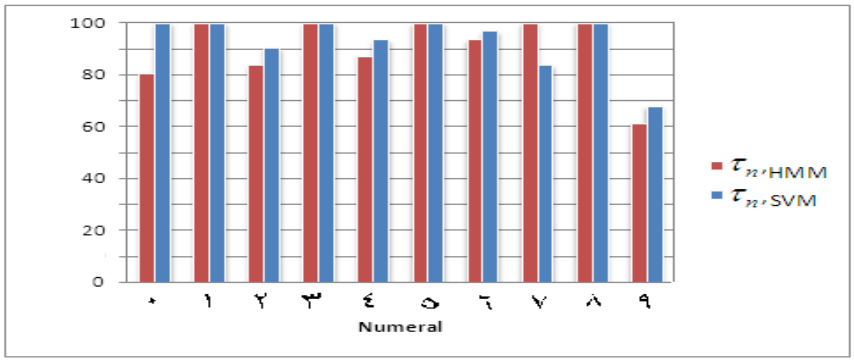

Fig. 4. The graphic representation of recognition rate for each numeral using HMM and SVM

We present the evolution of the global recognition rate τ_g (given in %):

Table 2: The values of global recognition rate in function of noise added of HMMs and SVMs

Noise	τ_g (HMM)	τ_g (SVM)
0.00	100	100
0.01	100	100
0.02	100	100
0.03	100	100
0.04	100	100
0.05	100	100
0.06	100	100
0.07	100	100
0.08	100	100
0.09	100	100
0.10	100	100
0.11	100	100
0.12	100	100
0.13	100	100
0.14	100	100
0.15	100	100
0.16	100	100
0.17	100	100
0.18	100	100
0.19	90.0	100
0.20	90.0	100
0.21	90.0	90.0
0.22	90.0	90.0
0.23	90.0	90.0
0.24	90.0	90.0
0.25	80.0	90.0
0.26	70.0	80.0
0.27	60.0	80.0
0.28	60.0	70.0
0.29	50.0	60.0
0.30	40.0	50.0

And the associated graphical representation to table above is:

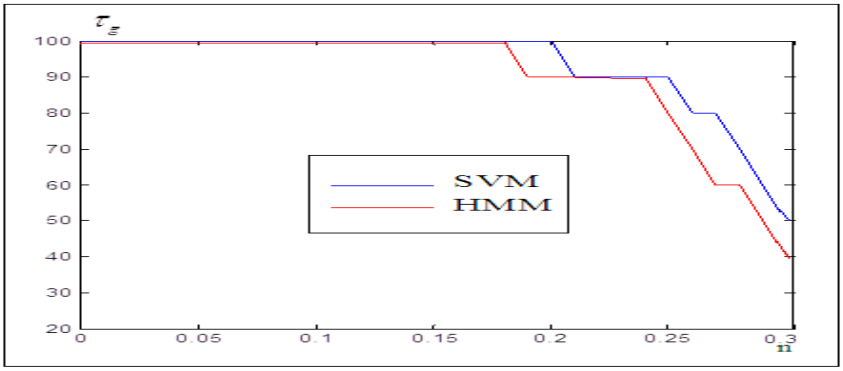

Fig .5. Graphical representation of the global rate recognition τ_g in function of noise added for the HMMs and the SVMs.

Analysis and comment:

The global rate recognition τ_g is a decreasing in function of noise added to each numeral, but the important remark is that the falling of this rate of HMM is greater than the rate of SVM, this shows that the SVM is more efficient than the HMM in recognition of noisy Eastern Arabic numerals.

5.1 RECOGNITION THRESHOLDING AND RECOGNITION INTERVAL

5.1.1 IN THE SVM CASE

Now, we propose to classify the KIM of all numerals according to their degree of robustness against noise presented in them when we will recognize these numerals by HMM then by SVM.

Of this fact, we note f_i the decision function that separates the class which is labeled by 1 of a numeral N_i to other class which is labeled by -1 contains all other numerals N_j for i,j= {٠,١,٢,٣,٤,٥,٦,٧,٨,٩} , i ≠ j .

If a test numeral $N_{test,i}$ translated, rotated, or resized and not much noisy , it is correctly recognized, that is to say its class is :

$$Class\ (N_{test,i}) = \arg(\max_i\ (f_0(N_{test,i}) \ldots\ldots f_9(N_{test;i}))) = i \quad (26)$$

But this equation is it valid up to what amount of added noise to $N_{test,i}$?

Practically, we found that for any test numeral $N_{test,i}$ $\forall$ i= {٠,١,٢,٣,٤,٥,٦,٧,٨,٩} there is a noise value added to it from where the f_i is no more maximum among all the decision functions f. f_1, …..f_9

We call this noise value the threshold of recognition or of tolerance or of stability, we symbolize it by $n_{t,i}$ in other word it's the amount of noise from which to the numeral $N_{test,}$ will be badly recognized.

So, into interval [0 $n_{t,i}$], we say in this once that the recognition system is a stable system.

For the determination of the threshold of stability $n_{t,I}$ for each numeral $N_{test,i}$ we must follow the evolution of f_i in function of added noise to $N_{test,i}$

5.1.2 IN THE HMM CASE

Firstly, we denote:

O_i The observation vector that models a numeral N_i of the learning base and λ_i^* its optimal model that obtained by the Baum-Welch algorithm.

$O_{test,i}$ The observation vector models a numeral $N_{test,i}$ of the test base and $F_i(O_{test,i} / \lambda_i^*)$ the probability which generate $O_{test,i}$ by λ_i^* obtained by the Forward algorithm.

If this numeral is translated, rotated, or resized and not much noisy, it is correctly recognized, that is to mean its class is:

$$class\ (O_{test,i}) = \arg(\max(\ F_0 \ldots\ldots\ F_9\ )) = i \quad (27)$$

As we did in SVM, this equation is valid until to a value of added noise to $N_{test,i}$ called the threshold of stability.

Thus for each numeral $O_{test,i}$ to determine the threshold of stability $n_{t,i}$ it must follow the evolution of F_i in function of noise added to it. We want to realize a comparison between the threshold of recognition $n_{t,i}$ of the KIM of each numeral when using the HMM then the SVM (we neglect a very few points of instability).

Also we call [0 $n_{t,i}$] the stability interval (SI) is that $N_{test,i}$ is correctly recognized.

Seen the results we did, we conclude that we do $n_{t,i}$ is different from one numeral to other and from the HMM to the SVM.

Table 3: The values of the recognition thresholds of each numeral by the HMM and the SVM

Numeral	HMM		SVM	
	$n_{t,i}$	$[0 \quad n_{t,i}]$	$n_{t,i}$	$[0 \quad n_{t,i}]$
٠	0.24	[0 0.24]	0.30	[0 0.30]
١	0.30	[0 0.30]	0.30	[0 0.30]
٢	0.25	[0 0.25]	0.27	[0 0.27]
٣	0.30	[0 0.30]	0.30	[0 0.30]
٤	0.26	[0 0.26]	0.28	[0 0.28]
٥	0.30	[0 0.30]	0.30	[0 0.30]
٦	0.28	[0 0.28]	0.29	[0 0.29]
٧	0.30	[0 0.30]	0.25	[0 0.25]
٨	0.30	[0 0.30]	0.30	[0 0.30]
٩	0.18	[0 0.18]	0.20	[0 0.20]

We say into $[0 \quad n_{t,i}]$ the recognition system is stable, and out this interval the system is instable.

We group the approximate variations of decision function f_i and the forward probability F_i in function of noise n ϵ [0 0.3] to each numeral in one graph for each numeral i= {٠,١,٢,٣,٤,٥,٦,٧,٨,٩} (we neglect a very few points of instability).

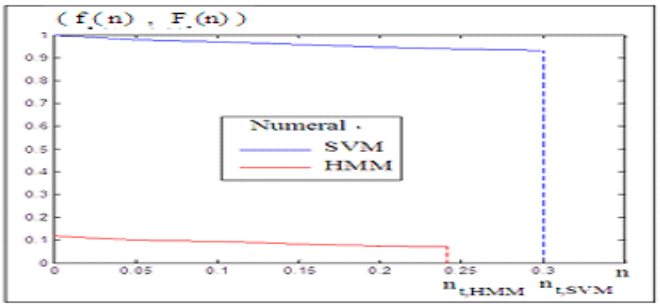

Fig.6. $f_٠$ and $F_٠$ in function of added noise to numeral ٠

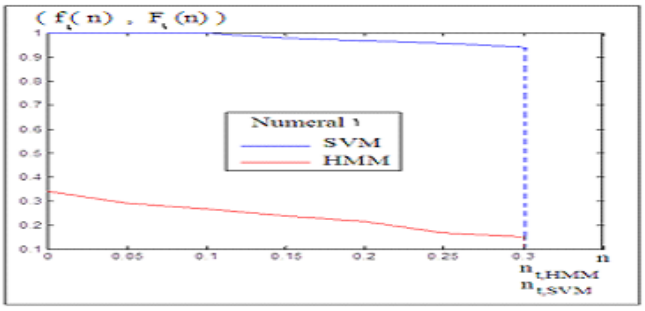

Fig. 7. $f_١$ and $F_١$ in function of added noise to numeral ١

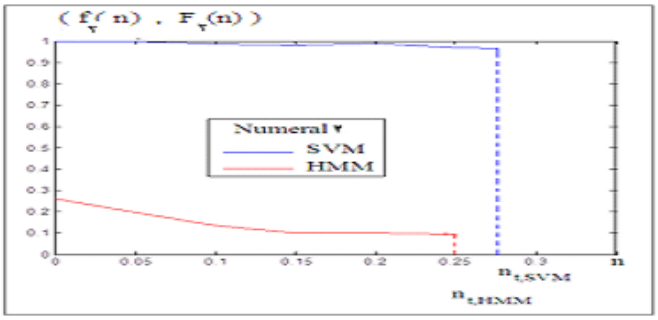

Fig. 8. $f_٢$ and $F_٢$ in function of added noise to numeral ٢

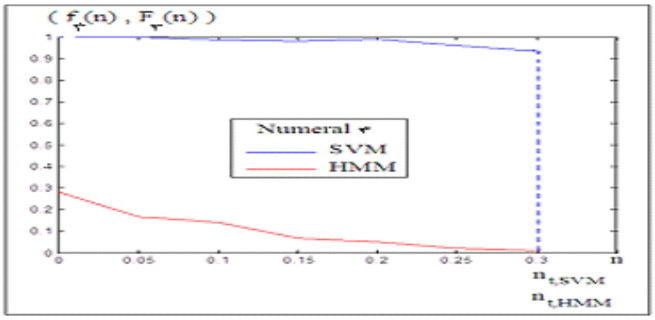

Fig. 9. $f_٣$ and $F_٣$ in function of added noise to numeral ٣

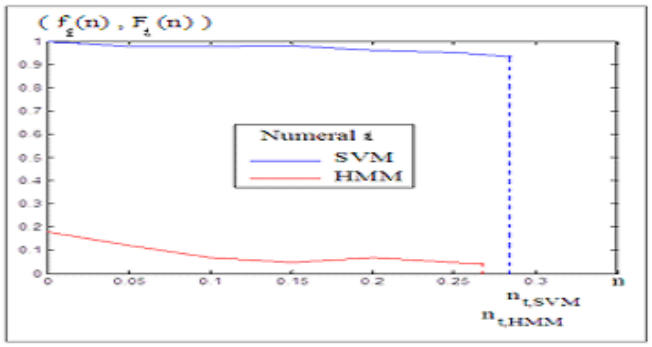

Fig. 10. $f_٤$ and $F_٤$ in function of added noise to numeral ٤

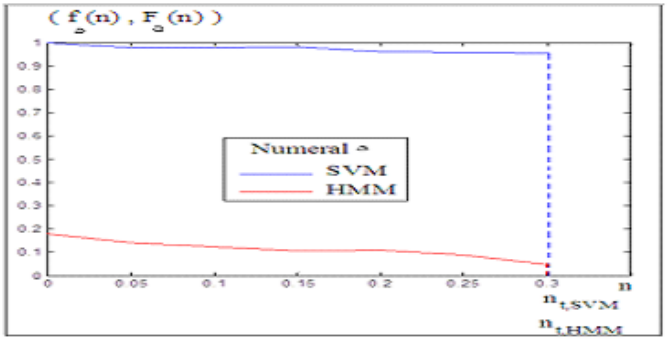

Fig. 11. $f_٥$ and $F_٥$ in function of added noise to numeral ٥

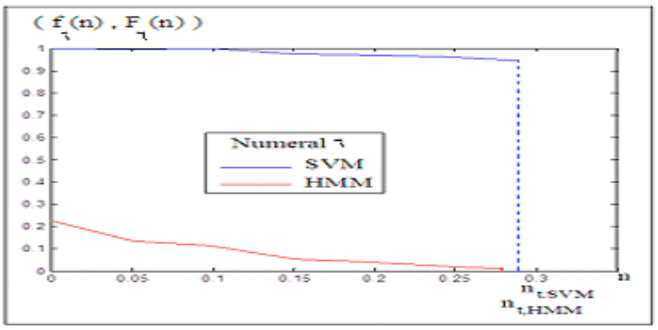

Fig. 12. $f_٦$ and $F_٦$ in function of added noise to numeral ٦

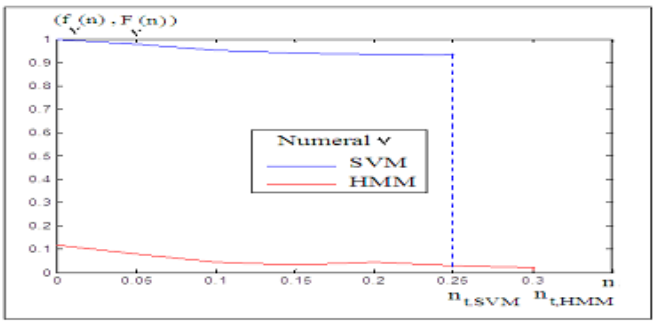

Fig. 13. $f_٧$ and $F_٧$ in function of added noise to numeral ٧

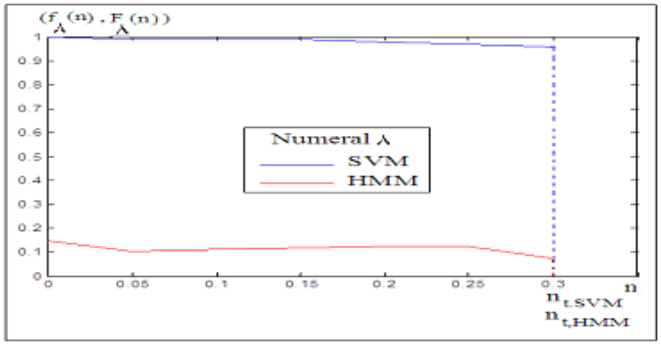

Fig. 14. $f_٨$ and $F_٨$ in function of added noise to numeral ٨

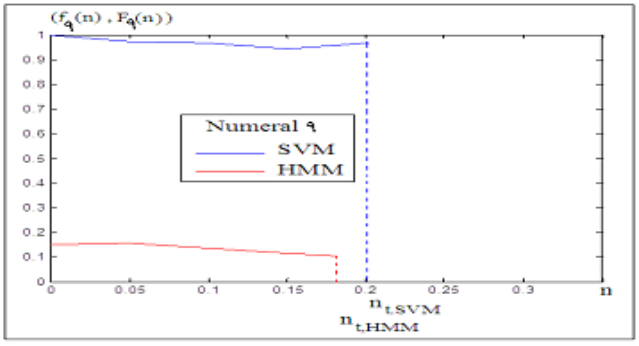

Fig. 15. $f_٩$ and $F_٩$ in function of added noise to numeral ٩

Analysis and comment

Taking into account the results obtained after having implemented these recognition systems, we can conclude that:

- For each numeral, the variation of its decision function and its Forward probability are decreasing as a function of noise added to numeral, but the decrease of the Forward probability is greater than the decision function.
- For each numeral, in generally the recognition threshold $n_{t,i}$ of the SVM is bigger that of the HMM.

All this shows that the SVM is more robust than the HMM in noisy Eastern Arabic numerals recognition.

6 CONCLUSION

The obtained results in the recognition of noisy Eastern Arabic numerals show that reliable recognition is possible by using the thresholding technique in the preprocessing phase, the KIM in the features extraction phase and the HMM and the SVM in the recognition phase. Our goal in this study is to compare between these both last methods, for well make this comparison; we have introduced a new concepts which are the threshold and interval of recognition or of stability of each numeral when using in first time the HMM then using the SVM in second time. The simulation results demonstrate that the SVM is the more performing than the HMM in this recognition.

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NATURAL CONVECTION HEAT TRANSFER FROM A HEAT SINK WITH FINS OF DIFFERENT CONFIGURATION

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ABSTRACT: Experiments were carried out on natural convection heat transfer from square pin fin heat sinks subject to the influence of its geometry and heat flux. A total of 50 fins were bolted into the upper surface of the base plate. The area of the base plate is 250mm by 250mm. The base plate and the fins were made of aluminum .Over the tested range of Rayleigh number, $12.45\times10^6 \leq Ra \leq 58.59\times10^6$, it was found that the solid pin fin heat sink performance for upward orientations depended on the Rayleigh number and generally shows higher heat transfer coefficients than those of the perforated/hollow pin fin ones. For all tested hollow/perforated pin fin heat sinks, however, the heat transfer performance for heat sinks with hollow/perforated pin fins was better than that of solid pins. The temperature difference between the base plate and surrounding air of these heat sinks was less than that of solid pin one.

KEYWORDS: Natural convection; Square solid/perforated pin fin; Heat sinks

1 INTRODUCTION

Natural convection heat transfer from a heat sink has been the subject of a large number of experimental and theoretical investigations. Heat sinks with extended surfaces have been widely used in various engineering applications especially in air conditioning as well as in electronic devices, electrical and internal combustion, solar energy applications, cooling of nuclear reactor fuel elements, improving heat transfer in radiators for air conditioning and in air cooled heat exchangers. In most of the electronics cooling applications, the final heat transfer medium is air.

Heat transfer from a finned heat sink depends on many parameters; temperature difference between the heat sink and the fluid, shape and size of the fins, number of fins, the type of flow and the fluid, thermal conductivity and spacing between the fins.

Natural convection heat transfer from solid and perforated pin fin heat sinks can be found from experimental and theoretical works. An experimental study was conducted on natural convection heat transfer from square pin fin and plate fin heat sinks subject to the influence of orientation by Huang et al. [1]. Over a tested range of $1.8\times10^6 < Ra < 4.8\times10^6$, it was reported that the downward facing orientation yielded the lowest heat transfer coefficient for both pin fin and plate fin geometry. The finning factor Φ (which represents the total surface area, A_t divided by the base plate area, A_{bp}) for the perforated pin fin was greater than from the solid pin fin .The heat transfer coefficient increases with decreasing the finning factor. In addition, the advantage of the pin fins escalates with the increase of the Rayleigh number due to the more open ends for air ventilation. Elshafei [2] studied the natural convection heat transfer from circular pin fin heat sinks subject to the influence of its geometry, heat flux and orientation. Their results showed that the solid pin fin heat sink performance for upward and sideward orientations was a competitive nature, depending on Rayleigh number ($3.8 \times 10^6 \leq Ra \leq 1.65 \times 10^7$) and generally shows higher heat transfer coefficients than those of the perforated/hollow pin fin. The heat transfer performance for heat sinks with hollow/perforated pin fins was better than that of solid pins. The temperature difference between the base plate and surrounding air of these heat sinks was less than that of solid pin. Zografos and Sunderland [3] investigated the heat transfer performance of inline and staggered pin fin arrays in natural convection with different inclination angle, and concluded that the inline arrays generally yielded higher heat transfer rates than the staggered ones. In addition, their

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investigation showed little influence of inclination when the inclination angle was less than 30^o from the vertical. Sparrow and Vemuri [4] studied the fin orientation on natural convection/radiation heat transfer from pin fin arrays. Their results revealed that the upward facing orientation yielded the highest heat transfer rates, followed by the sideward facing and the downward facing ones. Dialameh, et al. [5] made a numerical study to predict natural convection from an array of aluminum horizontal rectangular thick fins of (3 mm< t < 7 mm) with short lengths (L< 50 mm) attached on a horizontal base plate. The results showed that natural convection heat transfer coefficient increases with increasing temperature differences and fin spacing and decreases with fin length, and the fin thickness and fin height does not affect the value of average heat transfer coefficient considerably. Kobus and Oshio [6] carried out a theoretical and experimental study on the performance of pin fin heat sinks. A theoretical model was proposed to predict the influence of various geometrical, thermal and flow parameters on the effective thermal resistance of heat sinks. Subsequently, Kobus and Oshio [7] investigated the effect of thermal radiation on the heat transfer of pin fin heat sinks and presented an overall heat transfer coefficient that was the sum of an effective radiation and a convective heat transfer coefficient. Fisher and Torrance [8] presented the analytical solutions relevant to the limits of free convection for pin fin cooling. They suggested that the design of pin fin heat sink could be optimized by properly choosing the pin fin diameter and the heat sink porosity. For conventional heat sinks, the minimum thermal resistance was about two times greater than that in an ideal limit according to the model of in viscid flow with idealized local heat transfer.

The above literature indicates that many studies have been carried out for different types of fin arrays, but still there is lack of knowledge of the natural convection heat transfer from a surface with hollow /perforated pin fins. The main objectives of the present experimental work are to determine the effects of geometric parameters and base to ambient temperature difference on the natural convection heat transfer from square solid and perforated pin fins heat sink. Another objective is to correlate the experimental data of overall Nusselt number with the average modified Rayleigh number for such configurations.

2 EXPERIMENTAL SETUP AND PROCEDURE

2.1 PIN FIN ASSEMBLY

A total of 50 fins are used in this experimental investigation. Twenty fins have two holes, one of the holes is horizontal and the other is vertical. The fins are bolted into the upper surface of the base plate, the dimensions of the base plate is 250mm × 250mm. Thermal paste was used to minimize the thermal contact resistance between the pin fins and the base plate; the pin fins were fixed at equal spacing between the span wise directions of 18.125 mm. The base plate was made of the same material as the fins because of the considerations of conductivity machinability, and cost. The base plate and the fins were made of aluminum because high thermal conductivity, low radiative emissivity and good contact between them were assured. The experimental rig is shown in Fig. 1.

2.2 HEATING SYSTEM

During experiments, the heat sink base plate was heated by an attached electric heater, with an identical size as the base plate, which could supply a specific heat flux. The voltage and current of the electric input to the heaters were controlled by an AC power supply unit. The supplied power was calculated using the measured voltage and current supplied to the heaters. The supplied voltage and current into the heaters were measured by a digital clamp meter (UT200A). The presence of thin layer of high thermal conductivity mica ensured that good thermal contact existed between the heater and the heat sink base. The bottom surfaces of the base plate as well as the heater block were insulated by two layers of insulation, firebrick and glass wool blanket. The whole assembly, base, heater with associated thermal insulation, was located in a well-fitted open-topped wooden box of 20mm thick as shown in Fig. 1. The upper edges of the wooden box and the top surface of the laterally-placed thermal insulation were flushed with the upper surface of the heat sink base in which the pin fins protruded perpendicularly. The power supplied to the heater was controlled by a variac transformer to obtain constant heat flux along the base plate, and was measured by in line multi-meter (an ammeter and voltmeter).

A total of 12 K-type thermocouples were appropriately distributed among the base plate to measure its average temperature, T_{bp}.These thermocouples were pressed into fine holes and glued in position with epoxy so as to ensure good thermal contact. All thermocouples were pre-calibrated with an accuracy of ±0.1 ºC. The temperatures at various locations on the surface of the base plate were measured by calibrated K- type thermocouples connected to a 12-channel temperature recorder (Model BTM-4208SD). The whole assembly was located in an environmental chamber inside the laboratory. Heat sinks of solid and perforated pin fins as shown in Fig. 2 were tested in the enclosed room at nearly fixed temperature with the power inputs ranging from 150 W to 1400 W. Steady state conditions were indicated by noticing the repeatable readings

of each thermocouple at different locations of the heat sink. Each test run took nearly 2-hours to reach equilibrium when the power is turned on.

(a) Pif fins, (b) Base plate, (c)Heater, (d)Firebrick, (e)Glass wall blanket, (f)Wooden box

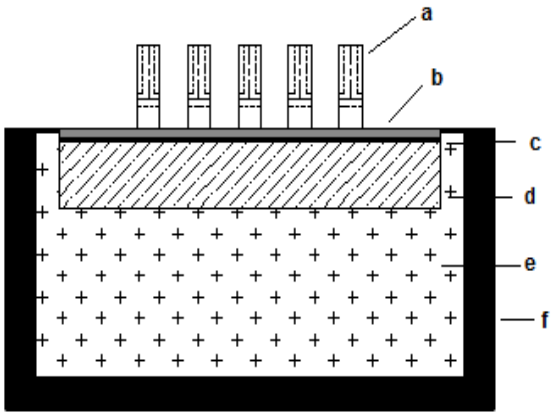

Fig. 1. Heat sink assembly

3 RESULTS AND DISCUSSION

For the sake of comparison, the thermal performance of heat sink is measured by detecting the variation of the temperature difference between the base plate and the surrounding air (ΔT) with the heat input rate (Q). Figure 2 indicates the variation of ΔT with Q for two tested modules (solid and perforated heat sink) arrangements. Generally, the results indicate that ΔT increases with increasing heat input rate (Q). In addition, the temperature difference (ΔT) for the perforated heat sink is less than for the solid heat sink for each heat input.

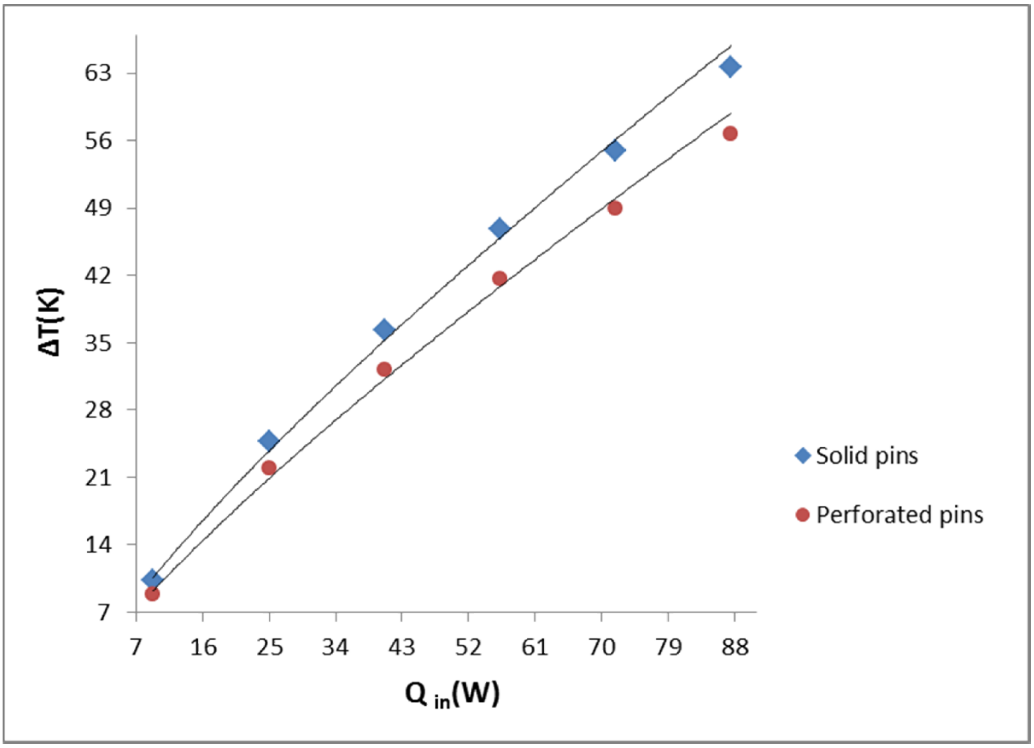

Fig. 2. Temperature difference variations ΔT with heat input rate, Q_{in} for solid and perforated heat sink

The variation between the temperature difference (ΔT) and the heat transfer coefficient (h) is shown in Fig. 3. Generally, the results indicate that the heat transfer coefficients for two test samples increase with the temperature difference between the base plate and the surrounding, this increase in both temperature difference and heat transfer coefficient is due to the increase in the heat input gradually. A comparison between the solid and perforated heat sink shows that the heat transfer coefficient for solid pin fin is greater than from perforated pin fin.

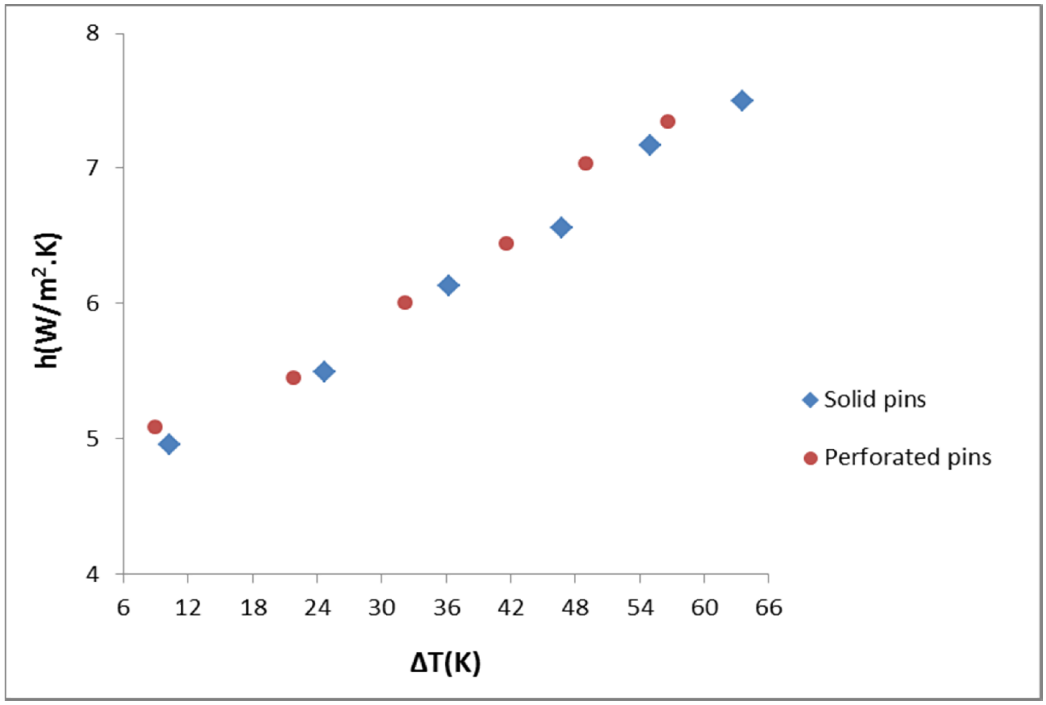

Fig. 3. Temperature difference variations ΔT with average heat transfer coefficient h for solid and perforated heat sink

4 CONCLUSIONS

In this study, natural convection heat transfer from square solid and perforated pin fins heat sink at different heat flux values was investigated experimentally. The effect of geometric parameters and base to ambient temperature difference on the heat transfer performance of fin arrays was discussed. Based on the preceding discussions, the following conclusions may be drawn:

- At the same heat input rate, the temperature difference between the base plate and surrounding air was found to be less for hollow/perforated pin fin heat sink than that for solid pin one.
- The heat transfer coefficient for solid pin fin is greater than from perforated pin fin.
- Temperature difference between the fin base and fin tip becomes larger, by adding perforation
- Perforated fins have higher fin effectiveness than solid fin and it rises remarkably by adding more perforations.

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Design and simulation of a planar inverted-F antenna (PIFA) for Wi-Fi and LTE Applications

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ABSTRACT: In recent years planar inverted-F antenna stay as one of the most popular antenna used in mobile phone, because of its low profile, light weight and simple structure. This study presents a simulation of a planar inverted-F antenna (PIFA) with a radiating plate to the associated ground plane by a shorting plate and a FR-4 substrate between the ground plane and the radiating plate. The PIFA antenna is fed by a coaxial cable through a SMA connector. In this work the different parameters are changed to observe their effects on the characteristics of PIFA as the resonance frequency, the length of the bandwidth and the radiation pattern. The kind of this PIFA element is to cover a wide frequency band from 2.31 GHz to 2.71 GHz; therefore, we can find these applications: Wi-Fi (2.45GHz), Bluetooth (2.4 GHz) and the two Long Term Evolution bands (LTE 2.3GHz, LTE 2.5GHz) includes.

KEYWORDS: Antennas; PIFA; planar antennas; Wi-Fi; LTE.

1 INTRODUCTION

Recently, the increasing use of mobile communications systems requires antennas having different properties such as small size, high speed and moderate gain [1], and because of the limited space available in wireless devices, the request of the design of low cost and small size of the antenna is necessary. Today, there is a growing need to gather all the wireless services in one device, particularly, the integration of Bluetooth technology, Wi-Fi and LTE in some portable devices with a high-speed data transmission and high quality. However, this normally requires many antennas to cover each service, and it is not possible to fit them all in a small device. To address this requirement, antennas that operate in multiple bands are required to support multiple standards. So, the idea is to enhance the functionality and performance of wireless communication devices and to cover the existing wireless communication frequency bands. The planar inverted-F antennas (PIFAs), is particularly interesting due to their compactness and suitable performance. PIFA antenna has been adopted in portable wireless units because of its low profile, light weight, and conformal structure (Balanis, 1982).

Today, planar inverted F antenna (PIFA) remains as one of the most popular antenna used in mobile phones [2]. Because of the limited space availability in wireless devices, we keep the size of this type of antenna small and appropriate for portable wireless units without degradation of performance in terms of bandwidth and radiation patterns [3]; so, the radiation pattern should close to be omnidirectional and it should cover required operating frequency bands for the IEEE 802.11b/g/n standard. Because of price advantages and performance via Bluetooth and Wireless digital phone, wireless technology IEEE 802.11b and IEEE 802.11g which have been widely used in wireless Ethernet network.

In [4], Chattha and Huang presented Dual-feed PIFA with a height h = 10 mm and a minimum bandwidth of the two ports is 200 MHz, In [5] they presented a dual-feed PIFA with height h = 5 mm and a minimum bandwidth 50 MHz by the two ports and In [6]; Rao and Wang also presented a compact dual-port antenna for Long-Term Evolution with a height h = 7.5 mm and minimum bandwidth by the two ports is 200 MHz

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In this paper, we propose a compact PIFA antenna h = 4.6 mm, with a simple structure and easy integration with active devices. The height h and the dimensions of the radiating plate are reduced and the minimum bandwidth is about 400 MHz (2.31 GHz to 2.71 GHz). We find that the radiation pattern in free space and the gain of the proposed antenna also meet the requirements of wireless communication terminals. The PIFA of the resonant frequency of 2.478 GHz and is satisfies the requirement to cover Wireless Local Area Network (WLAN), Bluetooth technologies and Long Term Evolution (LTE2300 and LTE2500) services. The antenna can be used in mobile phones and tablet computers.

2 ANTENNA CONFIGURATION

For the conventional PIFA antennas, each PIFA-patch element will be designed carefully based on approximately equation (1). This equation is a very rough approximation which does not cover all the parameters which significantly affect the resonance frequency of PIFA [7].

$$fr = \frac{c}{4(L_p+W_p)\sqrt{\varepsilon_r}} \quad (1)$$

Where:

- f_r is the resonance frequency at desired band.
- L_p is the length of the radiating element.
- W_p is the width of the radiating element.
- ε_r is the dielectric constant of the substrate.
- c is the speed of light.

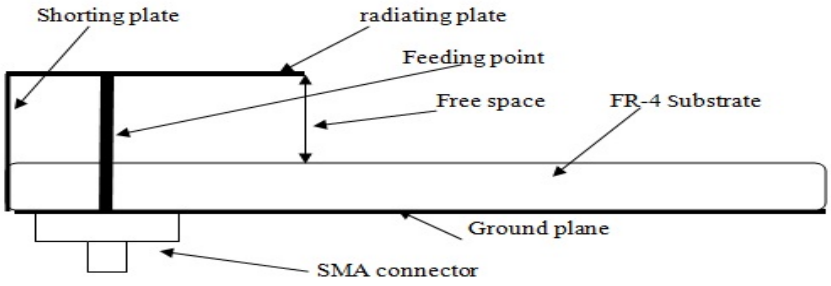

Fig. 1. the geometry of the PIFA antenna proposed

The configuration of the PIFA is shown in Figure 1. The radiating plate has the dimensions of Wp×Lp (Figure 2) and ground plane dimensions are Wg×Lg. There is an FR-4 substrate (hs=1.6mm) has a relative dielectric constant of 4.4 and it is between the rectangular ground plane and radiating plate. The antenna height is h=ha+hs and the space between the top plate and the substrate are also filled with air (free space). In practice, a substrate is generally just underneath the top plate, but this will make the top plate too heavy to be supported by the shorting and feeding plates. The shorting plate with the dimensions of Wsh×h is placed under the top corner of the top plate. The horizontal distance between shorting and feed plates is x. The distance between the coaxial cable and the right edge of the ground plane is Wp/2 and even for shorting plate. The PIFA antenna is fed by a coaxial cable through a subminiature version A (SMA) connector. The software package used for simulation is CST Microwave Studio v.11 and High Frequency Structure Simulator (HFSS).

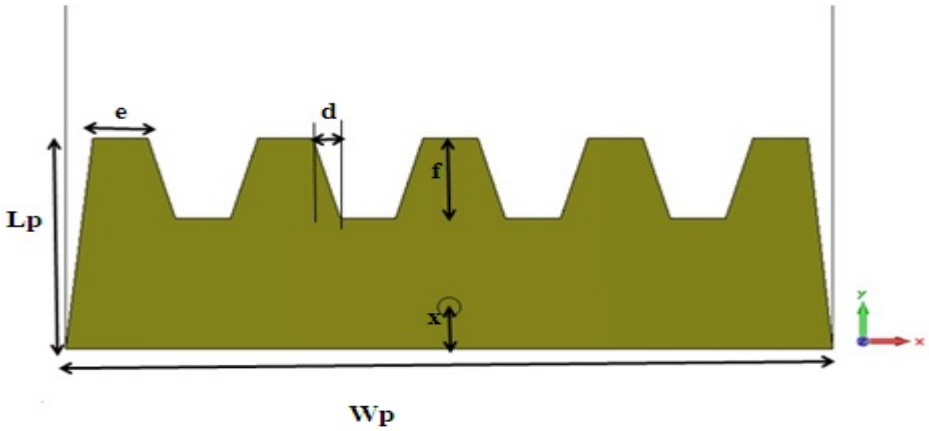

Fig. 2. the geometry of the top radiating plate

Table 1. Detailed dimension of the proposed antenna

Name of the parameter	Symbol	Value (mm)
Upper radiating patch length	Lp	10
Upper radiating patch width	Wp	30.7
Feed plate length	h	4.7
Feed plate width	Wsh	3
Ground plane length	Lg	90
Ground plane width	Wg	30.7
FR-4 substrate height	hs	1.6
FR-4 substrate length	Ls	90
FR-4 substrate width	Ws	30.7
Feed point location	(x, y)	(2, 0)
Feed pin radius	R	0.45
----	d	1.1
---	e	2.2
---	f	3.8

We changes the position of the feed pin by modifying the values of the horizontal distance x from 1.5 to 3.6 mm, the length of the radiating plate Lp from 8 to 20 mm, the width of the radiating plate Wp from 24 to 50 mm and height between substrate and the radiating plate ha from 3 to 10mm. we can observe this effects on PIFA characteristics while other parameters are constant. Table 1 lists the values of different variables of the PIFA proposed.

3 SIMULATED RESULTS

In this study of the antenna proposed we change one parameter to observe their effects on the characteristics of the PIFA and the other parameters are constant. There are many variables that may affect the PIFA antenna bandwidth and, therefore, numerical approaches are adopted.

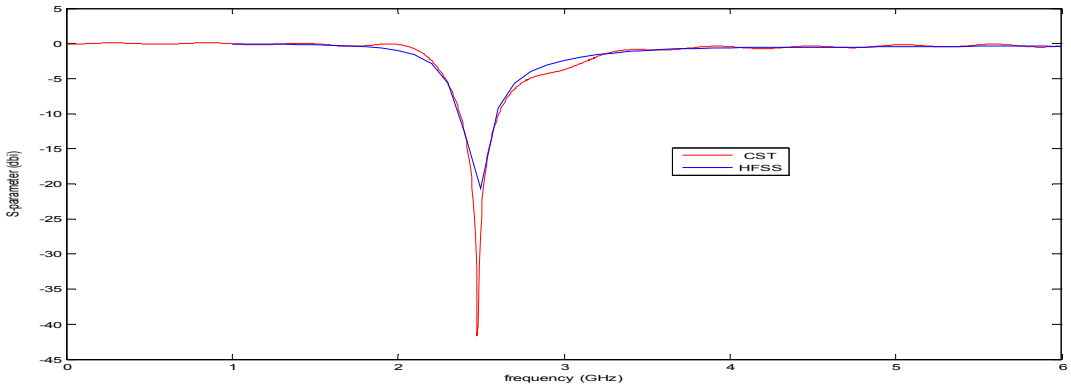

Fig. 3. The Simulated return loss for the proposed antenna

The S-parameter simulated with CST microwave studio and High Frequency Structure Simulator (HFSS) are shown in figure 3; we can see that the minimum bandwidth is about 400 MHz (2.31 GHz to 2.71 GHz).

How such a single element antenna works as a diversity antenna can be explained by the theory of characteristics modes: diversity gain can be achieved by exciting different modes of the antenna which result in different radiation patterns [8]. Here different modes on the radiator top plate and ground plane of the PIFA are excited to produce the desired diversity gain. It is observed from the parametric study that the dimension of ground plane greatly affects the resonant frequency [9].

3.1 THE CHANGES OF WIDTH AND LENGTH OF THE RADIATING PLATE

The changes are made in the width (Wp) and the length (Lp) of the top radiating plate and its effects are observed on the characteristic of PIFA. We change the width of the top radiating plate from 24 mm to 50 mm and length of the top radiating plate from 8 mm to 20 mm while all other parameters are constant, in Figure 4 (a, b) show that the increase in the width of top radiating plate decreases the resonance frequency and impedance bandwidth, in Figure 5 (a, b) show that the increase in the length of top radiating plate decreases the resonance frequency and impedance bandwidth.

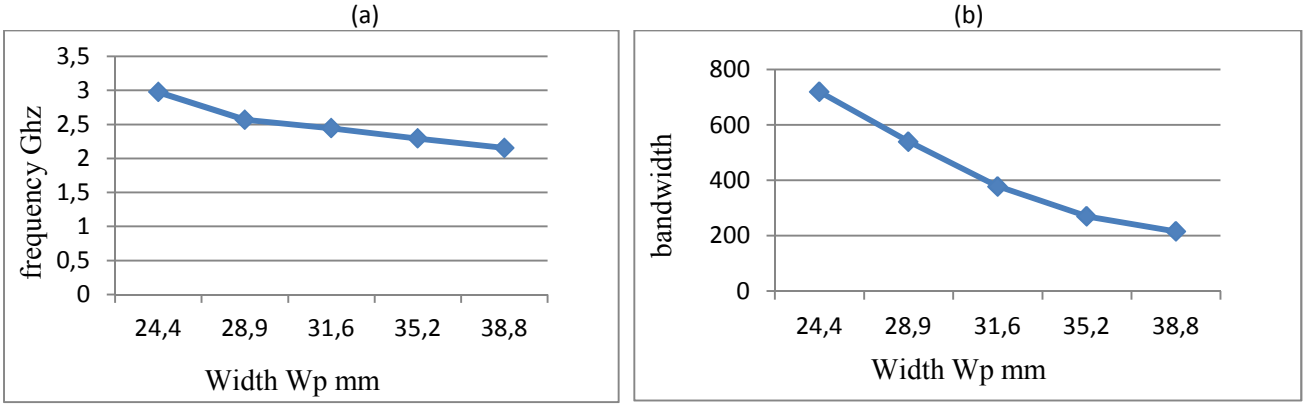

Fig. 4. Changes of width of the radiating plate according resonance frequency and bandwidth

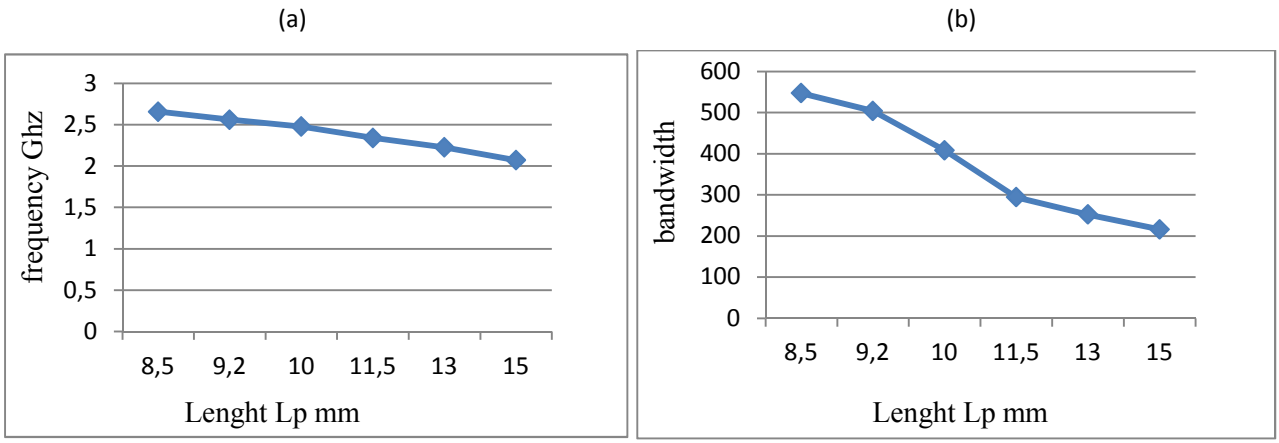

Fig. 5. Changes of length of the radiating plate according resonance frequency and bandwidth

The effect of changing the width of top plate Wp on the fractional bandwidth is shown in Figure 4 (b) and on resonance frequency is shown in Figure 4 (a). The effect of changing the length of top plate Lp on the resonant frequency is shown in Figure 5 (a) and on the bandwidth is shown in Figure 5 (b). It is evident that increasing the width of the feed plate increases the fractional bandwidth up to a particular value then further increase in the feed plate width only serves to decrease the fractional bandwidth.

3.2 THE CHANGES OF THE HEIGHT HA

The height of top plate h is varied from 3mm to 10mm to observe its effect while all other parameters are constant, simulated results is shown in Figure 6(a, b). The results show in Figure 6 (a) and Figure 6 (b) that the increase in height ha decreases the resonant frequency and the impedance bandwidth. This parameter can be decreased to enhance the impedance bandwidth and resonance frequency and is very critical as we need to have small antennas.

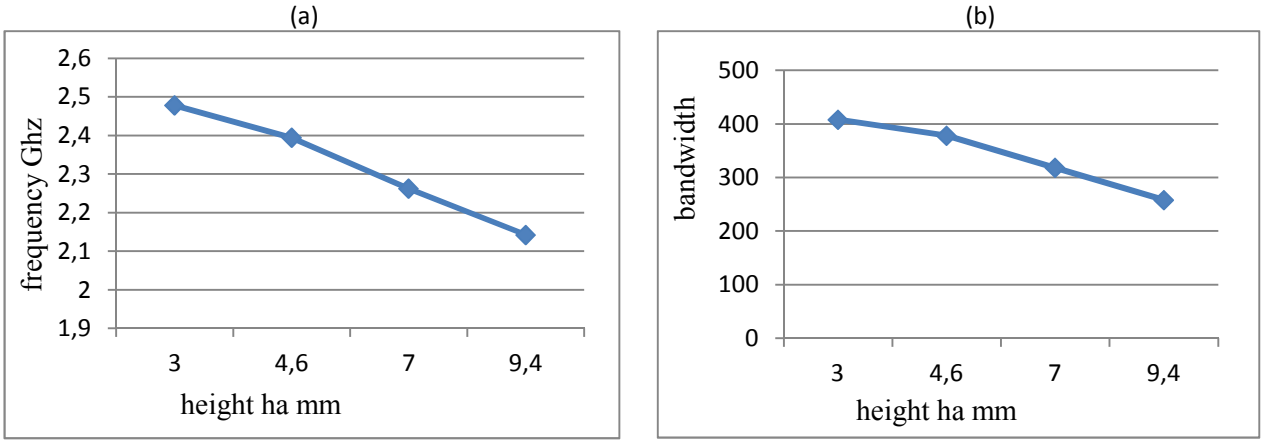

Fig. 6. Changes of the height ha according resonance frequency and bandwidth

3.3 THE CHANGES OF THE FEED PIN POSITION

The changes are made in the horizontal distance x of the PIFA from edge of ground plane to observe their effects on the characteristics of PIFA. The value of x is changed from 1 to 3.6mm while all other parameters are constant. The simulated results are shown in Figure 7 (a, b).

The results show that increase in distance x increases the resonant frequency (figure 7 a) and impedance bandwidth (figure 7 b). It is concluded that the placement of PIFA on ground plane significantly affects the characteristics of the PIFA and feed pin needs to be placed at maximum distance x of ground plane for maximum impedance bandwidth.

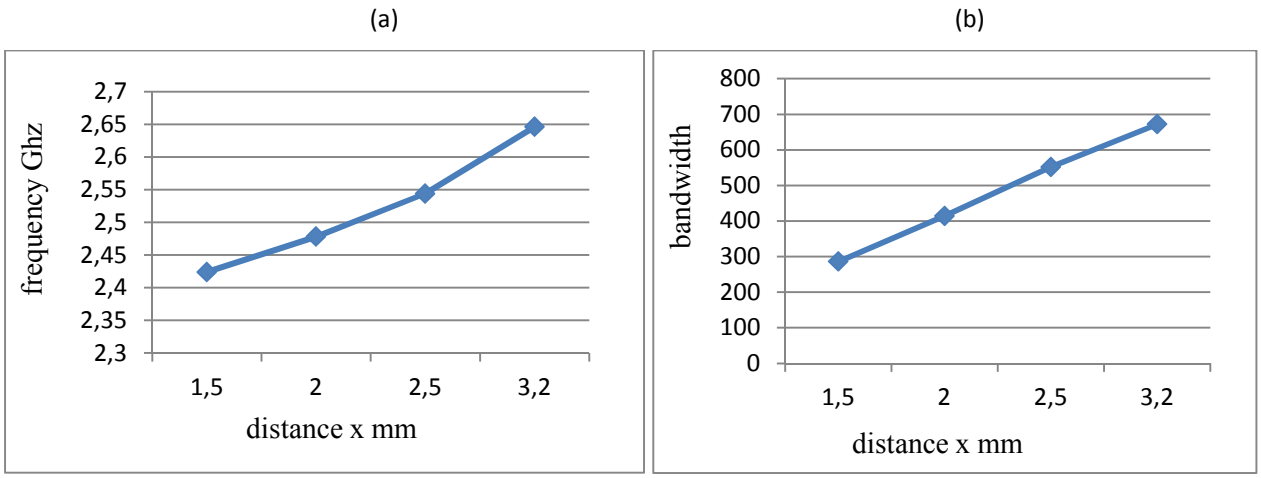

Fig. 7. Changes of the distance x according resonance frequency and bandwidth

Figures 8, 9 and 10 plot the simulated radiation patterns of antenna at the resonant frequency. In different planes the radiation patterns for resonant frequency are close to omnidirectional. The approximate omnidirectional characteristic of this new PIFA can be seen from the different horizontal and vertical patterns. However, the new PIFA is confirmed in its basic behavior as an acceptable omnidirectional radiator.

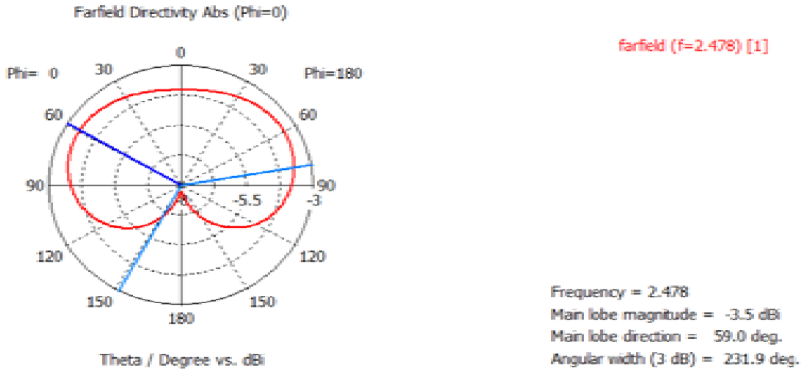

Fig. 8. Simulated radiation patterns in dB ($\varphi = 0$, x-z plane) at fr=2.478 GHz

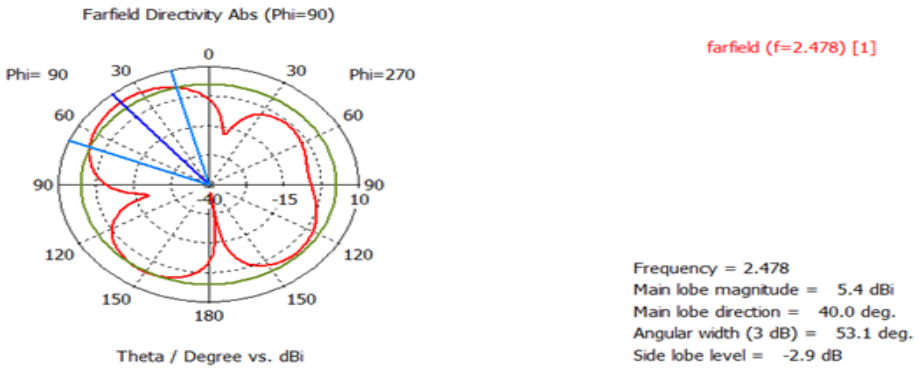

Fig. 9. Simulated radiation patterns in dB ($\varphi = 90$, y-z plane) at fr=2.478 GHz

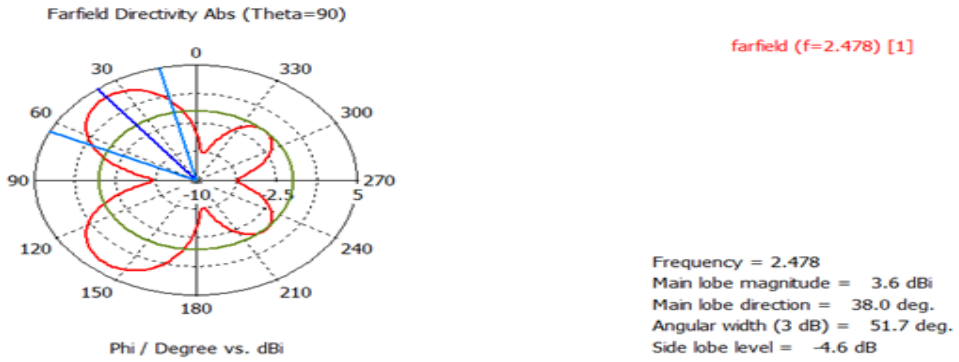

Fig. 10. Simulated radiation patterns in dB ($\theta = 90$, x-y plane) at fr=2.478 GHz

In Figure 11 it is shown the simulated maximum gain is above 2.9 dB. Both parameters are very acceptable for a mobile phone antenna and validate an adequate radiation performance besides the large bandwidth.

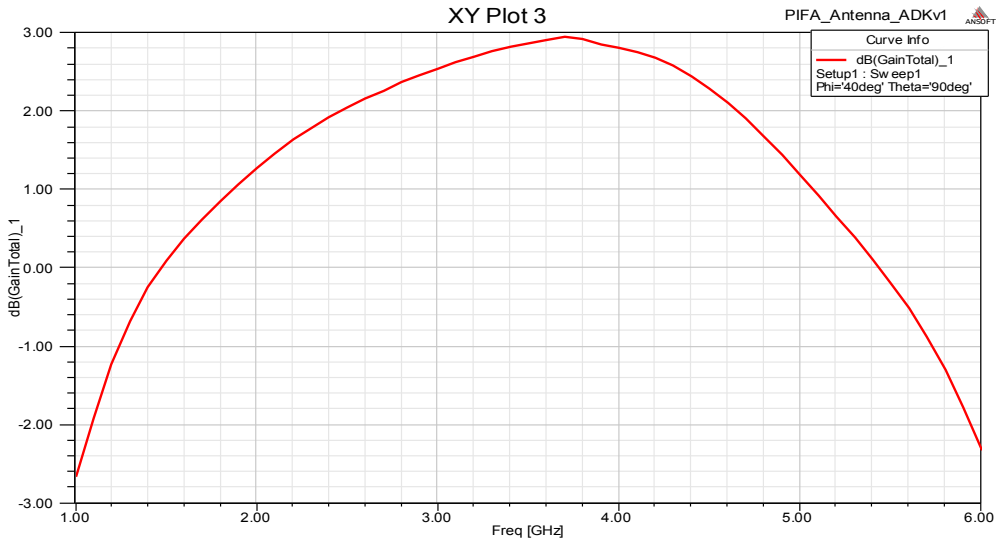

Fig. 11. Simulated gain at fr=2.478 GHz

4 CONCLUSION

The new design PIFA proposed in this article can cover the frequency range from 2.31 GHz to 2.71 GHz (400 MHz), therefore, it includes applications: Wi-Fi (2.4GHz), Bluetooth (2.4 GHz) and the two LTE bands (2.3GHz, 2.5GHz). The Changes of the length of the top radiating plate (Lp), the width of the top radiating plate, the height between the top radiating plate and the substrate (ha) and the feed position (x) changes the frequency of resonance and bandwidth and don't have significant effect on the radiation pattern.

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Convergence of Offline Gradient Method with Smoothing $L_{1/2}$ Regularization for Two-layer of Neural Network

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ABSTRACT: In this paper, we study the convergence of offline gradient method with smoothing $L_{1/2}$ regularization penalty for training multi-output feed forward neural networks. The monotonicity of the error function and weight boundedness for the offline gradient with smoothing $L_{1/2}$ regularization. the usual $L_{1/2}$ regularization term involves absolute value and is not differentiable at the origin. The key point of this paper is modify the usual $L_{1/2}$ regularization term by smoothing it at the origin are presented, the convergence results are proved, which will be very meaningful for theoretical research or applications on multi – output neural networks.

KEYWORDS: feed forward neural network; offline gradient method; smoothing $L_{1/2}$ regularization; boundedness; convergence.

1 INTRODUCTION

Feed forward neural networks (FNN) have been widely used in much application [1 – 9]. The Penalty (regularization) term is often introduced into the network training algorithms so as to control the magnitude of the weights and to improve the generalization performance of the network [10 - 13]. A commonly used penalty term added to the standard error function is a term proportional to the norm of the weights. The effectiveness of this penalty has been tested on many problems such as the monks problem, etc. An especially $L_{1/2}$ regularization term is introduced into the batch gradient learning algorithm for pruning of FNN, the usual $L_{1/2}$ regularization term is not smooth at the origin, which causes difficulty in the convergence analysis and, more importantly. Oscillation in the numerical computation as observed in the numerical experiments [14]. In [15], some convergence results are given for feed forward neural networks with $L_{1/2}$ regularization penalty, where the learning fashion of training examples is gradient algorithm learning. The key for the convergence results of the error function is decreasing monotonically, and the online gradient method with $L_{1/2}$ smoothing regularization term is deterministically convergent. As a simple example, the convergence for two- layer feed forward neural network is discussed in [16]. The convergence of the online and batch gradient algorithm with a penalty term for feed forward neural network has been also discussed [17 - 19]. These results are of global nature that they are valid for any arbitrarily given initial values of the weights. In addition, multi-output feed forward neural network is widely used in classification problems, and the convergence of multi-output neural network is very meaningful.

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In this paper, we study a multi-output BP neural network with $L_{1/2}$ regularization penalty term and define a relation formula between the penalty parameter and the learning rate parameter, then use it to prove the weak and strong convergences of the offline gradient algorithm with $L_{1/2}$ regularization penalty. We note that usual $L_{1/2}$ regularization penalty term is not smooth at the origin, so difficulty to proof main results, for which we suppose that $L_{1/2}$ regularization smoothing in the origin error function, then it come easy to prove, our main results. Additionally, the boundness of the new error function with $L_{1/2}$ regularization penalty is also guaranteed.

The rest of this paper is arranged as follows. The offline gradient method with smoothing $L_{1/2}$ regularization penalty term is described in section 2. In section 3, the convergence results of offline gradient method with smoothing $L_{1/2}$ regularization are presented. In section 4, we display a brief summary of our present work.

2 ALGORITHM DESCRIPTION

In this section, we introduction a two- layer network consisting of p input layers, n output layers. Fig. 1 illustrates the structure of two-layer multi-output feed-forward neural network

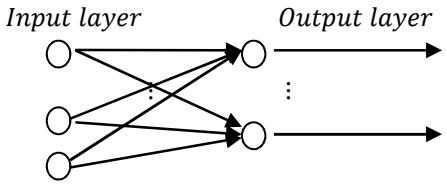

Fig.* 1 *structure of two − layer Multi − output feedforward neural network

Denote the $\omega = (\omega_{ab})_{IP}$ and $\omega_i = (\omega_{i1}, \omega_{i2}, \dots, \omega_{ip})$ $(1 \le i \le n)$ and the transfer function by $g: \mathbb{R} \to \mathbb{R}$, is a sigmoid function. Let $\{x^j, o^j\}_{j=1}^{J} \subset \mathbb{R}^p \times \mathbb{R}$ is a given of training samples.

For each input $\xi \in \mathbb{R}^p$, then the actual output is computed by

$$\xi = g(\omega \cdot \xi) \tag{1}$$

2.1 OFFLINE GRADIENT METHOD WITH $L_{1/2}$ REGULARIZATION

In supervised training of neural networks, synaptic weights are usually updated by an iterative algorithm which searches for the minimum of a cost function. A popular choice of the cost function is

$$\tilde{E}(\omega) = \frac{1}{2}\sum_{j=1}^{J}(o^j - \xi^j) = \frac{1}{2}\sum_{j=1}^{J}\sum_{i=1}^{n}\left(o^j - g(\omega_i \cdot \xi^j)\right)^2 \tag{2}$$

By adding a $L_{1/2}$ regularization penalty term, the modified cost function takes the form (cf. [6, 12])

$$\begin{aligned} E(\omega) &= \frac{1}{2}\sum_{j=1}^{J}\sum_{i=1}^{n}\left(o^j - g_{ji}(\omega_i \cdot \xi^j)\right)^2 + \lambda\sum_{i=1}^{n}\sum_{k=1}^{p}|\omega_{ik}|^{1/2} \\ &= \sum_{j=1}^{J}\sum_{i=1}^{n} g_{ji}(\omega_i \cdot \xi^j) + \lambda\sum_{i=1}^{n}\sum_{k=1}^{p}|\omega_{ik}|^{1/2} \end{aligned} \tag{3}$$

Where $g_j(t) \coloneqq \frac{1}{2}(o^j - g(t))^2$ and $\lambda > 0$ is a penalty parameter. Then the gradient function with respect to $\omega_{ik}(\, i = 1,2, \dots, n;\ k = 1,2, \dots, p)$ is

$$E_{\omega_{ik}}(\omega) = \sum_{j=1}^{J} g'_{ji}(\omega_i \cdot \xi^j)\xi_k^j + \frac{\lambda\, sgm\,(\omega_{ik})}{2\,|\omega_{ik}|^{1/2}} \tag{4}$$

Let ω^0 be arbitrary initial weight. The offline gradient method with $L_{1/2}$ regularization term updates the weights $\{\omega^m\}$ iteratively by

$$\omega_{ik}^{mJ+j} = \omega_{ik}^{mJ+j-1} - \Delta_{\mathrm{j}}^{\mathrm{m}}\omega_{ik}^{mJ+j-1}, \quad m = 0,1,2,\ldots. \tag{5}$$

Where

$$\Delta_{\mathrm{j}}^{\mathrm{m}}\omega_{ik}^{mJ+j-1} = -\eta_m \nabla_{\omega_{ik}} E\left(\omega_{ik}^{mJ+j-1}\right) = -\eta_m E_{\omega_{ik}}\left(\omega_{ik}^{mJ+j-1}\right)$$
$$= -\eta_m \left(\sum_{j=1}^{J} g'_{ji}\left(\omega_i^{mJ+j-1} \cdot \xi^j\right) \xi_k^j + \frac{\lambda\, sgm\left(\omega_{ik}^{mJ+j-1}\right)}{2\left|\omega_{ik}^{mJ+j-1}\right|^{1/2}} \right) \tag{6}$$

Here, $\nabla_{\omega_{ik}} E(\omega^{mJ+j-1})$ is the gradient of $E(\omega^{mJ+j-1})$ with respect to ω_{ik} $(i = 1,2,\ldots,n;\ k = 1,2,\ldots,p)$ and $\eta_m > 0$ is the learning rate.

2.2 OFFLINE GRADIENT METHOD WITH SMOOTHING $L_{1/2}$ REGULARIZATION

A modified $L_{1\backslash 2}$ regularization term in error function is difficulties to convergence analysis, so we proposed to smoothing the usual one at the origin, resulting in the following error function with a smoothing $L_{1\backslash 2}$ regularization penalty term:

$$E(\omega) = \frac{1}{2}\sum_{j=1}^{J}\sum_{i=1}^{n}\left(o^j - g(\omega_i \cdot \xi^j)\right)^2 + \lambda \sum_{i=1}^{n}\sum_{k=1}^{p} f(\omega_{ik})^{1/2}$$
$$= \sum_{j=1}^{J}\sum_{i=1}^{n} g_{ji}(\omega_i \cdot \xi^j) + \lambda \sum_{i=1}^{n}\sum_{k=1}^{p} f(\omega_{ik})^{1/2} \tag{7}$$

In order to approximate the non-smooth function $|x|$. For definiteness and simplicity, we use the smoothing function $f(x)$ defined by:

$$f(x) = \begin{cases} -x, & x \le -a; \\ -\dfrac{1}{8a^3}x^4 + \dfrac{3}{4a}x^2 + \dfrac{3}{8}, & -a < x < a; \\ x, & x \ge a; \end{cases} \tag{8}$$

Where *a* is a small positive constant. Then we have

$$f'(x) = \begin{cases} -1, & x \le -a; \\ -\dfrac{1}{2a^3}x^3 + \dfrac{3}{2a}x, & -a < x < a; \\ 1, & x \ge a; \end{cases}$$
$$f''(x) = \begin{cases} 0, & x \le -a; \\ -\dfrac{3}{2a^3}x^2 + \dfrac{3}{2a}, & -a < x < a; \\ 0, & x \ge a; \end{cases}$$

It is easy to get

$$f(x) \in \left[\frac{3}{8}a, +\infty\right), \quad f'(x) \in [-1,1], \quad f''(x) \in \left[0, \frac{3}{2a}\right]$$

Where $g_j(t) = \frac{1}{2}(o^j - g(t))^2$ and $\lambda > 0$ is a penalty parameter. Then gradient function with respect to ω_{ik} $(i = 1,2,\ldots,n;\ k = 1,2,\ldots,p)$.

$$E_{\omega_{ik}}(\omega) = \sum_{j=1}^{J} g'_{ji}(\omega_i \cdot \xi^j)\xi_k^j + \lambda \frac{f'(\omega_{ik})}{2f(\omega_{ik})^{1/2}} \tag{9}$$

Let ω^0 be arbitrary initial weight. The offline gradient method with smoothing $L_{1/2}$ regularization term updates the weights $\{\omega^m\}$ iteratively by

$$\omega_{ik}^{mJ+j} = \omega_{ik}^{mJ+j-1} - \Delta_{\mathrm{j}}^{\mathrm{m}}\omega_{ik}^{mJ+j-1}, \quad m = 0,1,2,\ldots \tag{10}$$

Where

$$\Delta_{j}^{m}\omega_{ik}^{mJ+j-1} = -\eta_m \nabla_{\omega_{ik}} E\left(\omega_{ik}^{mJ+j-1}\right) = -\eta_m E_{\omega_{ik}}\left(\omega_{ik}^{mJ+j-1}\right)$$

$$= -\eta_m \left(g'_{ji}\left(\omega_i^{mJ+j-1} \cdot \xi^j\right)\xi_k^j + \lambda \frac{f'\left(\omega_{ik}^{mJ+j-1}\right)}{2Jf\left(\omega_{ik}^{mJ+j-1}\right)^{1/2}} \right) \quad (11)$$

Here, $\nabla_{\omega_{ik}} E(\omega^{mJ+j-1})$ is the gradient of $E(\omega^{mJ+j-1})$ with respect to ω_{ik} $(i = 1,2,\dots,n;\ k = 1,2,\dots,p)$ and $\eta_m > 0$ is the learning rate.

3 MAIN RESULTS

Our assumptions in this paper are described below:

Assumption (A1): $\left|g^{(k)}(t)\right| < C,\ \left|g_{ji}^{(k)}(t)\right| < C\ (k = 0,1,2)$ are uniformly bounded for $t \in \mathbb{R}$.

Assumption (A2): λ and η are chosen to satisfy $0 < \eta < \frac{1}{\lambda + C_1}$.

For simplicity, we denote

$$C_1 = \frac{1}{2}JCC_2^2, \qquad \mathrm{C}_2 = \max_{1\le j\le J}\left\|\xi^j\right\|,$$

Assumption (A3): the set $\Omega_0 \in \{\omega \in \Omega: E_\omega(\omega) = 0\}$ Contains finite points, where Ω is closed bounded region such that $\{\omega^m\} \subset \Omega$.

The following Lemma is a crucial tool for our analysis.

Lemma 1. Let $F: \Phi \subset \mathbb{R}^p \to \mathbb{R}\ (\mathrm{p} \ge 1)$ be continuous for a bounded closed region Φ. if the set $\Phi_0 = \{x \in \Phi: \mathrm{F_x(x)} = 0\}$ has finite points and the sequence $\{x_n\} \in \Phi$ satisfy: $\lim_{n\to\infty}\|F_x(x_n)\| = 0$ and $\lim_{n\to\infty}\|x_{n-1} - x_n\| = 0$. Then, there exists $x^* \in \Phi_0$ such that $\lim_{n\to\infty} x_n = x^*$. Thus proof is omitted see [20].

The next theorem confirms the boundedness of the weights in the training procedure, which is a desired rewarding of adding a smoothing $L_{1\backslash 2}$ regularization penalty term.

Theorem 2. Suppose that Assumptions (A1) and (A2) are valid. That the weight sequence $\left\{\omega_{ik}^{mJ+j}\right\}$ is the generated form equ. (10). For arbitrary initial valueω^0, Then $\left\{\omega_{ik}^{mJ+j}\right\}$ $(i = 1,2,\dots,n\,; k = 1,2,\dots,p; m = 0,1,2,\dots)$ are uniformly bounded, i.e., there exist positive constants $M > 0$ such that

$$\left\|\omega_{ik}^{mJ+j}\right\| \le M, \quad i = 1,2,\dots,n\,; k = 1,2,\dots,p; m = 0,1,2,\dots \quad (12)$$

Proof. By applying the assumption (A1), there is a constant $A_2 > 0$ such that for all $m = 0,1,2,\dots$,

$$\sum_{j=1}^{J}\left|g'_{ji}\left(\omega_i^{mJ+j-1} \cdot \xi^j\right)\right|\left\|\xi_k^j\right\| \le A_2 \quad (13)$$

In addition to that, for $x \in \mathbb{R}, f(x) \in \left[\frac{3}{8}a, +\infty\right), f'(x) \in [-1,1]$ holds. By the updating equs. (10) and (11), we have

$$\begin{aligned}\left|\omega_{ik}^{mJ+j} - \omega_{ik}^{mJ+j-1}\right| &= \eta_m\left|\Delta\,\omega_{ik}^{mJ+j-1}\right| \\ &\le \eta_m\left(\left|g'_{ji}\left(\omega_i^{mJ+j-1} \cdot \xi^j\right)\xi_k^j + \lambda \frac{f'\left(\omega_{ik}^{mJ+j-1}\right)}{2Jf\left(\omega_{ik}^{mJ+j-1}\right)^{1/2}}\right|\right) \\ &\le \eta_m\left(A_2 + \frac{\lambda}{3a}\sqrt{6a}\right) \le \eta_m A_1\end{aligned}$$

Where $A_1 = A_2 + (\lambda/3a)\sqrt{6a}$.

Then

$$\begin{aligned}\left|\omega_{ik}^{(m+1)J+j} - \omega_{ik}^{mJ+j}\right| &\le \left|\omega_{ik}^{(m+1)J+j} - \omega_{ik}^{(m+1)J+j-1}\right| + \left|\omega_{ik}^{(m+1)J+j-1} - \omega_{ik}^{(m+1)J+j-2}\right| \\ &\quad + \cdots + \left|\omega_{ik}^{(m+1)J+1} - \omega_{ik}^{(m+1)J}\right| + \left|\omega_{ik}^{mJ+J} - \omega_{ik}^{mJ+j-1}\right| + \left|\omega_{ik}^{mJ+j-1} - \omega_{ik}^{mJ+j-2}\right| \\ &\quad + \cdots + \left|\omega_{ik}^{mJ+j+1} - \omega_{ik}^{mJ+j}\right| \\ &\le (j\eta_{m+1} + (J-j)\eta_m)A_1 \quad (14)\end{aligned}$$

Since

$$\begin{aligned}\left|\omega_{ik}^{(m+p)J+j}-\omega_{ik}^{mJ+j}\right| &\le \left|\omega_{ik}^{(m+p)J+j}-\omega_{ik}^{(m+p-1)J+j}\right|+\left|\omega_{ik}^{(m+p-1)J+j}-\omega_{ik}^{(m+p-2)J+j}\right| \\ &+\cdots+\left|\omega_{ik}^{(m+1)J+j}-\omega_{ik}^{mJ+j}\right| \\ &\le A_1 j\left(\eta_{m+p}+\eta_{m+p-1}+\cdots.+\eta_{m+1}\right)+C_2(J-j)\left(\eta_{m+p-1}+\eta_{m+p-2}+\cdots.+\eta_m\right) \\ &\le JA_1\varepsilon \end{aligned} \quad (15)$$

Therefore, the weight sequence $\left\{\omega_{ik}^{mJ+j}\right\}$ is a convergence. By the properties of convergence sequence, $\left\{\omega_{ik}^{mJ+j}\right\}$ must be a bounded sequence, so is $\left\|\omega_{ik}^{mJ+j}\right\|$. namely, there exists a suitable constant $M>0$ such that

$$\left\|\omega_{ik}^{mJ+j}\right\| \le M \quad (16)$$

Where $i=1,2,\ldots,n\,; k=1,2,\ldots,p;; m=0,1,2,\ldots; j=1,2,\ldots,J.$

Naturally, there also exists a constant $\bar{M}\ge 0$ such that

$$\left\|\Delta\,{}_k^m\omega_i^{mJ+j-1}\right\| \le \bar{M} \quad ,k=1,2,\ldots,J \quad (17)$$

This proof is completed.

Theorem 3. Suppose that the error function is given by equ. (7), that the weight sequence $\{\omega^m\}$ is generated by the algorithm of equ. (11) for any initial value ω^0, and Assumption (A1) and (A2) are valid. Then we have

(i) $E\left(\omega^{(m+1)J}\right)\le E(\omega^{mJ})$,

(ii) There is $E^*\ge 0$ such that $\lim_{m\to\infty}E(\omega^{mJ})=E^*$;

(iii) $\lim\limits_{m\to\infty}\left\|\Delta\omega_i^{mJ}\right\|=0,\quad \lim\limits_{m\to\infty}\|E_\omega(\omega^{mJ})\|=0.$

Moreover, if Assumption (A3) is valid, then we have the strong convergence:

(iv) There *exists* $\omega^*\in\Omega_0$ such *that* $lim_{m\to\infty}\,\omega^m=\omega^*$.

The Proof of Theorem 3. Is divided into four parts dealing with statements (i), (ii), (iii) and (iv), respectively.

Proof of (i) of the theorem 3. For convenience, we use the following notations:

$$\sigma^{m}=\sum_{i=1}^{n}\sum_{k=1}^{p}\left(\Delta_j^m\omega_{ik}^{mJ}\right)^2 \quad (18)$$

Using the Taylor's formula we expand $g_{ji}\left(\omega_i^{(m+1)J}\cdot\xi^j\right)$ at $\omega_i^{mJ}\cdot\xi^j$ we get

$$\begin{aligned} &g_{ji}\left(\omega_i^{(m+1)J}\cdot\xi^j\right) \\ &\quad=g_{ji}\left(\omega_i^{mJ}\cdot\xi^j\right)+g_{ji}'\left(\omega_i^{mJ}\cdot\xi^j\right)\left(\Delta\omega_i^{mJ}\right)\xi^j \\ &\quad+\frac{1}{2}g_{ji}''\left(t_{m,j}\right)\left(\left(\Delta\omega_i^{mJ}\right)\xi^j\right)^2 \end{aligned} \quad (19)$$

Where $t_{m,j}$ lies in between $\omega_i^{mJ}\cdot\xi^j$ and $\omega_i^{(m+1)J}\cdot\xi^j$.

From equ. (7) and equ. (19) we get

$$\begin{aligned} E\left(\omega^{(m+1)J}\right)-E\left(\omega^{mJ}\right) &= \sum_{j=1}^{J}\sum_{i=1}^{n}\sum_{k=1}^{p}g_{ji}'\left(\omega_i^{mJ}\cdot\xi^j\right)\left(\Delta_j^m\omega_{ik}^{mJ}\right)\xi_k^j+\frac{1}{2}JCC_2^2\sum_{i=1}^{n}\sum_{k=1}^{p}\left(\Delta_j^m\omega_{ik}^{mJ}\right)^2 \\ &+\lambda\sum_{i=1}^{n}\sum_{k=1}^{p}\left(f\left(\omega_{ik}^{(m+1)J}\right)^{1/2}-f\left(\omega_{ik}^{mJ}\right)^{1/2}\right) \\ &=-\left(\frac{1}{\eta_m}-C_1\right)\sum_{i=1}^{n}\sum_{k=1}^{p}\left(\Delta_j^m\omega_{ik}^{mJ}\right)^2-\lambda\sum_{i=1}^{n}\sum_{k=1}^{p}\frac{f'\left(\omega_{ik}^{mJ}\right)}{2f\left(\omega_{ik}^{mJ}\right)^{1/2}}\cdot\left(\Delta_j^m\omega_{ik}^{mJ}\right) \\ &+\lambda\sum_{i=1}^{n}\sum_{k=1}^{p}\left(f\left(\omega_{ik}^{(m+1)J}\right)^{1/2}-f\left(\omega_{ik}^{mJ}\right)^{1/2}\right. \end{aligned} \quad (20)$$

Where $C_1 = \frac{1}{2}JCC_2^2$.

By using the Lagrange mean value theorem for $f(x)$, we have

$$E\left(\omega^{(m+1)J}\right) - E(\omega^{mJ}) = -\frac{1}{\eta_m}\sum_{i=1}^{n}\sum_{k=1}^{p}\left(\Delta_j^m\omega_{ik}^{mJ}\right)^2 + \frac{\lambda}{2}\sum_{i=1}^{n}\sum_{k=1}^{p}F''(t_{i,k,m})\left(\Delta_j^m\omega_{ik}^{mJ}\right)^2$$

$$= -\left(\frac{1}{\eta_m} - M\lambda - C_1\right)\sum_{i=1}^{n}\sum_{k=1}^{p}\left(\Delta_j^m\omega_{ik}^{mJ}\right)^2 \qquad (21)$$

Where $t_{i,k,m} \in \mathbb{R}$ is between ω_{ik}^{mJ} and $\omega_{ik}^{(m+1)J}$, $M = \frac{\sqrt{6}}{\sqrt{a^3}}$, and $F(x) \equiv \left(f(x)\right)^{\frac{1}{2}}$. Note that

$$F'(x) = \frac{f'(x)}{2\sqrt{f(x)}}$$

$$F''(x) = \frac{2f''(x).f(x) - [f'(x)]^2}{4[f(x)]^{\frac{3}{2}}} \le \frac{f''(x)}{2\sqrt{f(x)}} \le \frac{\sqrt{6}}{2\sqrt{a^3}}$$

By assumption (A2), we have

$$E\left(\omega^{(m+1)J}\right) \le E(\omega^{mJ}) \quad , m = 0,1,2,\ldots., j = 1,2,..,J \qquad (22)$$

This completes the proof to statement (i) of Theorem 3.

Proof of $(\mathbf{ii})$ ***of Theorem 3.*** Since the nonnegative sequence $\{E(\omega^{mJ})\}$ is monotone and bounded below. There must be a limit value $E^* \ge 0$ such that $\lim_{m\to\infty} E(\omega^{mJ}) = E^*$. The Proof of (ii) is thus completed.

Proof of $(\mathbf{iii})$ ***of Theorem 3.*** It follows from assumption (A2) that $\beta > 0$. Taking $\beta = \frac{1}{\eta_m} - \lambda M - C_1$ and using equ. (21), we have

$$E\left(\omega^{(m+1)J}\right) \le E(\omega^{mJ}) - \beta\sigma^m \le \cdots \le E(\omega^0) - \beta\sum_{k=0}^{m}\sigma^k$$

Since $\left(\omega^{(m+1)J}\right) \ge 0$, we have

$$\beta\sum_{k=0}^{m}\sigma^k \le E(\omega^0).$$

Let $m \to \infty$, then

$$\beta\sum_{k=0}^{\infty}\sigma^k \le \frac{1}{\beta}E(\omega^0) < \infty.$$

these results to

$$\lim_{m\to\infty}\sigma^m = \lim_{m\to\infty}\sum_{i=1}^{n}\sum_{k=1}^{p}\left(\Delta_j^m\omega_{ik}^{mJ}\right)^2 = 0.$$

It follows from equs. (9) – (11) and equ. (19) that

$$\lim_{m\to\infty}\left\|\Delta_j^m\omega_{ik}^{mJ}\right\| = 0, \quad \lim_{m\to\infty}\|E_\omega(\omega^{mJ})\| = 0. \qquad (23)$$

The proof to (iii) is thus completed.

Proof of $(\mathbf{iv})$ ***of Theorem 3.*** From equ. (23) leads to: existing $E^* \in \Phi_0$ such that $\lim_{m\to\infty}(\omega^{mJ}) = \omega^*$. This completes the proof of *(iv)*.

4 CONCLUSION

Convergence results are established for the offline gradient method with smoothing $L_{1\backslash 2}$ regularization term for training multi-output feedforward neural networks. The monotonicity of the error function and weight boundedness for the offline gradient with smoothing $L_{1\backslash 2}$ regularization are presented, both weak and strong convergence results are proved, which will provides a strong theoretical support for many applications on multi-output neural networks.

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IMPACT OF PERSONALITY ON CAREER SUCCESS

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ABSTRACT: The relationship between personality and career success was investigated in a questionnaire study with a sample of 200 doctors and educators, who were employed in different hospitals and universities on different organizational designations. Personality judged by the "Big Five Personality Model". Career Success comprised of subjective (intrinsic) career success (financial success, life success, interpersonal success and job success) and objective (extrinsic) career success (salary and promotion) dimensions. In Pakistani society/culture people unaware about their personality, so the research on personality and its impact on career success were unjustified and mostly insignificant. Meaning of success in our society is to earn money and get competitive advantages as compared to colleagues. Personal life and interpersonal relationships have less worth in success counter. Research presents the insignificant impact of personality, person environment-fit and job performance on career success. With respect to limitations of the study, construct of personality like: education, knowledge and experience levels not included in research.

KEYWORDS: Intrinsic career success, extrinsic career success, Big five personality.

INTRODUCTION

An employee satisfies his needs in a way of career success to accomplishment and power. Career success enhances individuals' quantity and personal satisfaction *(Kilduff and Day, 1994).* Study at professional level, career success has advantages for both people and organization *(Aryee et al., 1994; Schein, 1978*). At the personal level, career success allows to secure of materialistic headway, power, and fulfillment *(Gattiker and Larwood, 1990, 1988; Judgeet al., 1995; Poole et al., 1990).* Learning of career success helps people to improve proper procedures for career improvement *(Aryee et al., 1994; Ellis and Heneman, 1990).*

Career itself requires characteristics to be performed efficaciously *(Gottfredson et al., 1975)*. Some careers require specific attributes that classified the necessities of work properties *(Caldwell and Burger, 1998)*. Career success is profoundly subject to the similarity between personality of the employee and the professional quality (Judge et al., 1999). Career directing program that helps self thought processes appear to empower occupants to replenish uniqueness needed on career success *(Mcoetzee and Schreuder, 2002)*.

Personality is the universe in which a person has full authority to control his mental power and behaviors in each and every situation or circumstances. *Alloprt et al (1965)* depict distinctive personality attributes like focal, auxiliary, normal and cardinal characteristics while *Cattell's (1966)* study examined up to sixteen essential and five optional elements and *Hysenck* verbalized that just three characteristics of extraversion, passionately stable and psychoticism are sufficient to illustrate the identity of an individual *(Eysenckand Eysenck, 1975)*. Today Personality Big Five model of Goldberg (1992) is internationally acknowledged for builds of disposition characteristic which incorporate core measurements of identity. Five big model

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incorporate extraversion, agreeableness, openness to experience, conscientiousness, and emotionally stable *(Costa and Mccrae, 1985).*

In industrial psychology, researchers have been often examining the relationship between personality and job performance *(Barrick, Mount & Judge, 2001).* Job performance is a multi-dimensional construct which show how well workers perform their assignments. Job performance demonstrates the degree to which they finish assignments, the way they use their accessible assets and the time and vigor they use on their errands *(Boshoff & Arnolds, 1995; Schepers, 1994).*

LITERATURE REVIEW

Personality is a branch of psychology that defines the individual differences and personalities. They focus on these following steps:

1. Draw a picture of a person and his or her psychological process.
2. Investigate that how people differ from each other.
3. Investigate the similarities of human beings.

Main focus is on the area to draw a picture of a person and his / her major psychological processes. Next step is to understand the differences of individual behavior means recognize how people differ from each other. A third step is to recognize by which traits individuals are similar. These three steps are used to understand the personality of the individual.

THE BIG FIVE PERSONALITY TRAITS

There are thousands of dimension of personality trait. In early 1990 studies focus on big five traits that's called "big five model*" Digman (1996), Spearman (1904)* started work in his general factory to discover personality traits. They find factor of trait. And *webb (1915)* enlarged his study of trait in to 48 characteristics. Garnett (1919) analyzed the correlation of *webb* and introduce openness (intellectual), conscientiousness, and extraversion and these factors called Webb-Garnett factors. *Tupes and Christal (1961*) used 30 scales of *Catell (1933)*'s and make big five model. *Lussier (2000)* define big five model as Surgency, Agreeableness, Adjustment, Conscientiousness, and Openness to Experience. But Pierce & Gardner (2000) define big five model as Extroversion, Adjustment, Agreeableness, Conscientiousness, and Inquisitiveness. But in this paper we study the Goldberg's Five Personality Inventory (FFPI).

Extroversion

This trait is characterized as these people belief on social ability, assertiveness in nature, tends toward actions and want to experience toward action. So the individual who have extraversion trait are makes central position in their work environment and maintain their bossy position at their work place. So if the individual have extraversion trait then they will be at work place and their involvement have good scored.

Agreeableness

Agreeableness defines as self-sacrifice, friendliness and humility, while ill feeling and selfishness is traits of low agreeableness. People involvement in work enhancement and maintenance of their feelings for their worth and esteem when they view their work and career achievement. People who seek to be low agreeableness have more work involvement because they are impression seeking in their nature that serves as self-esteem which creates advancement and acknowledgement in work environment Jans, 1982; Rabinowitz and Hall, (1977).

Openness to New Experiences

Burch and Anderson, (2008) said that people who don't have openness to experience are conventional toward problem and Sucier and Goldberg, (1998) says they don't able to explore new ideas to solve their problems as well as Goldberg, (1992) said they dislike variety and changes so they rigid with their old thoughts. For example: John Quincy Adams, Fredrick Douglass and Jane Adam have leadership qualities and skills because they have and ability to openness of ideas.

Conscientiousness

This trait is related to the industriousness and sense of duty. Barrick and Mount, (1991); Mount and Barrick, (1995); Salgado, (1997) they all said that conscientiousness have correlation with job performance of all type of jobs and occupation. Individual who show high conscientiousness have high positive significant affect toward work environment because they

have sense of duty toward work. Brown (1996) said that he studies huge researches on job involvement identify the positive significant relationship between job involvement and the feature to individual work ethics.

Emotional Stability

Neuroticism have extreme of worry, suspicion, and low confidence and propensities to control negative emotions , because its measures process under negative light , in which individuals who scored high in neuroticism is low level of attitude towards his work. Moreover, according to low confidence and suspicion also have low ambitious for their career and their goals according to organizations goals. Certainly Experimental evidence stated that neuroticism is negatively related to goal oriented (Malouff et al., 1990). Similarly, negative impact on career and work goals, neuroticism must be less likely to assign in work by individuals.

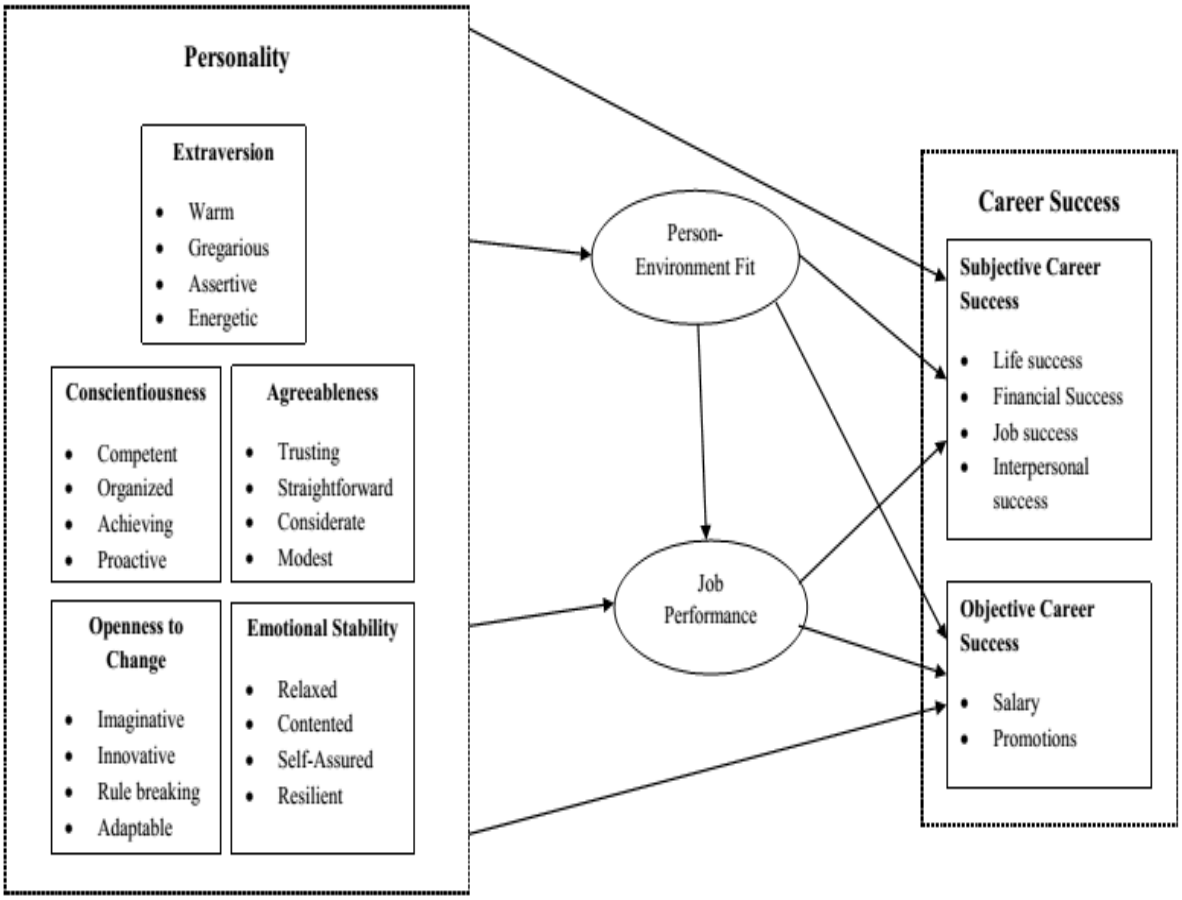
Person Environment fit (PEF)

PEF is use as a forecasting instrument of turnover objectives (Vogel and Feldman (2009), and Lyons and O'Brien (2006)). PEF is use as forecasting instrument of job performance and workforce quality (Kieffer, Schinka and Curtis, 2004). DelCampo (2006) said PEF could be a mediator variable of commitment and a common firm's culture. As a mediator it has strong relationship. Boon, Hartog, Boselie, and Paauwe, (2011) Said PEF is strong mediator of human resource policies and employees outcomes.

Job Performance

Job performance related to people behavior links their jobs in the organization and organizational goals *(Campbell, McHenry, & Wise, 1990)*. Job performance concentrate on people's behavior not on outcomes *(Murphy, 1989)*, because outcomes can help the employees to achieve their results with easiest way and this act can damage the organizational structure because they not follow other important behavior's. Organizations mostly concern with job performance behavior because of high productivity in the work place takes *(Hunter & Hunter, 1984)*. The importance of behavior is not related to job performance, but rather the behaviors themselves (*Campbell, McCloy, Oppler, and Sager, 1993)*. Another part of performance is that behavior's must be related to the goal of the organizations *(Campbell et al., 1993)*.

CONCEPTUAL MODEL & HYPOTHESIS



***H1a*:** There is positive relationship between personality and intrinsic career success.
H1b: There is positive relationship between personality and (extrinsic) career success.

***H2a*:** There is positive relationship between personality and person environment-fit.
H2b: There is positive relationship between personality and job performance.

***H3a*:** There is positive relationship between person environment-fit and subjective (intrinsic) career success.
H3b: There is positive relationship between person environment-fit and objectively (extrinsic) career success.

H4a: There is positive relationship between job performance and subjective (intrinsic) career success.
H4b: There is positive relationship between job performance and objectively (extrinsic) career success.

METHODOLOGY

In rank to assemble the information for understanding the impact of personality on career success, a trial of 200 respondents will pose to contribute in a self-administrative survey. Population of the research is doctors and educators. The population consisted of three immensely colossal cities of Pakistan, [(1) Islamabad; (2) Lahore; and (3) Multan].

In this sample three main attributes to contribute in the self–administrated analyzers. First, big five personality traits, second determinants of career success which consist of person environment fit and job performance. Third, career success categorized into two aspects, subjective and career success.

Big five dimensions of personality questionnaire B5PQ [(1) extraversion; (2) agreeableness; (3) openness to change; (4) conscientiousness; and (5) emotionally stable] are quantified utilizing the instrument developed by *John Smith (1990)*. Respondents designate how they usually feel by evaluation the degree of their feelings on a likert five-point scale where 1="strongly disagree", 2="disagree", 3="neutral", 4=" agree", 5="strongly agree".

Measurement of job performance measured by five-point likert scale developed by *Miyuki Takase (2005)* where 1="strongly disagree", 2="disagree", 3="neutral", 4="agree", 5="strongly agree". And person-environment fit also measured by likert scale but different values developed by *Daniel Robert Harrison (2010)* where 1="not at all", 2="partially not fit", 3="semi fit", 4="partially completely fit", 5="completely fit".

The bits and pieces for approach towards career success, Intrinsic (Subjective) Career Success [(1) Life success; (2)Financial Success; (3) Job success; and (4) Interpersonal success] and Extrinsic (Objective) Career Success [(1) salary; (2) promotion] are adapted from *Alberto Ismael Bejarano Heredia (2007).* The replication format is withal a five-point likert scale ranging from "strongly disagreed" to "strongly agreed".

Surveys were conducted through personal interaction and asked some question regarding with their personality and career which were not found in survey form.

Actions with the subsequent steps were well thought-out by format and management of the survey:

- Crafting and executing the survey with the involvement of researcher, and scholarly critic persons.
- Taking perfection, questions designed uncomplicated, straight, and clear words; in a succinct and striking survey design.
- Design a cover letter elucidation the aim of the research and assuring discretion the participant's information.

After collecting the absolute survey forms, only 200 survey forms preferred for study, these questionnaires data entered into SPSS sheet for the analysis.

DISCUSSION

Personality is a key element of a person. A quote "first impression is the last impression" it's talking about personality and its traits like impression, attitude, behavior and action/reaction. At organizational level, first preference gives your knowledge and experience than you highly priorities by your personality because personality developed by knowledge and experience.

The purpose of this research was to test the impact of personality on subjective and objective career success in health and education sector of Pakistan. Organizational environment and culture construct through the different social elements which inject by the employees personality. Employee's personality has significant elements which lead to him on the success path. Career success had been alienated into two types for best measurements; first type was subjective career success and second was objective career success. All the factors of success (professional and personal life) were included in career success.

The information demonstrates that personality and subjective career success are exceptionally greatly noteworthy and positive relationship. But there were no positive relationship between personality and objective career success.

In present study, personality and career success results influenced by other research factors "person environment fit and job performance". These factors had continuous effect on career success. If organizational environment is suitable or adjustable for a person according to his personality, then it leads to appreciable performance.

The significance and noticeable quality of organizational career planning, arranging and administration as a component of Human Resources Management has been distinguished by numerous researchers *(Baruch, 2003; Hall, 1986; Van Mannen and Schein, 1975; Hasann, 2007).* The positive relationships discovered around organizational structures with career success, organizational structures with subjective career success, and organizational structures with objective career success is predictable with these past investigates.

CONCLUSION

This study illustrates the impact of personality on career success and on other factors. In context of Pakistan society especially in health and education sectors, people have not enough knowledge about their selves. In simple worlds, doctors and educators have not self-awarded. So the results of this study present the knowledge and perception level about personality, career and success. In these sectors, people declared their career success in terms of high earning as compared to their colleagues.

Perceptions about career success in these sectors have linkage to the materialistic approach. Earn more and more money and try to get authority. In education sector, educators enumerated their personal life's relations and activates as success. Personality constructs from different traits and these traits mould according to personal goals and objectives. In health sector

of Pakistan, doctors have mission to just earn money and money. So their personalities are mostly introvert, warm less behavior and modest attitude. Instead of these, educators give importance to their contacts, community occasions and interpersonal affairs.

RECOMMENDATIONS

According to the results of this research, recommendations for individuals to focus on self-awareness because without this, nobody can develop own self. Personality is the part of self-awareness. Self-development leads to success in any discipline and profession. Knowledge and experiences take changes in person's personality.

Personality refers to individual's attitude and behavior regarding his success in any field. Need of reconstruction of the concept of success in our society/country. Recommendations for future research are investigates the elements which construct the individual's personality i-e, education, society factors, family background and etc. And those characters of our society which have highly impact on personality i-e, parents, teachers, friends and etc.

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INVESTIGATING FACTORS AFFECTING EMPLOYEE WORKPLACE DEVIANT BEHAVIOR

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ABSTRACT: The purpose of this research is to investigate the impact of factors like personality factors, job factors, organizational factors, job burnout and work engagement on employee workplace deviant behavior. Moreover, this study also contributes to knowledge in the emerging literature on the subject matter of human resource management, organizational behavior and organizational development. The survey was conducted among three sectors of Pakistan, electronic, textile and sports where 170 questionnaires were distributed to the employees of these sectors. Structural Equation Modeling was used to examine the relationship among variables and to test the model, whereas AHP test was used to find the critical factors associated with this study. The personality factors, organizational factors, job burnout and work engagement are essential factors for the firm because these three factors have extremely vital effect on employee workplace deviant behavior. Personality factors like conscientiousness, trait anger and agreeableness were found to have a significant effect on job burnout. Similarly, personality factors like high level of conscientiousness and low level of trait anger enhance the level of work engagement which ultimately lowers the employee workplace deviant behavior. Organizational factors have significant impact on work engagement while job burnout has significant effect on employee work place deviant behavior. Work engagement impacts employee workplace deviant behavior. This study was limited to only three sectors of Pakistan and further sectors can be considered in order to validate this research in future. The time and resources were also remained the big issues during the research. The findings of this study allow the managers to understand the factors underlying employee workplace deviant behaviors and in this way, managers or organizations.

KEYWORDS: Workplace deviant behavior, Effective behaviors of employee, Employee workplace behavior, divergent behavior at workplace.

INTRODUCTION

The workplace is a platform where a variety of different actions are indicated, each with a different impact on the individuals. These behaviors usually fall within the constructs of the standards of the firm. Organizational standards are a selection of ‘‘expected behaviors, languages, concepts and postulations that allow firms to perform at an appropriate pace”(Coccia, 1998). However, when normal workplace behaviors go outside the standards of the organizations, its repercussions are far-reaching and impact all levels of the organization such as its decision-making procedures, efficiency and economical costs (Coccia, 1998).

Researchers have given these behaviors many different titles such as workplace deviance (Bennett and Johnson, 2003), counterproductive behaviors (Mangione and Quinn, 1975) and anti-social behaviors (Giacolone and Greenberg, 1997). Essentially, actions are considered deviant when an ‘‘organization’s traditions, guidelines, or inner guidelines are breached by an individual or a team that may endanger the well-being of the organization or its citizens’’ (Robinson and Bennett, 1995).

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Counterproductive work behavior is "a collection of deliberate behaviors that harm the organization or its members" (O'Boyle Jr., 2010). Chang and Smithikrai (2010) explain counterproductive work behavior as voluntary or purposeful behaviors that functions against the passions of the organization. Gruys and Sackett (2003) regard these actions/behaviors as the ones which are purposeful on the part of a company member considered by the company as opposed to its genuine passions. Counterproductive work behaviors have been described as deviance (Robinson and Bennett, 1995), anti-social activities (Giacalone, Riordan and Rosenfeld, 1997), unruliness (Hunt, 1996), harmful and dangerous activities (Murphy, 1993) and have been shown to be persistent and expensive both to companies and to employees' well-being (Chang and Smithikrai, 2010).

LITERATURE REVIEW

EMPLOYEE WORKPLACE DEVIANT BEHAVIOR

Ansari et al (2013) suggested that for years, research in industrial/organizational mindset has focused on determining relationships between personal features (e.g., behavior, values, abilities, skills, past encounters, and character traits) and suitable workplace behaviors (e.g., inspiration, pro-social actions, and productivity). While it is essential know the aspects that give rise to a successful working relationship between a person and an organization, it is also essential to understand the aspects that may give rise to unwanted actions, such as deviant work behaviors, also referred to as counterproductive work behavior (Monnastes, 2010).

The significance of discretionary actions (counterproductive work behavior and business citizenship behavior) has improved so high. These are because of many factors. Researchers have shown that the social connections among the workers warranty the company wellness. So, developing healthy connections by reducing workplace deviant behaviors and improving the organizational citizenship actions lead to the organizational wellness (Koys, 2001).

JOB BURNOUT

The idea of "Job Burnout" was first presented by Freudennberger in Nineteen seventies. The experts have offered many different explanations for job burnout. Maslach (1982) described burnout as "a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishments that can happen among individuals who do 'individual work' of some kind". As mentioned in Maslach's (1982) meaning, burnout is an emotional problem made up of emotional fatigue, depersonalization and reduced individual success (reduced efficacy) that can happen among people who perform with individuals in some capacity. Emotional exhaustion represents feelings of being psychologically overextended and drained by a person's contact with other people. Depersonalization represents an unfeeling and uncertain reaction toward these people, who are usually the recipients of one's service or care. Reduced efficacy represents a decrease in a person's emotions of proficiency and successful accomplishment in a person's work with people. This meaning of burnout, which is now being used widely in continuous analysis, was not depending on a theoretical model but was produced empirically (Halbesleben and Buckley, 2004).

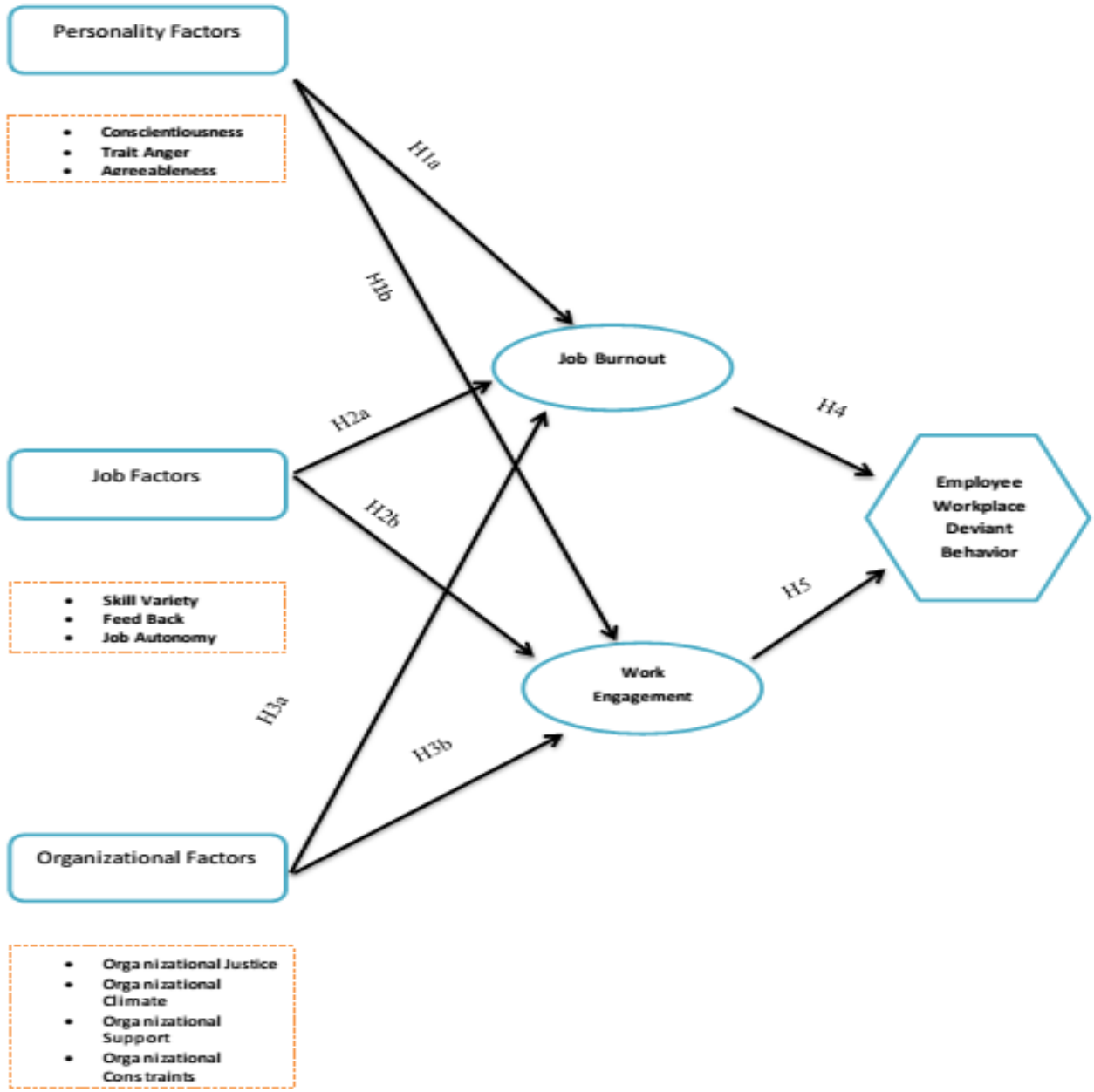
WORK ENGAGEMENT

Kahn (1990) first put forward the idea of "personal engagement". He defined individual participation as "harnessing of organization members' selves to their work roles; in engagement, people employ and assert themselves physically, cognitively, and emotionally during role performance". But to Kahn (1990), individual disengagement is relevant to uncoupling of selves from work roles; in disengagement, people take out and protect themselves actually, cognitively, or psychologically during role performance (Saks, 2006).

PERSONALITY FACTORS

Personal variations such as personality create up the core of much business research, because there are powerful relationships among these variations and company results such as job performance, desire of turnover and job satisfaction. Among these character features, which effect employees' actions, are conscientiousness, trait anger and agreeableness which have been believed by many researchers?

RESEARCH MODEL



HYPOTHESES

H1a: Personality factors are negatively related to employees' job burnout.
H1b: Personality factors are positively related to employees' work engagement

H2a: Job Factors are negatively related to employees' job burnout.
H2b: Job factors are positively related to employees' work engagement

H3a: Organizational factors are negatively related to employees' job burnout.
H3b: Organizational factors are positively related to employees' work engagement.

H4: Job burnout is positively related to employees' workplace deviant behavior.
H5: Work engagement is negatively related to employees' workplace deviant behavior.

RESEARCH DESIGN

The research was conducted on employees of manufacturing sector of Pakistan. Three sectors were taken i.e. textile, electronics and sports. In this study, the analysis on quantitative approach was planned in order to test the hypotheses as well as to increase reliability of data and discussion. A questionnaire was designed based on likert scale so that respondents may respond according to the questions which are given in the questionnaire

A questionnaire comprised of two parts. First part represents the demographics which include gender, age, qualification and job experience type questions. Second part is the main body of questionnaire consisted of likert scale questions which included statements related to respondent's attitude in which respondents were asked to specify their level of agreement on a five point likert scale i.e. 1-strongly disagree, 2- disagree, 3-neutral, 4-agree and 5-strongly agree.

SAMPLING TECHNIQUE AND SIZE

There are two types of sampling techniques which are probability sampling technique and non-probability sampling technique. As all the employees of three sectors are the population of research study, simple random sampling technique is being used. Five major cities were selected for data collection e.g. Faisalabad, Lahore, Sialkot, Karachi and Multan. These cities were selected to get the maximum response from defined population.

The study has done in three major industrial sectors and five cities are selected for data collection. So, the following table shows the distribution of 170 questionnaires in each city by using the simple random sampling technique for data collection.

Self-administered structured close ended questionnaire was designed for data collection. It consisted of questions having predefined parameters to answers. The questionnaire comprise of bipolar questions, multiple choices and five point likert scales. Data was collected by handing over the printed questionnaires to the respondents in each city.

DISCUSSION & FINDINGS

Employee workplace deviant behavior (EWDB) in the organizations has become an important issue upon which managers must have to pay attention. This factor is not only responsible for destroying the organizations but it also spoils employees of organizations. Every year, several cases related to employee's deviant behavior are occurring out of which some are exposed while others are hidden or suppressed by the management of the organizations. Many employees leave or switch their organizations due to unjust behaviors of organizations or their managers. So, there is a need of taking this issue seriously.

The current study has done in order to investigate factors affecting employee workplace deviant behavior in Pakistani scenario. Thus, the ultimate purpose was to create the conceptual framework in which these factors affecting employee workplace deviant behavior. Most of the previous studies have investigated only one factor or dimension of employee workplace deviant behavior especially in case of Pakistan. This study is unique in a way that it carries all the factors i.e. personality factors, job factors, organizational factors, job burnout and work engagement which are affecting employee workplace deviant behavior.

The respective dimensions of each factor have taken and were measured by using various measuring tools. The study suggests that personality factors have significant effect on job burnout and work engagement, while the organizational factors have significant effect on work engagement. Personality factors like conscientiousness, trait anger and agreeableness were found to have a significant effect on job burnout hence supporting the views of Ansari et al, (2013). Similarly, same views were also presented by Mazni Alias et al, (2013) personality factors especially the low conscientiousness and agreeableness increases job burnout. These personality factors as suggested by the Ansariet al, (2013) that high level of conscientiousness and low level of trait anger enhance the level of work engagement which ultimately lowers the employee workplace deviant behavior. Mazni Alias et al, (2013) argued that people, who are high in agreeableness, show less deviant behaviors. Organizational factors (like organizational justice & organizational constraints) have significant impact on work engagement, hence supported the previous studies of Ansari, et al, (2013). This perspective was also highlighted by the work of Vonai Chirasha and Mildred Mahapa (2012) who proposed that organizational factors (like organizational climate & support) are the factors which enable the employees to be engaged more in their work which in turn reduce the deviant behaviors. Job burnout has significant effect on employee work place deviant behavior and hence, supported the hypotheses given by Ansari et al, (2013). Work stress/job burnout as stated by Vonai Chirasha and Mildred Mahapa (2012), affect the behaviors of employees and is the basic reason of developing frustration, intolerance, anger and irritation which in turn lead numerous kinds of misconducts. Current study also revealed that work engagement impacts employee workplace deviant behavior. This finding was backed by the work of Ansariet al, (2013). Employees showing workplace deviant will become

mentally and physically ill, but work engagement as described by Crabtree (2005) would feel employees that their work positively affects their psychological and physical well-being.

CONCLUSION

The objective of this research is to investigate the factors affecting employee workplace deviant behavior. There are five dimensions of employee workplace deviant behavior (personality factors, job factors, organizational factors, job burnout and work engagement). On the basis of this, eight hypotheses were developed that relate each of the employee workplace deviant behavior dimensions. The results showed that personality factors, organizational factors, job burnout and work engagement are essential factors for the firm because these three factors have extremely vital effect on employee workplace deviant behavior. In sector comparison, results of three sectors are slightly different so, the three sectors are having same consideration. In all the sectors, personality factors of employees are the main cause of job burnout or work engagement i.e. if the personality factors increased, job burnout will decrease and work engagement will increase and vice versa. Similarly, job burnout and work engagement have been discovered, are the main factors which are responsible for increasing and decreasing the employee workplace deviant behavior among the employees of the organizations.

LIMITATIONS

One of the limitations for this research is the level of the understanding of the participants and their seriousness towards the questionnaire filling pattern. This study was limited to only three sectors and further sectors can be considered in order to get the good results. The time and resources were also remained the big issues during the research

RECOMMENDATIONS

For further study, it is recommended that compare the two different sectors like Banks, hospitals or insurance because the level of employee workplace deviant behavior is also there. Or can compare the service sector with the manufacturing.

Furthermore data collection technique should be redesigned. Another option is the cross-cultural analysis within the one country like among large cities and small cities or rural vs. urban etc.

Identify more dimensions of employee workplace deviant behavior. Moreover, this work can be under further research on the basis of demographics

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MERGER AND ACQUISITION of PEPSI Co ON THE BASIS OF FINANCIAL ANALYSIS

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ABSTRACT: *Purpose:* The basic purpose of this research is to demonstrate financial position of Pepsi Company with beverages and food industry that how companies amount their financial magnitudes and utilize these financial steps to recognize organization's change associated situations.
Design/ Methodology: The detailed analysis strategy is utilized to better understand the organization. In this study analysts created that how organization's operations and position is effected by the incredible financial destruction in general world's economy. Primary and secondary data are used for that ratio analysis Also they examined that how they are attempting to make due in businesses to hold their heading position.
Findings: After the ratio analysis researcher found that company is in good position in his beverage and food industry or leading company with high sale growth, No doubt company affected by the worse economic situation but still follows the top level strategies in their operations and sustains their position.

KEYWORDS: Financial ratio analysis, merger & acquisition, Beverages industry, performance measurement.

INTRODUCTION

PepsiCo is one of the leading companies in providing food plus drinks products. It subsidizes in 200 countries and its brands comprises of Frito-Lay North America, PepsiCo Beverages North America, PepsiCo International and Quaker Foods North America. PepsiCo was established in 1965 through the union of Pepsi cola as well as Frito Lay. The company is leading by denoting world with proper foods. It deals with different variety a food preferences and also healthy partialities. . On the basis of revenue PepsiCo is graded as the second major business of food & beverages However in North America, it is first largest business on the basis of net revenue.

It serves as a company due to its justified benefit. It consists of extensively well-known brands, pioneering products, and dominant market services. (financial-management-project-pepsi-financial-ratios, 2014)

PEPSICO SEGMENT ANALYSIS

Pepsi segments its market on the basis of demographically assuming age, family size and income. The company has identified six main segments, which are Frito-Lay North America (FLNA), (25.5% of total revenue Quaker Foods North America (QFNA), (5.02% of total revenue) Latin America Foods (LAF), (10.6% of total revenue), PepsiCo Americas Beverages (PAB) (35.06% of total revenue), Europe, (15.54% of total revenue) and Asia, Middle East & Africa (AMEA) (9.28% of total revenue). Its competitor is Coca cola. Almost 1 billion sales were generated in 2012, which generated net incomes of $43.3 billion. (The pepsi Store, 2010)

The major reason of expansion of PepsiCo is merger and acquisition. In 1997its business diverse due to many large-scale acquirements, so PepsiCo initiated to spread the processes elsewhere it includes the business of soft drinks and snack foods. In 1998, PepsiCo made another acquisition with orange juice company. In 2001 it merged with another company named as Quaker Oats. In August 2009, in order to purchase the two largest bottlers of its products PepsiCo made a $7 billion

proposal in North America: Pepsi Bottling Group and PepsiAmericas. The acquisition was accomplished in 2010. Which result the formation of an innovative wholly preserved subsidiary named as *PepsiCo Beverages Company.* (pepsiCo-completes-transformative-botteling-acquisitions, 2012) .During 2011, main worldwide acquisition was established by acquiring bulk stake in Wimm-Bill-Dan Foods, which is a Russian company of food that products juices, fruits, milk and such kind of products. In October 2011, it became the world's greatest food and Beverages Company by purchasing rest of 23% stake of that Russian food company.

INDUSTRY ANALYSIS

The industry in which PepsiCo exist is the industry of food and beverages. This industry comprises of considering rare food resources, wrapping and packing, and also allocating them. Its business consists of different varieties of food along with intoxicating and non-alcoholic drinks. Beverages industry comprises of all the food soft drinks business. But its main competitor in that industry is Coca-Cola. It was started by a pharmacist Dr. John S Pemberton in 1886, in Atlanta, Georgia, Coca-Cola is the world's primary producer, dealer as well as supplier of non-distilled beverages distillates and sauces. It contains 500 brands mostly. It operates in almost 200 countries but main region is in USA.

When we compare PepsiCo and Coca-Cola, it is seen that in 2005, PepsiCo exceeded from The Coca-Cola for the first time in many years and that's why competition started between both companies. In 2009, In U.S, Coca-Cola Company earned greater market shares by the sale of soft drinks.. In similar year, PepsiCo preserved much shares of whole U.S beverages industry higher share of the U.S. refreshment beverage market, but with some changings in product categories of both companies. In 1990s and 2000s, PepsiCo made much more partnerships, so it made its business of mainly beverages, snacks and foods. In 2009, different brands of PepsiCo like Quaker Oats, Frito-Lay earned many U.S market shares in snack food sales. These shares were almost 39% of whole snack food market. In snack food market main competitor of PepsiCo is Kraft Foods which preserved 11% market shares at that time. Many other competitors are RC Cola, Turk Kola, Real Inca Kola and Zam Zam Cola etc. Others may be Evoca Cola and Afri Cola. 19% return of PepsiCo made it to defeat Coca-Cola from 9%. (pepsi-Cola Brands, 2010)

Recently it is confirmed that in many regions like restaurant chain Buffalo Wild Wings has moved beverage contractors from Coca-Cola to Pepsi, which is positive and create high demand of Pepsi. Moreover, PepsiCo's benefits bonds through the National Football League and Major League Baseball. Coca-Cola has three sections of its incomes .For PepsiCo; it's only a sector of its incomes. More income of PepsiCo's is earned from snacks and foods, and different brands like Quaker, Frito-Lay and Cheetos etc. According to author, the transformation happening in the product mix is the real reason of PepsiCo success and that's why in 2013, it has beaten Coca-Cola. Some financial results of PepsiCo and Coca-Cola are shown below. The amount is in $.

		Coca-Cola		**PepsiCo**
Market Cap		173 Billion		125 Billion
Sales		47 Billion		66 Billion
Net Profit Margin		18.5%		10.1%
ROE		26.7%		30.5%
Net Income		8.7 Billion		6.7 Billion

Coca-Cola, temporarily, is in a harder situation and the reasons are just dependability on different flavored beverages. According to Cortes. "Customers are progressively turning away from sentimental beverages, moreover, enlarged government instructions on how to sell soda drinks. On the apparent side, both companies look as similar given that they both are appreciated at about 17 times their future anticipated incomes.

PEPSI FINANCIAL RATIO ANALYSIS

Financial ratio analyses for Pepsi Company are as follows. PepsiCo Inc.'s current ratio improved from 2011 to 2012 and from 2012 to 2013 but it is decrease from 2009.In the same way quick ratio shows that Pepsi hold more inventory than industry and its time series analysis shows that this ratio slightly fluctuate from 2009 to 2013.The current and quick ratios are not sustained of Pepsi. Current ratio of Pepsi company is relatively stable .quick ratio of Pepsi is also not stable and have declining trend in 2011 but it is much better than industry.

Year	Current ratio	Quick ratio	Debt-to-Equity ratio	Debt-to-capital ratio	*Interest Coverage ratio*	*Inventory Turnover* ratio	payable turnover ratio	working capital turnover	Gross profit margin	Net Profit Margin	Return on Assets	Return on Equity
2009	1.44	1.00	0.47	0.32	21.35	7.68	6.98	11.33	53.51	13.75	14.92	35.86
2010	1.11	0.80	1.18	0.54	10.12	7.88	6.88	34.49	54.05	10.93	9.27	29.86
2011	0.96	0.62	1.30	0.57	11.32	8.26	7.74	0	52.49	9.69	8.84	31.29
2012	1.10	0.80	1.27	0.56	10.24	8.74	7.03	40.15	52.22	9.43	8.28	27.71
2013	1.14	0.93	1.22	0.55	10.76	9.16	6.41	15.22	52.96	10.15	8.70	27.76

(Source: Annual Report of PepsiCo 2012-2013) (Inc, 2014)

Pepsi Company's debt equity ratio enhanced through 2009 to 2013. This implies, relative to the industry, the Pepsi Company takes a less destructive method to finance its growth with its debt, reducing its risk as a company similarly debt to capital ratio improved through 2009 to 2013.pepsico Inc. interest coverage ratio declined from 2009 to 2010 but enhanced from 2012 to 2013. Inventory turnover ratio of Pepsi is much greater in comparison with industry. Payable turnover is same to some extent of both PepsiCo and industry. But the working capital turnover of Pepsi is declining every year which shows that working capital turnover of Industry is greater than Pepsi. PepsiCo Inc.'s gross profit margin declined from 2011 to 2012 but then enhanced from 2012 to 2013 beyond 2011 level. Similarly case with net profit margin that shows company has higher level of earnings. Return on assets this ratio shows that Pepsi has ability to use their assets efficiently to produce more revenue. The Pepsi's return on equity ratio slightly decreased from 2009 to 2013 but it is higher than industry. It showing that profits are using to make the money the actual shareholders have invested.

2013 Ratio Analysis of industry

Ratios	Pepsi	Industry
Current ratio	1.14	1.11
Quick ratio	0.93	0.76
Debt to Equity	1.22	0.99
Debt to capital	0.55	0.50
Interest coverage	10.76	14.40
Inventory Turnover	9.16	6.79
R/A Turnover	9.55	12.70
P/A Turnover	6.41	6.69
Working capital	15.22	23.12
Gross profit	52.96	50.22
Net Profit	10.15	8.60
Return on Assets	8.70	6.29
Return on equity	27.76	20.00

(Source: Annual Report of PepsiCo 2012-2013) (Inc, 2014)

There are several reasons to contemplate when defining whether a stock is a good investment, not just whether the free cash flows are positive. In 2009 the Pepsi Company acquires two largest bottler in North America. And in 2011 it makes its largest acquisition. Due to this Pepsi increase its assets and its liquidity ratio increase. And due to this its inventory turnover ratio also increase because it had not hold inventory for long time period .Pepsi invest in different projects and earn profit. But due to this acquisition it faces many problems it go far away from its core business due to this investors believe become low and the profitability ratio some extent affected. And gross profit margin become low as industry. But according the ratio analysis of industry of 2013 you can see that Pepsi's ratios greater than industry ratios Company's performing well in 2013 as compared to all previous years and overall it is efficiently succeeded in the industry and most of the performance measuring ratios are better than industry which can be easily understand by the following graphic representation of the Pepsi & Industry average.

SHORT TERM LIQUIDITY MANAGEMENT

The beverage and food industry averages a current ratio of 1.11 and a quick ratio of 0.76, so Pepsi's current ratio is 1.14 and quick ratio is 0.93, the observation after combined the both ratios are lead to the conclusion that Pepsi is in a solid short-term liquidity position. Although this favorable solid position is important for owners it may become is the important for debt investors.

In case of Pepsi, many solid improvements have to be seen in its liquidity position since 2011 to2013. But a large increase which is shown is in other current assets. The other current assets

increased 46% percent in 2013 Several improvement in short term liquidity is the result to reductions in and income tax pay able and short term obligations slightly reduced total current liabilities. .Pepsi in 2013 also increases the sales revenue because its cost of sales become low and the result due to increase in sale revenue the operating profit also increase throughout the period But its selling expense and net income remain same. This increase in sales revenue and operating profit shows its management efficiency.

	2009	2010	2011	2012	2013	2010%	2011%	2012%	2013%
Assets									
Cash &cash equivalents	3943	5943	4067	6297	2375	50.72%	-31.56%	54.83%	-62.3%
short term investments	192	426	358	322	303	121.8%	-15.96%	-10.1%	-5.9%
Account Receivable	4624	6323	6912	7041	6954	36.740%	9.315%	1.866%	-1.23%
Inventories	2618	3372	3827	3581	3409	28.800%	13.49%	-6.42%	-4.81%
Other current assets	1194	1505	2277	1479	2162	26.046%	51.295%	-35.04%	46.18%
Total Current Assets	12571	17569	17441	18720	22203	39.75%	-0.72%	7.333%	18.61%
Liabilities									
Short term obligation	464	4898	6205	4815	5306	955.6%	26.68%	-22.41%	10.10%
Accounts payable	8127	10923	11757	11903	12533	34.404%	7.635%	1.242%	5.293%
Income taxes payable	165	197	192	371		19.39%	-2.54%	93.23%	-100
Total Current liabilities	8756	15892	18154	17089	17839	81.498%	14.23358	-5.866%	4.388%
Liquidity ratios									
Current ratio						1.11	0.96	1.10	1.14
Quick ratio						0.80	0.60	0.80	0.93

(PepsiCo, Stock analysis, 2014) Beverages and food industry ratios.

CAPITAL STRUCTURE &DEBT MANAGEMENT

There is a substantial change in Pepsi's capital structure over the last several years. The amount of Pepsi's long term debt increased since 2009 to 2013.but since 2012 to 2013 the percentage to increase the amount of long term debt go down by 4% from 2012 to 2013, while short term obligations increases in 2012 to 2013 more than 10%. the retained earnings of Pepsi improved through 2009 to 2013, this increasing trend in debt while retained earnings also increased shows that company uses more debt for to meet their expense or to improve the short term liquidity position of the firm, and might be possible their earnings are to be saved for some future projects which making the firm more risky. Debt to equity ratio of Pepsi is decrease from 2012 to 2013 which is a good indication for creditors. Some of the decrease in long term debt from 2012 to 2013 is due to increase in use of short-term debt 10%.

However, we watched prior that trade offsets expanded essentially in for spendable dough the same time period, showing that a percentage of the fleeting financing was utilized in this way, the liquidity position of Pepsi is expansion throughout the time of 2012 to 2013.

On the off chance that supports are required past which are accessible inside, pepsi ought to turn to the value market, which is by and large recognized to be good right now.

Pepsi's Debt/Equity ratio is 1.22, which is higher than the industry average of 0.99, So, pepsi has not just expanded its influence; it has expanded its power well over the business normal influence proportion. Notwithstanding, the deviation from the business normal influence degree ought to be nearly analyzed as, on normal, different firms in comparative business circumstances see the proper harmony between the duty safe house profit and trouble costs at much lower levels of power.

Year	2009	2010	2011	2012	2013	2010%	2011%	2012%	2013%
Short term obligation	464	4,898	6,205	4,815	5,306	955.6034	26.68436	-22.40	10.1973
Long term debt	7,400	19,999	20,568	23,544	24,333	170.2568	2.845142	14.46908	3.351172
R/E	33,805	37,090	40,316	43,158	46,420	9.717497	8.697762	7.04931	7.558274
Debt to capital ratio						0.54	0.57	0.56	0.55
Debt to equity						1.18	1.30	1.27	1.22
Interest coverage ratio						10.12	11.32	10.24	10.76

(Source: Annual Report of PepsiCo, 2012-2013) (Inc, 2014)

DUPONT ANALYSIS

For PepsiCo and the beverages industry DuPont analysis is shown in table below. There is much similarity between DuPont analysis and analyzing ratios.

	Pepsi	Industry
Return on Equity (ROE)	30.5%	26.7%
=	=	=
Net Profit Margin(NPM)	10.1%	18.5%
X	X	X
Total Asset Turnover (TAT)	0.86	0.73
X	X	X
Assets/Equity (A/E)	3.52	2.00
ROA	8.686	13.505
=	=	=
NPM(Net Profit Margin)	10.1%	18.5%
X	X	X
Total Asset Turnover	0.86	0.73

- **ROE = NPM * TAT * A/E**
- **ROA= NPM*TAT**

Return on the shareholders' equity of PepsiCo is greater than the industry.

The constituents of the ratios show that PepsiCo's net profit margin ratio is lower than the industry. PepsiCo has benefit in its (Assets to Equity of **3.52%** in comparison with **2.00%** which is of industry). Moreover assets ratio of PepsiCo is also greater than industry. (Total Asset Turnover of **0.86%** compared to **0.73%**), so return on equity is greater, the reason is its greater net profit margin.

Probably high leverage ratio shows lower net profit margin because of some facts as to pay interest and debt that made leverage ratio high. But PepsiCo has a different situation as many operational efficiencies like total asset turnover is greater than the industry overall ROE is high than industry. ROA of PepsiCo is lower than the industry which shows that the investment of PepsiCo is less as compared to industry. For DuPont analysis there is shown comparison of PepsiCo and beverages industry, In order to improve profit margins, PepsiCo requires to enhance manufacture effectiveness and cost relevant efficiencies. In this way it can generate more benefits and success than its competitor.

SUMMARY AND CONCLUSION

In This paper more focus on financial ratio analysis of Pepsi Company which have shown more complex for us because they do not fall in single company but we

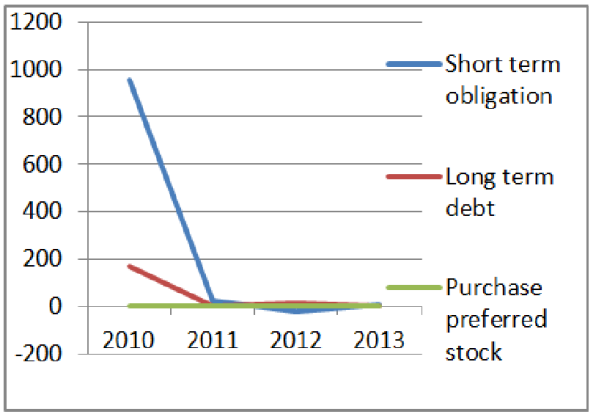
Also compare it and make analysis of beverages and food industry where Pepsi Company lies. The variances in the industry features of the industry obscure the financial ratio analysis of Pepsi. Though, a more applicable description of the operating characteristics of Pepsi is achieved by increasing the density of the analysis, that is, by comparing Pepsi to the industry.

SUGGESTIONS AND RECOMMENDATIONS

The primary proposal that I might make to PepsiCo is that they ought to center all the more on making items that could be viewed as solid options to their clients. PepsiCo can go about this in two ways: 1. making new brands that give solid snacks or refreshments, and 2. making their current items more solid. By and large, this center will give PepsiCo an edge in an environment where less than great snacks and refreshments are beginning to get less and less gainful consistently.

The second suggestion I might have for PepsiCo might be to grow their center out of the US and into remote markets. Remote shoppers, particularly ones in creating nations, are searching for approaches to enhance their lives. The interest is there for American brands and items. By stretching their center, PepsiCo might not be so vulnerable to market vacillations in the US. This will make PepsiCo a stronger organization and provide for them considerably a greater amount of an edge general. At last, PepsiCo is an extraordinary organization. They have made due for almost one hundred years by listening to purchasers and giving items that they need. As long as they can keep up this method, they are prone to be an effective organization for a long time to come.

GRAPHIC REPRESENTATION OF RATIOS



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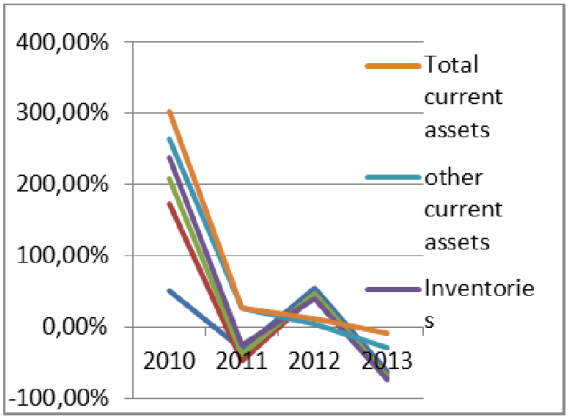

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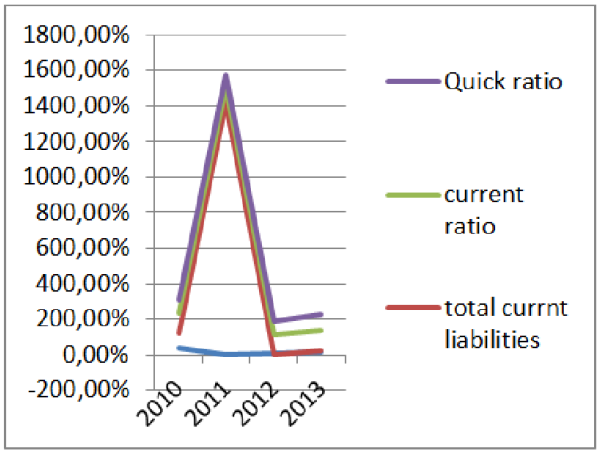

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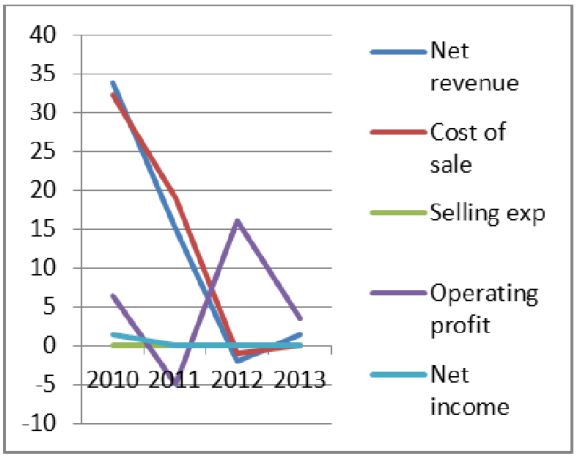

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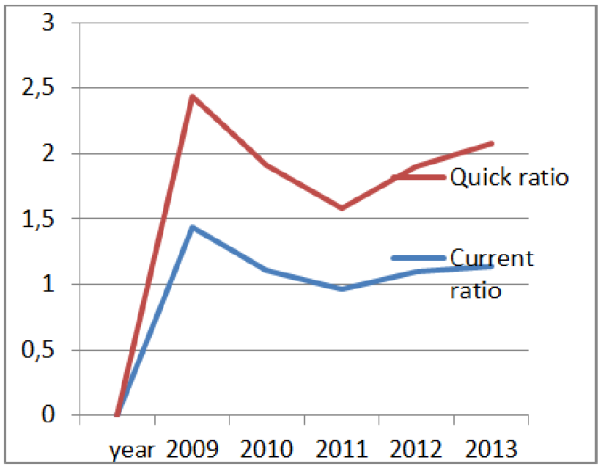
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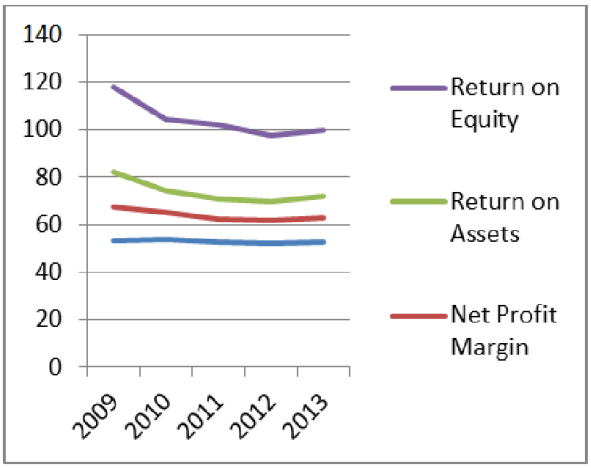
year 2009 2010 2011 2012 2013
Quick ratio
Current ratio

(e)


140
120
100
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60
40
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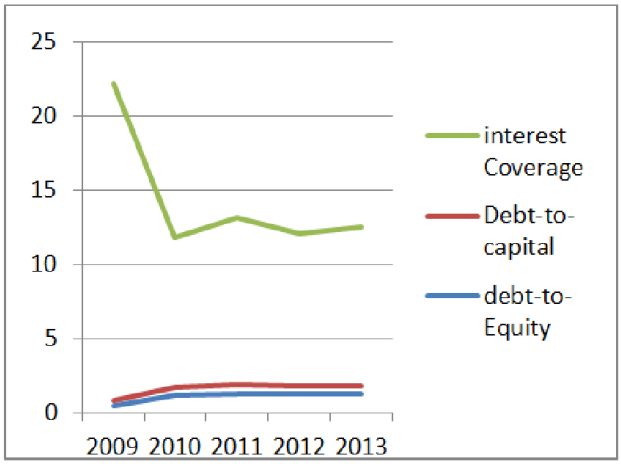
0
2009 2010 2011 2012 2013
Return on Equity
Return on Assets
Net Profit Margin

(f)


25
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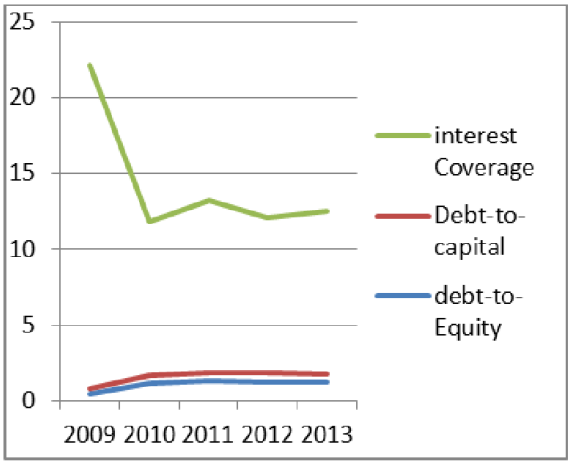
2009 2010 2011 2012 2013
interest Coverage
Debt-to-capital
debt-to-Equity

(g)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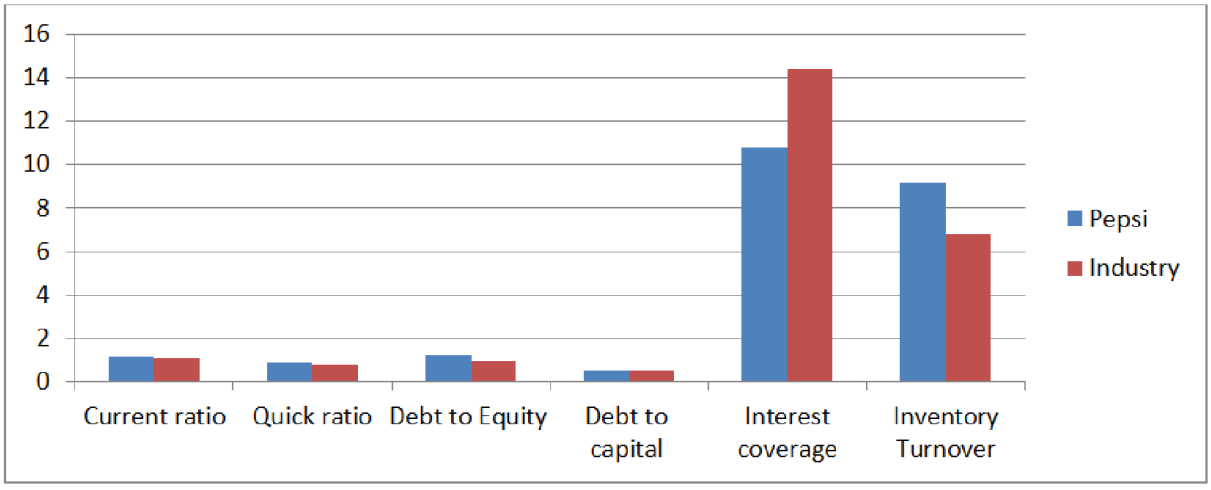
16
14
12
10
8
6
4
2
0
Current ratio
Quick ratio
Debt to Equity
Debt to capital
Interest coverage
Inventory Turnover
Pepsi
Industry

(h)

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A double–hurdle model for innovative performance: the role of university-industry collaborations

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ABSTRACT: In the last few decades, university-industry collaborations have attracted considerable attention. A large body of literature has pointed to the importance of scientific research for technological change, innovation and economic performance. This paper identifies the effect of collaborations with public research organizations on firms' innovative performance. Using the French Community Innovation Survey, we present evidence that collaborating with universities and other public research organizations increases firm's innovative performance.

KEYWORDS: Innovation, public research organizations, double-hurdle model, French Community Survey.

1 INTRODUCTION

In the last few decades, the link between collaborations with public research organizations (PROs) and innovative performance has been well documented. Universities are no longer simply considered as ivory towers that perform research for the own sake of knowledge, but as real actors in the knowledge-based economy [1]. In addition to their traditional roles (i.e. education and research), universities are now playing a third role which is the diffusion of knowledge and techniques that may contribute to industrial innovation [2].

Many empirical studies find support for the idea that interactions with PROs positively influence firms' innovative performance. For instance, cooperation with universities is shown to be positively associated with innovative sales in Netherlands, Germany and Sweden [3], [4], [5]. In contrast, Meda and *al*. [6] and Eom and Lee [7] found that collaboration with PROs does not yield benefits in Italy and Korea, respectively. In France, few studies have evaluated the effect of collaborations with public research organizations on innovative performance [8]. Consequently, empirical evidence is yet to be found confirming whether collaborations with PROS could significantly improve firms' innovative performance.

France is the second most important country in the European Union (EU) with regards to gross domestic expenditure on research and development (R&D)[9]. However, the percentage of higher education expenditure on R&D financed by industry is among the lowest rates in the EU: 2,57 percent in France against 6,57 in the EU in 2011[10]. France is considered as an innovation follower because of its low ability to transform innovation inputs into innovation outputs [11]. Since 1983, companies that pursue innovation activities are granted a tax cut to encourage them to innovate. This is relatively late compared to countries such as Canada and United States where this measure was applied since 1960 and 1979, respectively. Still, firms can be offered a research tax credit if they engage in R&D activities which is very important especially for small and medium enterprises and very small enterprises.

In order to improve its innovation efforts, a number of actions have been taken. For instance, an evaluation agency of research and higher education (AERES) was implemented in 2007 whose aim is to make the French academic system closer to international standards. Moreover, several clusters were created in different regions so that universities and public research

organizations can easily collaborate with firms in strategic sectors. Many technology Transfer Offices were also created within and outside campuses.

Our paper contributes to this growing empirical literature. We examine the relationship between knowledge emanating from PROs through formal collaborations and firms' innovative performance in France. We distinguish between collaborations with universities or establishments of higher education and those with public or non-profit research organizations. Our paper also achieves some methodological improvement since we propose to use a double hurdle model [12]. Our main result suggests that collaborations with PROs have a recent positive effect on firm's innovative intensity.

The remainder of the paper is organized as follows. Section 2 introduces our data and shows the main descriptive statistics. It is followed by the econometric modeling and the results in section 3. Finally, our conclusions are presented in section 4. An appendix is presented in section 5.

2 INNOVATIVE PERFORMANCE AND UNIVERSITY-INDUSTRY RELATIONSHIPS

2.1 DATA AND VARIABLES

The data used are taken from the fifth French Community Innovation Survey (CIS 2006). It was undertaken in 2007, covers the period 2004-2006 and collects information on the innovative behavior of manufacturing firms with more than 19 employees. To consider the impact of academic partnerships on innovative performance across time, we also use the previous survey (CIS 4) which was undertaken in 2005 and covers the period 2002-2004.The surveys had 7009 and 4900 participating firms in 2005 and 2007, respectively.

The CIS questionnaire contains some filtering questions which creates selection problems. Firms are first asked some general questions such as their turnover, their industry, their size, their export activity and whether they are part of a group. Then, they answer questions that determine if they are innovators. The following questions relate mainly to innovating firms, which describe in more details their innovative activities. Non innovating firms have only to answer questions about obstacles to innovation and intellectual property rights.

Theoretical foundations of academic interactions with firms are well defined. Innovation is the result of a process that requires a variety of resources which can be brought through collaboration with science ([13], [14]). The Triple Helix model also emphasized the role of university-industry interactions in improving the commercialization of knowledge [15]. CIS provides information on firms' interactions in their innovative activities; including links with PROs. Firms are first asked whether they have cooperated with partners for innovation. If yes, they then have to specify with whom they have collaborate.

The main input of innovation is R&D activity. The survey provides information about R&D intensity measured as the amount spent on R&D in euro on total sales. Two types of R&D intensity are considered: internal R&D, defined as investment in in-house R&D, and external R&D which is bought-in from outside the firm. Prior knowledge enables firms to increase their absorptive capacity so that they can identify opportunities for successful innovations [16]. We include another variable of investment in R&D which is whether the firm is continuously doing R&D activities.

Other explanatory variables are chosen on the basis of previous empirical literature. The survey gives information about the demand pull and technology push hypotheses. The first approach, which is attributed to Schmookler, implies that innovation is a function of the market demand [17]. Firms innovate to meet the unsatisfied needs of consumers. In order to control for this feature, a binary variable is used describing if the firm aimed to break into new markets and/or to increase its market share. We also consider a binary variable which identify firms who faced obstacles linked to the market[1] that have hampered their innovation activities. In contrast to the demand pull approach, the technology push view, which is ascribed to Schumpeter, supports the idea that innovation is driven by research and technological capabilities [18]. Making commercial use of new knowledge is here the main objective no matter if a demand already exists or not. We capture the technological opportunity using 11 industry dummies whose description is presented in Appendix A. We rely on previous academic

[1] *Firms were asked whether they faced obstacles to innovation such as competition and uncertainty of demand.*

evidence to separate between high-tech industries (Vehicles, Chemicals, Electric and Machinery) and low-tech industries (Food, Textile, Wood, Plastic-rubber, Non-metallic, Metallic and NEC[2]) [19].

Obstacles to innovation are important factors that may affect innovation performance, especially the cost of innovation [20]. We use a dummy variable which explains whether the cost of innovation hindered firms' activities of innovation. We expect that the cost of innovation will have a negative effect on the extent to which sales are generated from innovation.

Another Schumpeterian hypothesis argues that competition between firms drives innovation [18]. Firms operating in foreign markets may be more exposed to competition which may affect their innovation activities [21]. Aschhloff and Schmidt [4] point out that international competition could encourage firms to improve product quality and to create more new products. They also consider that exporters have access to a larger market to sell their products than non-exporters. Therefore, we include a binary variable which identify whether a firm exports or not.

A last hypothesis, also developed by Schumpeter, argues that large firms have the resources that enable them to address the risks associated with innovation activities [18]. Thus, we control for firm's size measured as the logarithm of the number of employees. Finally, previous studies found that the exchange of knowledge between firms which are part of the same internal network may enhance innovation [22], [23]. We use a binary variable coded 1 if the firm belongs to a company group and coded 0 if it does not.

2.2 INNOVATIVE PERFORMANCE

The survey first asks firms whether they have introduced at least one product innovation. It distinguishes between products that are only new to the firm and those that are new to the market. The former can be considered as a simple imitation of products that are already available in the market, whereas the latter are true innovations. Then, CIS asks innovative firms to estimate the percent of turnover related to the introduction of new products, which can be considered as a measure of innovative performance. We choose to restrict our analysis to the share of sales related to products that are new to the market.

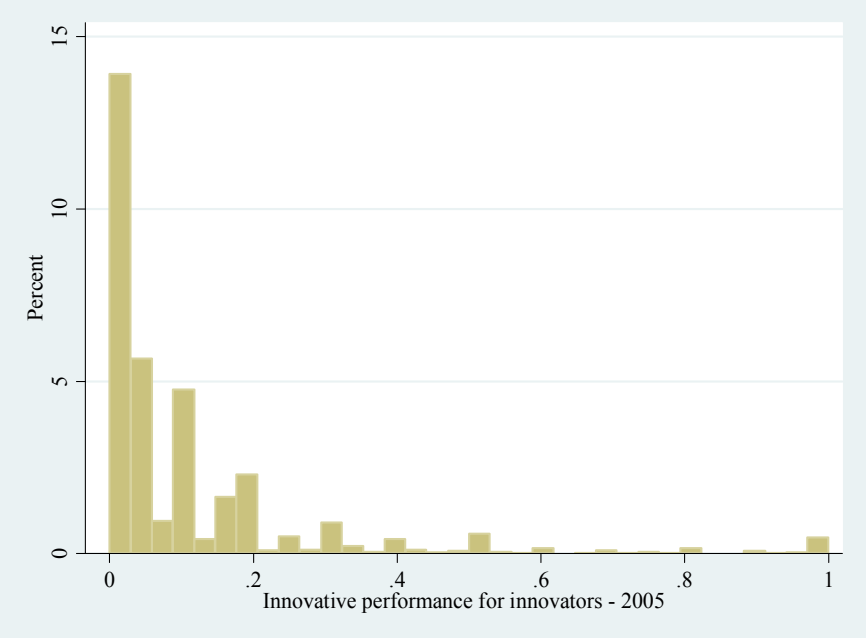

Figure 1: Innovative performance for innovators - 2005

[2] *Not Elsewhere Classified.*

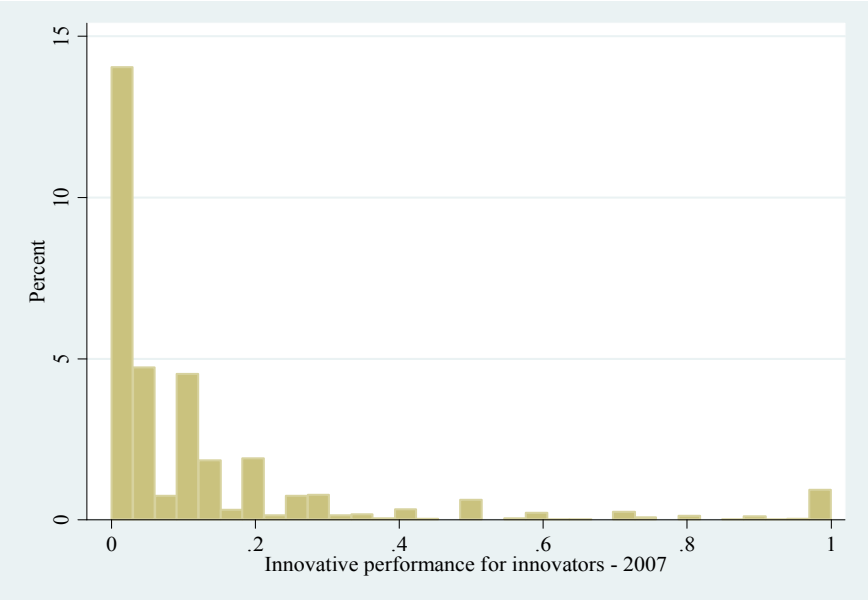

Figure 2: Innovative performance for innovators - 2007

A quick overview of Fig. 1 and 2 above provides interesting insights of the distribution of innovative performance for both surveys. The majority of innovative firms have an innovation intensity which is below 20%. About 30 % percent of these firms report a zero innovative intensity even if they introduced a new product into markets. Also, for some firms, their total turnover comes from sales of products new to market.

2.3 COLLABORATING VS. NON-COLLABORATING FIRMS

Tab.1 thereafter gives the mean of the variables used in our analysis, separately for firms who cooperate with academia and those that do not[3]. The former seem to have a higher innovative performance than the later. Internal R&D investment of collaborating firms is twice that of non-collaborating firms in 2007, whereas the difference is not significant in 2005. The link is almost the same for external R&D, however it is only significant in 2005. Furthermore, firms having partnerships with PROs are more likely to have continuous investment on R&D activities than those that do not. Noticeably, firms who engage in academic partnerships have a higher average size, most often belong to a group and are nearly all export-oriented. Moreover, most collaborating firms want to increase their market share or to break into new markets but they are more likely to face barriers to innovation. Finally, it appears that there are some differences between collaborating and non-collaborating firms with regard to technological opportunity. Collaborating firms are more likely to operate in Chemical and Electric industries while non-collaborating firms are more likely to be in Wood, Textile or Food industries.

Overall, this statistical analysis shows that there is a difference between collaborating and non-collaborating firms, especially with regard to innovative performance which is larger for the former. This effect appears to be statistically significant in the two surveys and this is the hypothesis that is examined in the following econometric analysis.

[3] *At this stage, we still do not separate between the two types of academic collaborations previously mentioned.*

Table 1: A comparison between collaborating and non-collaborating firms

	2005			2007		
Variables	**Collaborating firms (N=168)**	**Non-collaborating firms (N=2673)**	**Significance**	**Collaborating firms (N=570)**	**Non - collaborating firms(N=1602)**	**Significance**
Innovative performance	0.146	0.108	***	0.144	0.120	**
Internal R&D	0.073	0.054	ns	0.040	0.021	***
External R&D	0.020	0.003	***	0.005	0.003	ns
Continuous R&D	0.952	0.621	***	0.868	0.638	***
Increasing market share	0.964	0.924	*	0.921	0.873	***
Market obstacles	0.935	0.850	***	0.877	0.785	***
Cost of innovation	0.911	0.825	***	0.877	0.767	***
Firm's size	6.679	4.898	***	5.952	5.081	***
Belonging to a group	0.935	0.734	***	0.865	0.712	***
Exporting	1.000	0.854	***	0.939	0.851	***
Vehicles	0.119	0,086	ns	0,082	0,101	ns
Chemicals	0,232	0,104	***	0,189	0,093	***
Electric	0,274	0,145	***	0,198	0,164	*
Machinery	0,107	0,098	ns	0,118	0,092	*
Food	0,054	0,165	***	0,111	0,144	*
Textile	0,006	0,077	***	0,042	0,074	***
Wood	0.030	0.080	**	0.044	0.082	***
Plastic Rubber	0.065	0.061	ns	0.049	0.071	*
Non-metallic	0.018	0.045	*	0.042	0.050	ns
Basic metal	0.083	0.094	ns	0.104	0.087	ns
NEC	0.012	0.046	*	0.021	0.043	**

***, ** and * represent 1%, 5% and 10% levels of significance, respectively ns : non significant

3 MODELING INNOVATIVE PERFORMANCE

Because only firms that have introduced a new product have to complete the question about innovative performance, CIS data can be subject to a selection problem**.** It is also likely that the decision to innovate and innovative performance may be explained by different independent variables. To take account of these two features, most studies use a Heckman selectivity model consisting of two equations where the first is a probit equation which indicates if a firm innovates or not, and the second equation explains the extent of innovative performance [24]. Using CIS data for France, Robin and Schubert [8] estimated a Heckit model (see [25]) which is an extension of the Heckman model that allows some explanatory variables to be endogenous. In fact, they consider that collaborations are endogenous independent variables since collaboration variables and innovative performance may be determined by the same unobserved variables. While they focus on the potential endogeneity of academic collaborations, it seems that their model does not fully takes into account the selection problem[4]. Indeed, the authors include some independent variables in the probit part of their model (the decision to innovate) which are not observed for all firms, namely, collaborations with non-academic partners and an indicator of openness (which indicates if an external source of knowledge is used). Our paper builds upon this recent work but differs from it in different respects.

First of all, using the Heckman model requires that innovative performance must be positive for all innovating firms. Still, the distribution of innovative performance reported in Fig. 1 and 2 shows opposite conclusion. In fact, even after controlling the innovating activity, some zero innovative intensity is still likely. Indeed, about 30% of the innovating firms in 2005 and 2007 report zero innovative intensity. This leads us to consider a double hurdle model, where a positive dependent variable

[4] Robin et Schubert include some independent variables in the probit part of their model (the decision to innovate) which are not observed for all firms, namely, collaborations with non-academic partners and an indicator of openness (which indicates if an external source of knowledge is used).

is observed if two hurdles are crossed [12]. The first hurdle is related to the decision to innovate and the second hurdle is to have an innovation intensity larger than zero. The double hurdle model can be represented by the following functions [26]:

$$y_i = \begin{cases} y_i^* \ if \quad y_i^* > 0 \ \ and \ \ D_i > 0 \\ 0 \ \ otherwise \end{cases} \tag{1}$$

where the latent dependent variable is described by the regression equation:

$$y_i^* = x_i^* \beta + e_i \tag{2}$$

with, $e_i \sim N(0, \sigma_e^2)$, and D_i is a latent variable describing the decision to innovate:

$$D_i = z_i \theta + w_i \tag{3}$$

with $w_i \sim N(0,1)$.

The equation of the decision to innovate only contains explanatory variables observed for all firms, irrespective of whether they are innovators.

Thus, under the assumption of the independence between the two stochastic errors, the likelihood function of the double hurdle model is:

$$\ln L = \sum_0 \ln\left(1 - \Phi\left(x_i . \frac{\beta}{\sigma_e}\right)\Phi(z_i . \theta)\right) + \sum_1 \left(-\ln \sigma_e + \log \varphi(\frac{y_i - x_i . \beta}{\sigma_e}) + \ln \Phi(z_i . \theta)\right) \tag{4}$$

where $\Phi(.)$ and $\varphi(.)$ are the standard normal cumulative and density functions respectively. The Stata program used to estimate the model described in this paper is presented in Appendix B.

Moreover, most studies do not control for the possible endogeneity of collaboration in the innovative performance equation [5], [7], [20], [27]. In addition, no endogeneity could be found in studies that have tested the potential endogenous character of collaborations [4], [28]. Because our purpose is to carry out a model that best suits the data, testing endogeneity is left to other future studies.

Finally, although the literature does not specify whether to use exclusion restrictions in double hurdle models, many empirical analyses include them. This restriction means that a variable should appear among the explanatory variables of the decision equation without being included in the explanatory variables of the outcome equation. As an exclusion variable, we use the variable representing obstacles to innovation which are linked to the market.

Tab.2 below shows the results for the two surveys. We distinguish in the outcome equation between exports to European markets and exports to other international markets. The machinery industry serves as the reference category. For each survey, we examine three models: the first only takes account of collaborations with universities or establishment of higher education, the second only introduces collaborations with public or non-profit research organizations and the third model includes all cooperation variables (including cooperation with non-academic institutions[5]). The first part of each model presents the decision equation of the double hurdle model (columns 1, 3, 5, 7, 9 and 11) while the second column is the outcome equation (columns 2, 4, 6, 8, 10 and 12).

We find that collaboration with PROs positively affects the enterprise's revenues from product innovation in 2007, while the relationship is insignificant in 2005. When all forms of collaboration are included in the regression (columns 6 and 12), academic collaborations turn to be insignificant. This suggests the existence of a multicolinearity problem which is mainly related to data structure. As a consequence, we prefer to present the collaboration variables one by one.

Besides our main finding, our results also indicate that internal R&D investments are positively associated with innovative performance. Doing R&D on a continuous basis has also a similar effect. In contrast, the amount an enterprise invests in external R&D seems not to have any effect on innovative intensity.

[5] *Such as others firms of the group, suppliers, customers, competitors and consultants.*

Regarding the Schmooklerian hypothesis, which states that innovation depends on market demand, there is a strong association between increased innovation performance and the willingness of firms to increase their market share and/or to break into new markets. It also appears that firms that face barriers to innovation related to market demand such as competition and demand uncertainty are more likely to innovate. Turning to the technology push hypothesis, the results do not allow us to conclude that innovation is more important in the high-tech sectors. There are some sectoral differences but this Schumpeterian hypothesis is not clearly confirmed.

As expected, the cost of innovation reduces sales from product innovation. Firm's size appears to be positively associated with the decision to innovate but influences negatively sales from innovation. Being part of a group has only a positive impact on the probability to innovate in 2005. Finally, the export activity only determines the decision to innovate but does not affect significantly the intensity of innovation.

4 CONCLUSION

This paper has investigated the effect of collaboration with public research organizations on innovative performance through an estimation of a double hurdle model. Our findings show evidence that collaboration with public research organizations increases innovative performance. While this effect is significant in 2007, it turns out be insignificant in 2005, which may reflect an evolution of the role of science-industrie links in France.

Our econometric analysis was done under the assumptions of independent, homoskedastic and normally distributed error terms. If these assumptions are not true, coefficients estimates are inconsistent [26]. Yet, Smith [29] found that the dependent double hurdle model is statistically deficient since the correlation parameter is poorly identified. He argues that this is why most studies were unable to support the existence of dependent parameter. Consequently, assuming this parameter is zero allows a better estimation of all parameters.

For future research, additional empirical work is needed to improve the robustness of these results, especially with regard to normality and homoskedasticity assumptions as well as endogeneity problems.

Table 2: Double hurdle estimation for innovative performance

Variables	2005 (N=7009)											
	1		2		3		4		5		6	
Firm's size	0.352***	(0.030)	-0.013***	(0.004)	0.352***	(0.030)	-0.013***	(0.004)	0.353***	(0.030)	-0.014***	(0.004)
Belonging to a group	0.317***	(0.073)	-0.010***	(0.012)	0.317***	(0.073)	-0.010***	(0.012)	0.317***	(0.073)	-0.010***	(0.012)
Exporting	0.699***	(0.070)			0.699***	(0.070)			0.700***	(0.070)		
Exporting_Europe			-0.010	(0.016)			-0.010	(0.016)			-0.010	(0.016)
Exporting_ Others			0.006	(0.012)			0.007	(0.012)			0.006	(0.012)
Increasing market share			0.255***	(0.021)			0.254***	(0.021)			0.254***	(0.021)
Market obstacles	0.875***	(0.069)			0.875***	(0.069)			0.875***	(0.069)		
Cost of innovation			-0.025**	(0.012)			-0.025**	(0.012)			-0.026**	(0.012)
Internal R&D			0.012***	(0.003)			0.012***	(0.003)			0.012***	(0.003)
External R&D			0.309*	(0.184)			0.308*	(0.183)			0.294	(0.184)
Continuous R&D			0.063***	(0.011)			0.064***	(0.011)			0.063***	(0.011)
Coop_univ			0.021	(0.020)							0.009	(0.023)
Coop_other PROs							0.030	(0.023)			0.022	(0.028)
Coop_non academic											0.006	(0.011)
Vehicles	-0.260	(0.176)	0.023	(0.021)	-0.260	(0.176)	0.024	(0.021)	-0.260	(0.176)	0.023	(0.021)
Chemicals	0.056	(0.201)	-0.020	(0.020)	0.054	(0.201)	-0.020	(0.020)	0.056	(0.201)	-0.020	(0.02)
Electric	-0.010	(0.171)	0.017	(0.018)	-0.010	(0.171)	0.017	(0.018)	-0.010	(0.171)	0.017	(0.018)
Food	-0.400**	(0.158)	-0.060***	(0.019)	-0.400**	(0.158)	-0.050***	(0.019)	-0.400**	(0.158)	-0.060***	(0.019)
Textile	-0.710***	(0.161)	0.037	(0.022)	-0.710***	(0.161)	0.037*	(0.022)	-0.710***	(0.161)	0.037*	(0.022)
Wood	-0.790***	(0.165)	-0.040	(0.023)	-0.790***	(0.165)	-0.040	(0.023)	-0.790***	(0.165)	-0.040	(0.023)
Plastic Rubber	-0.220	(0.203)	0.026	(0.023)	-0.220	(0.203)	0.027	(0.023)	-0.220	(0.203)	0.026	(0.023)
Non metalic	-0.350*	(0.211)	-0.080***	(0.026)	-0.350*	(0.211)	-0.080***	(0.026)	-0.350*	(0.211)	-0.080***	(0.026)
Basic metal	-0.560***	(0.164)	0.013	(0.020)	-0.560***	(0.164)	0.014	(0.02)	-0.560***	0.164	0.013	(0.020)
NEC	-0.440**	(0.191)	0.114***	(0.026)	-0.440**	(0.191)	0.114***	(0.026)	-0.440**	(0.191)	0.114***	(0.026)
Constant	-2.309***	(0.183)	-0.059*	(0.032)	-2.309***	(0.182)	-0.059*	(0.032)	-2.312***	(0.183)	-0.055*	(0.033)
Sigma	0.201***(0.004)				0.200***(0.004)				0.200***(0.004)			
Wald test (prob>chi2)	304.060(0.000)				304.730(0.000)				305.010(0.000)			
Variables	2007 (N=4900)											
	7		8		9		10		11		12	
Firm's size	0.502***	(0.045)	-0.014**	(0.006)	0.502***	(0.045)	-0.014**	(0.006)	0.506***	(0.045)	-0.017***	(0.006)
Belonging to a group	0.024	(0.093)	0.004	(0.017)	0.022	(0.093)	0.006	(0.017)	0.023	(0.094)	0.002	(0.017)
Exporting	0.885***	(0.087)			0.883***	(0.087)			0.886***	(0.088)		
Exporting_Europe			-0.046**	(0.023)			-0.044*	(0.023)			-0.043*	(0.023)
Exporting_ Others			0.029	(0.018)			0.029	(0.018)			0.031*	(0.018)
Increasing market share			0.232***	(0.025)			0.232***	(0.025)			0.232***	(0.025)
Market obstacles	0.720***	(0.084)			0.720***	(0.084)			0.723***	(0.085)		
Cost of innovation			-0.004	(0.016)			-0.006	(0.016)			-0.008	(0.016)
Internal R&D			0.255**	(0.114)			0.261**	(0.114)			0.252**	(0.115)
External R&D			-0.192	(0.413)			-0.228	(0.412)			-0.223	(0.413)
Continuous R&D			0.072***	(0.016)			0.073***	(0.016)			0.070***	(0.016)
Coop_universities			0.032**	(0.016)							0.000	(0.02)
Coop_other PROs							0.040**	(0.018)			0.022	(0.022)
Coop_non academic											0.049***	(0.015)
Vehicles	-0.400	(0.252)	0.044	(0.028)	-0.400	(0.251)	0.043	(0.028)	-0.400	(0.254)	0.044	(0.028)
Chimicals	-0.240	(0.274)	0.007	(0.027)	-0.240	(0.274)	0.008	(0.027)	-0.230	(0.278)	0.003	(0.027)
Electric	-0.190	(0.241)	0.003	(0.025)	-0.180	(0.24)	0.003	(0.025)	-0.180	(0.243)	0 .000	(0.025)
Food	-0.910***	(0.231)	-0.010	(0.027)	-0.910***	(0.231)	-0.020	(0.027)	-0.910***	(0.234)	-0.010	(0.027)
Textile	-0.830	(0.235)	0.176	(0.032)	-0.830	(0.235)	0.176	(0.032)	-0.820	(0.238)	0.170	(0.033)
Wood	-1.340***	(0.234)	0.062***	(0.034)	-1.340***	(0.234)	0.062***	(0.034)	-1.350***	(0.237)	0.062***	(0.034)
Plastic Rubber	-0.250	(0.291)	0.083***	(0.031)	-0.250	(0.291)	0.084***	(0.031)	-0.250	(0.295)	0.079**	(0.031)
Non metalic	-0.610**	(0.272)	0.032	(0.036)	-0.610**	(0.272)	0.030	(0.036)	-0.610**	(0.275)	0.031	(0.036)
Basic metal	-0.990***	(0.237)	0.043	(0.029)	-0.990***	(0.237)	0.044	(0.029)	-0.990***	(0.24)	0.041	(0.029)
NEC	-0.350	(0.306)	0.014	(0.039)	-0.350	(0.306)	0.012	(0.039)	-0.340	(0.311)	0.008	(0.039)
Constant	-2.624***	(0.281)	-0.077*	(0.045)	-2.625***	(0.281)	-0.080*	(0.045)	-2.633***	(0.284)	-0.077	(0.045)
Variance	0.247***(0.005)				0.247***(0.005)				0.247***(0.005)			
Wald test (prob>chi2)	174.01(0.000)				175.16(0.000)				182.90(0.000)			

Standard errors are between brackets

***, ** and * represent 1%, 5% and 10% levels of significance, respectively

5 APPENDIX

Appendix A: Industrial sectors based on Nace code

Industries	Nace	Definitions
Food	15-16	Manufacture of food, beverage and tobacco
Textile	17-19	Manufacture of textiles ; Manufacture of wearing apparel; dressing and dyeing of fur ; Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
Wood	20-22	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials ; Manufacture of pulp, paper and paper products
Chemicals	23-24	Manufacture of coke, refined petroleum products and nuclear fuel ; Manufacture of chemicals and chemical products ; Publishing, printing and reproduction of recorded media
Plastic Rubber	25	Manufacture of rubber and plastic products
Non-metallic	26	Manufacture of other non-metallic mineral products
Metallic	27-28	Manufacture of basic metals ; Manufacture of fabricated metal products, except machinery and equipment
Machinery	29	Manufacture of machinery and equipment n.e.c
Electrical	30-33	Manufacture of office machinery and computers ; Manufacture of electrical machinery and apparatus n.e.c.; Manufacture of radio, television and communication equipment and apparatus ; Manufacture of medical, precision and optical instruments, watches and clocks
Vehicles	34-35	Manufacture of motor vehicles, trailers and semi-trailers ; Manufacture of other transport equipment
NEC	36	Manufacture of furniture; manufacturing n.e.c.

Appendix B: Stata code for estimation of the double hurdle model

```
capture program drop myhurdle5
program define myhurdle5
args lnf xb s1 zc
quietly replace `lnf'=ln(1-normprob(`xb')* normprob(`zc')) if $ML_y2==0
quietly replace `lnf'=-ln(`s1'*sqrt(2*_pi))-0.5*(($ML_y1-`xb')/`s1')*(($ML_y1-`xb')/`s1')+ ln( normprob(`zc')) if $ML_y2==1
end
```

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Inflation et Croissance aux Etats-Unis et en Europe 1951-2011: Une étude empirique

[Inflation and Growth in the United States and Europe from 1951 to 2011: An empirical study]

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ABSTRACT: The link between inflation and growth has often been the center of debate and has attracted much attention. In this context, this work is an attempt to determine the possible relationship between inflation and growth through an econometric study using the method of panel data (the panel includes in one side the United States, in the other Europe represented by France, Germany, the United Kingdom, Italy and Spain), we tried to confirm the thesis that states: inflation is negatively related to growth, was also exposed in this work policies against inflation and deflation to achieve the idea that both are harmful to growth hence the idea of targeting. So of this work, we can conclude that there is a negative relationship between inflation and growth where we must set a limit inflation above (and below) which fight against inflation Night the economy.

KEYWORDS: link, inflation and growth, United States and Europe, negatively, deflation, targeting.

RESUME: Le lien entre l'inflation et la croissance a été souvent le centre des débats et a suscité beaucoup d'attention. Dans ce contexte, Ce travail est un essai de détermination de la relation qui peut exister entre l'inflation et la croissance à travers une étude économétrique utilisant la méthode des données de panel (le panel regroupe d'un côté les Etats Unis, de l'autre l'Europe représentée par : la France, l'Allemagne, le Royaume-Uni, l'Italie et l'Espagne), on a essayé de confirmer la thèse qui stipule que : l'inflation est négativement liée à la croissance, on a exposé aussi dans ce travail les politiques de lutte contre l'inflation et la déflation pour aboutir à l'idée que toutes les deux sont néfastes à la croissance d'où l'idée du ciblage. Donc de ce travail, on peut conclure qu'il y a une relation négative entre l'inflation et la croissance d'où il faut fixer une limite d'inflation au-dessus (et en dessous) de laquelle lutter contre l'inflation nuit à l'économie.

MOTS-CLEFS: lien, Econométrique, l'inflation et la croissance, Europe et Etats-Unis, Négativement, déflation, ciblage.

JEL: C33, E12, E31, E52, F02, N14.

1 INTRODUCTION

La relation entre l'inflation et la croissance a été souvent le centre de débats et a suscité beaucoup d'attention, que ce soit dans les anciennes théories dites traditionnelles ou les nouvelles théories dites théories de la croissance endogène.

Si, dans les théories traditionnelles, la question n'a pas été traitée en profondeur (ou n'a pas été traitée du tout), l'émergence des théories appelées théories de la croissance endogène depuis le début des années quatre vingt a pu fournir

quelques explications. Dans les théories traditionnelles, que ce soient les théories keynésiennes, néoclassiques, néo-keynésiennes ou monétaristes, on a cherché, surtout, à traiter les causes de l'inflation, ses formes,…Concernant la croissance, l'étude a souvent porté sur les irrégularités de cette dernière, les crises, les cycles, les fluctuations, …

Dans les théories de la croissance endogène, on assiste depuis les travaux de Romer (1986) à un renouvellement de la théorie économique et beaucoup de sujets ont étés traités : le rôle du progrès technique dans la croissance, le rôle du capital humain dans la croissance, le capital public, …Et récemment, on a assisté à la production d'une littérature empirique condensée en ce qui concerne la relation entre l'inflation et la croissance ; citons, à ce propos Barro(1990), Fortin (1990), Dornbusch et Reynoso (1989), De Gregorio (1993), Gylfason (1999), Rousseau et Wachtel (2001) et beaucoup d'autres. Si, dans la plupart de ces travaux, une relation négative et significative entre l'inflation et la croissance a été décelée (le cas des travaux qu'on vient de citer), dans d'autres études on a constaté l'absence de toute relation significative comme chez Fortin (1990), Kryiakopoulos (1990) et Stanners (1993).

En ce qui nous concerne, on va traiter la relation entre l'inflation et la croissance tout en menant une étude économétrique sur un échantillon de six pays : les Etats-Unis et cinq pays de l'Europe : la France, l'Allemagne, le Royaume-Uni, l'Italie et l'Espagne. Le choix de ces pays et de la période d'étude n'est pas le fruit du hasard, au contraire, depuis la fin de la deuxième guerre mondiale et durant à peu près un quart de siècle, l'Europe a connu une croissance forte et une inflation relativement forte. A l'inverse, les Etats-Unis, ont connu une croissance faible et une inflation forte. A partir des années quatre vingt, on a constaté une « permutation » des rôles, les Etats-Unis sont passés en tête avec une croissance forte, et l'Europe voit sa croissance baisser, malgré la stabilité de l'inflation, inflation qui n'a pas bougé depuis des années et qui se situe à présent entre 2% et 3%. En parallèle, les Etats-Unis qui ont toujours produit des "miracles économiques", réalisent des taux de croissance record malgré les crises (problème de déficits, stagnation en 2002).

La croissance américaine a dépassé le taux de 5% en 2000 (c'est-à-dire avant la récession), alors que l'activité européenne, en nette reprise, n'a cru qu'au rythme de 3,5 %. Depuis 1992, les Etats-Unis enregistrent des taux de croissance systématiquement supérieurs aux taux européens. Au delà des facteurs purement conjoncturels qui pourraient expliquer un décalage de cycles entre l'Europe et les Etats-Unis, des facteurs plus structurels ont été avancés, tel que l'avènement aux Etats-Unis d'une nouvelle économie basée sur le développement de nouvelles technologies. Les premiers signes de ralentissement de l'économie américaine se font aujourd'hui ressentir et les pays européens investissent, à leur tour, massivement dans les technologies de l'information afin de diminuer le différentiel de croissance entre l'Europe et les Etats-Unis.

D'autre part, l'Europe a connu un événement important, à savoir la naissance de l'euro, qui représente une tentative de réponse de cette dernière à la globalisation, lui permettant une meilleure adaptation au contexte international. Cette monnaie a eu le mérite d'avoir contraint les Etats européens à remettre de l'ordre dans leurs finances publiques, elle a permis d'éradiquer les variations de change en facilitant la comparaison des prix et a contribuer à décloisonner le marché intérieur, un grand marché européen sans risque de change, ce qui permettra dans l'avenir d'améliorer la situation des entreprises. Mais, avec tous ses avantages qui promettent beaucoup aux économies européennes, l'Euro, malgré sa « puissance » face au dollar, n'a rien changé quant aux taux de croissance. En effet, après cinq années d'existence de l'euro, la croissance en Europe ne s'est pas améliorée d'une manière « tangible », l'inflation a augmenté légèrement. Peut être, est-il encore tôt pour juger l'efficacité de l'euro, étant donné que c'est une monnaie trop jeune, et le moment pour évaluer cette efficacité est encore loin.

2 ESTIMATION DE L'EFFET DE L'INFLATION SUR LA CROISSANCE

2.1 DÉMARCHE

2.1.1 DONNÉES, ÉCHANTILLON ET VARIABLES

On a un panel de six pays. Notre période d'étude est la suivante : 1951-2011. Notre démarche consiste à travailler sur les moyennes des taux de croissance des variables qui sont calculées tous les cinq ans ; d'où, au lieu de travailler sur 60 observations pour chaque variable, pour chaque pays, on va travailler sur 12 observations pour chaque variable, pour chaque pays. On va commencer par 1951, par suite, on va avoir exactement 12 intervalles de cinq ans. Ces intervalles sont : [1951-1955] ; [1956-1960] ;[1961-1965] ; [1966-1970] ; [1971-1975] ; [1976-1980] ; [1981-1985] ; [1986-1990] ; [1991-1995] ; [1996-2000] ; [2001-2005] ; [2006-2011], Sur chaque intervalle de cinq ans, on a calculé une moyenne et pour faciliter la saisie et le traitement sur EVIEWS, ces intervalles sont remplacés respectivement par les années suivantes : 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010 et 2011. D'où, la période apparente de notre nouvel échantillon est la suivante {2000, 2011}.

Le modèle linéaire de base sera estimé en retenant le logarithme népérien des variables explicatives à l'exception de la variable muette. Cette forme présente deux avantages : d'une part, les coefficients estimés peuvent êtres interprétés comme des nombres sans dimension, à savoir des élasticités. D'autre part, le passage au logarithme permet de réduire le poids des valeurs extrêmes et d'améliorer les performances économétriques du modèle ; par suite notre problématique prendra la formulation générale ci-après, une formulation proche de celle de Barro (1997)[1] :

Log (GDPGRT) = a Log (GDPGRT (-1)) + b Log (DEFGDP) + c Log (TCHOM) + d

Log (TINV) + e Log (GE) + f Log (OPEN) + g Log (TPOP) + h Log (LIFE) + ε Eq. (1)

Expression dans laquelle les variables ont la signification suivante :

LGDPGRT est le Logarithme du taux de croissance du produit intérieur brut réel par habitant

LDEFGDP est le Logarithme de l'inflation représentée par le déflateur du PIB : le taux d'inflation entretient une relation ambivalente avec le taux de croissance. En effet une inflation forte peut être le signe d'une économie en croissance, suivant en ce sens l'optique keynésienne, illustrée par la courbe de Phillips. D'autre part, et comme cela a été signalé précédemment, une inflation forte peut avoir un effet négatif sur la croissance. Ainsi Sarel (1996) a montré, à partir d'un échantillon de 87 pays de niveaux de développement différents, que l'inflation a un effet négatif sur le PIB lorsqu'elle est supérieure à 8%.

LOPEN représente le Logarithme du taux d'ouverture qui est égal à la somme des importations en pourcentage du PIB plus les exportations en pourcentage du PIB, OPEN= (IMP+EXP)/GDP. Barro considère, au lieu de cette variable, une variable qu'il appelle termes de l'échange qui est égale pour chaque période au ratio "prix des exportations/prix des importations". Les travaux de Adams (1989) ou encore ceux de Carré, Dubois & Malinvaud (1977) entre autres, ont nettement mis en évidence une relation positive entre ouverture et croissance économique.

D'autres études basées sur le calcul des coefficients de corrélation, les fonctions de production ou encore celles utilisant les données de panel, démontrent que la relation entre la croissance et l'ouverture est significative et positive (Bahmani-Oskooe et Niroomand, 1999 ; Afxentiou et Serletis, 1992 ; Harrison, 1995 ; Michaely, 1977 ; Balassa, 1978 ; Feder, 1983 ; ou encore Esfahani, 1991). Cependant des études utilisant les tests de causalité et/ou celles qui s'intéressent à une économie particulière remettent en cause le sens de la relation (Jung et Marshall, 1985 ; Moosa, 1999 ; Dhawan et Bisawal, 1999 ; Kwan et alii, 1996 ; Liu, Song et Romilly, 1997).

LGDPGRT (-1) est le Logarithme du taux de croissance du PIB réel décalé d'une période.

LTINV est le Logarithme de l'investissement en pourcentage du PIB appelé aussi taux d'investissement : l'investissement est un facteur de croissance tant pour l'école néoclassique que pour l'école keynésienne.

LGE est le Logarithme des consommations publiques en pourcentage du PIB : selon les Keynésiens, la dépense publique vient s'ajouter ou se substituer aux dépenses de consommation et d'investissement, notamment dans les situations de crise où les agents ont recours à une épargne de précaution. Elle a un multiplicateur permettant de générer la croissance économique. Pour les Néo-keynésiens, les dépenses publiques permettent de relancer l'activité économique à travers leur action sur le revenu des ménages et les recettes des entreprises (action positive sur la demande effective).

LTCHOM est le Logarithme du taux de chômage : d'après Arthur Okun[2], qui décrit une relation linéaire entre les pourcentages de variations du chômage et les variations en pourcentage du produit national brut, il déclare que, pour chaque point de pourcentage de diminution du chômage tombe, le PNB réel monte de 3 pour cent. La loi d'Okun est basée sur des données allant de la fin de la deuxième guerre mondiale à 1960. Il a averti que cette loi était bonne seulement dans la marge des taux de chômage allant de 3% à 7,5%, taux expérimentés dans cette période de temps.

LLIFE ou Life expectancy, est le Logarithme de l'espérance de vie à la naissance : les effets de la santé sur le développement sont évidents. Les pays dans lesquels l'état de santé et le niveau d'éducation de la population sont médiocres ont plus de difficultés à assurer une croissance durable.

[1] Barro J.R. (1997) « Les facteurs de la croissance économique : une analyse transversale par pays », Economica
[2] Arthur M. Okun (1928-80) est connu principalement pour la loi d'Okun.

LTPOP est le Logarithme du taux de croissance de la population: la relation entre la croissance de la population et la croissance économique a été abordée de différents points de vue ; en effet, et face au préjugé qu'un excès de population freine la croissance économique, A. Sauvy avait développé le concept d'*optimum de population* pour montrer que le défaut de population, autant que son excédent, pouvait freiner le développement économique. D'autre part, E. Durkheim pense que « le développement numérique de la population est une des causes de la division sociale du travail ; la division sociale est elle-même le point de départ de toute une série de perfectionnements dans tous les domaines de la vie »[3].

Cependant une autre catégorie d'économistes démographes pense qu'on est aujourd'hui en présence d'un monde surpeuplé. En effet, il est vrai que, dans un certain nombre de cas, le taux de croissance démographique l'a emporté sur le taux de croissance économique, entraînant une diminution du niveau du PIB par tête. On parle alors de « mal malthusien ».

Après avoir procédé aux tests nécessaires, il s'agit bien d'un panel homogène, d'où l'équation du modèle à estimer devient :

Log (GDPGRT) = a Log (GDPGRT(-1)) + b Log (DEFGDP) + c Log (TCHOM) + d

Log (TINV) + e Log (GE) + f Log (OPEN) + g Log (TPOP) + h Log (LIFE) + δ Eq. (2)

2.2 ESTIMATION

Notre estimation de l'effet de l'inflation sur la croissance se base sur la démarche suivante : on estime, dans un premier temps, la croissance représentée par le Logarithme du taux de croissance du PIB réel par tête (LGDPGRT) en fonction de l'inflation représentée par le déflateur du PIB (LGDPDEF) et en fonction de la croissance à l'instant (t-1), c'est-à-dire (LGDPGRT(-1)). Dans un deuxième temps, on introduit dans la régression la variable représentant le chômage (LTCHOM). Dans un troisième temps, on introduit la variable relative à l'investissement (LINV), et ainsi de suite jusqu'à ce qu'on introduise toutes les variables[4]. En dernier lieu, on estime notre équation en introduisant une variable muette, cette variable muette représente un événement important qui s'est produit au cours des années soixante dix qui est la crise pétrolière, ou précisément les deux chocs pétroliers (le premier en 1973 et le deuxième en 1975). Appelons cette variable d, elle est définie comme suit :

d=1, s'il y a choc et 0 sinon. Autrement dit : d=1 en 1973 et d=1 en 1975 et 0 ailleurs.

D'où, en termes de moyennes, la variable muette se situe dans l'intervalle [70,74] et [75,79], c'est-à-dire qu'on va supposer que la variable muette prendra la valeur 1 sur chacun de ces deux intervalles ; autrement dit, puisqu'on travaille sur des moyennes, cette variable prendra la valeur 1 sur l'intervalle [71,75], ainsi que sur l'intervalle [76,80]. Rappelons aussi que ces deux intervalles correspondent respectivement aux deux années numérotées 1999 et 2000 dans le nouvel échantillon.

L'idée de cette démarche est de tester la significativité du coefficient de l'inflation et aussi améliorer la qualité de l'estimation et par suite de savoir si le modèle est robuste ou non. Les signes attendus des variables sont :

LGDPGRT = f (LGDPGRT(-1), LDEFGDP, LTCHOM, LTINV, LGE, LOPEN, LTPOP,

(?) (?) (-) (+) (+/-) (+/-) (+)

LLIFE)

(+)

[3] *E. Durkheim, de la division du travail social, 1893, p.122*

[4] *Ce qu'on appelle, en statistiques, la méthode ascendante.*

L'estimation de l'équation (2) nous a donné les résultats suivants (Tableau 1) :

Tableau 1 : Régression avec le logiciel Eviews et la méthode SURE

Variable dépendante Log(GDPGRT) :

	REG1	REG2	REG3	REG4	REG5	REG6	REG7	REG8
Log(gdpgrt(-1))	-0.1735	-0.3309	-0.2311	-0.3214	-0.3404	-0.3295	-0.3544	-0.3725
	(0.2137)	(0.0143)	(0.0571)	(0.0057)	(0.0042)	(0.0061)	(0.0038)	(0.0039)
Log(defgdp)	-0.6361	-0.3104	-0.1579	-0.1941	-0.1396	-0.1492	-0.2575	-0.2638
	(0.0000)	(0.0032)	(0.1249)	(0.0863)	(0.2447)	(0.2036)	(0.0252)	(0.0239)
Log(tchom)		-0.7947	-0.8436	-0.5928	-0.5287	-0.2797	-0.7372	-0.7484
		(0.0000)	(0.0000)	(0.0002)	(0.0017)	(0.2266)	(0.0142)	(0.0149)
Log(tinv)			1.5737	1.2593	1.2236	0.7755	1.4319	1.4319
			(0.0002)	(0.0061)	(0.0077)	(0.1336)	(0.0148)	(0.0179)
Log(ge)				-1.9715	-2.1518	-2.5795	-1.3850	-1.4026
				(0.0003)	(0.0002)	(0.0006)	(0.0822)	(0.0909)
Log(open)					-0.3956	-0.3160	-1.6114	-1.6771
					(0.2573)	(0.3750)	(0.0045)	(0.0053)
Log(tpop)						0.1124	0.1281	0.1375
						(0.1734)	(0.1228)	(0.1118)
Log(life)							16.7660	17.9359
							(0.0073)	(0.0076)
Variable muette Représentant les Deux chocs pétroliers								0.1443 (0.5268)
R^2	0.24	0.32	0.37	0.39	0.39	0.38	0.42	0.41
Nombre D'observations	49	49	49	49	49	49	49	49

NB : *entre parenthèses sont écrits les p-values.*

2.3 RÉSULTATS ET INTERPRÉTATIONS

L'examen du tableau ci-dessus révèle les remarques suivantes :

- Concernant la significativité des variables, le tableau ci après nous résume «l'état » de chaque variable dans chaque régression :

Tableau 2 : significativité des coefficients des variables

	Reg1	Reg2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8
LGDPGR (-1)	NS	SS	SS	SS	SS	SS	SS	SS
LDEFGDP	SS	SS	NS	SS	NS	NS	SS	SS
LTCHOM		SS	SS	SS	SS	NS	SS	SS
LTINV			SS	SS	SS	NS	SS	SS
LGE				SS	SS	SS	SS	SS
LOPEN					NS	NS	SS	SS
LTPOP						NS	NS	NS
LLIFE							SS	SS
D								NS

NB :

NS : veut dire non significative

SS : veut dire statistiquement significative.

D'après les deux tableaux ci-dessus, on constate que le coefficient de la variable représentant la croissance à l'instant (t-1) (c.a.d, LGDPGR(-1)), est non significatif seulement dans la première régression et est significatif pour les autres. Le coefficient relatif à la variable taux de chômage (LTCHOM) est négatif et significatif dans toutes les régressions sauf dans la sixième ; idem pour le coefficient du taux d'investissement (LTINV), il est significatif partout sauf dans la sixième régression. Le coefficient des dépenses publiques (LGE) est négatif et significatif partout. Le coefficient de la variable relative à l'ouverture (LOPEN) est négatif et non significatif dans les 5ème et 6ème régressions et est significatif dans les deux dernières (7ème et 8ème). Le coefficient relatif au taux de croissance de la population (LTPOP) est non significatif. Le coefficient de l'espérance de vie est positif et significatif.

Economiquement parlant, le signe négatif de la variable LOPEN, qui représente l'ouverture, s'explique par le fait que les pays concernés n'ont pas réussi, d'une part, à protéger leurs exportations face à la concurrence étrangère et, d'autre part, qu'ils n'ont pas bien établi des barrières à l'entrée qui aient contraint l'entrée des produits provenant de l'étranger (importations), ce qui a permis à des produits étrangers d'envahir le marché national et de menacer les produits locaux, d'où cet effet négatif sur la croissance.

S'agissant des variables LTINV, LTCHOM et LLIFE, elles ont les signes attendus : l'investissement a un effet positif sur la croissance, le chômage a un effet négatif sur la croissance et l'espérance de vie agit positivement sur la croissance. Pour la variable LGE, on remarque que son coefficient est négatif, ce qui veut dire que les dépenses publiques, dans le cas de notre panel, agissent négativement sur la croissance.

- Concernant le pouvoir explicatif du modèle mesuré par $R^{2,}$ il est de 0.24 dans la première régression, de 0.39 dans la cinquième, 0.38 dans la sixième et de 0.42 dans la septième.

- Concernant la variable muette, son introduction nous a permis d'avoir un R^2 égal à 0.41, et son coefficient est positif mais non significatif. Autrement dit, l'ajout d'une variable muette n'a pas amélioré le modèle en termes de pouvoir explicatif.

Discutons maintenant le cas du coefficient de la variable qui nous intéresse le plus dans ce travail, à savoir le taux de l'inflation représenté par le déflateur du PIB. On remarque que pour toutes les régressions, on obtient un coefficient négatif pour le déflateur du PIB ; ce coefficient est égal respectivement, dans les différentes régressions, à : -0,63 ; -0,31 ; -0,15 ; -0,19 ; -0,13 ; -0,14 ; -0,25 et -0,24. C'est-à-dire qu'une augmentation de l'inflation de 1 point de pourcentage[5] fait diminuer la croissance à peu près de 0,6% dans la première régression, de 0,3% dans la deuxième régression, de 0,15% dans la troisième et ainsi de suite. Le coefficient de l'inflation est statistiquement significatif dans les équations (1), (2), (4), (7) et (8). D'où, on peut conclure que l'inflation agit négativement sur la croissance, mais avec des élasticités assez différentes, selon ces cinq régressions pour lesquelles elles sont statistiquement significatives.

[5] *Selon les termes de Barro.*

Nos conclusions rejoignent, à ce niveau, celles de Barro (1997) qui, pour un panel de 114 pays, utilise trois équations pour estimer le taux de croissance réel par habitant (variable dépendante) pour les périodes respectives suivante 1965-1975, 1975-1985 et 1985-1990 en fonction des variables indépendantes suivantes :

- Log (PIB réel/tête du début de période)
- Scolarisation masculine dans le secondaire et le supérieur
- Log (espérance de vie)
- Log (PIB réel/tête) x Scolarisation masculine
- Log (taux de fécondité)
- Taux de consommation gouvernementale
- Indice du respect de la loi
- Termes de l'échange
- Indice de démocratie
- Indice de la démocratie au carré
- Taux d'inflation

Après estimation, Barro conclut que l'inflation agit négativement sur la croissance ; le coefficient (qu'il trouve), relatif à l'inflation, est de (-0,029) ; il conclut qu'une augmentation de dix points en pourcentage de l'inflation fait diminuer la croissance de à peu près 0,3 en pourcentage. D'autre part, et pour vérifier la linéarité de la relation entre l'inflation et la croissance, Barro a estimé de nouveau son modèle de départ, en séparant les coefficients relatifs à l'inflation en trois groupes : au dessus de 15% d'inflation, entre 15% et 40%, et au dessus de 40% ; il obtient des coefficients de (-0,023) dans le groupe à faible inflation, de (-0,055) dans le groupe intermédiaire et de (-0,029) dans le groupe supérieur ; il conclut que la relation négative et linéaire entre l'inflation et la croissance, vient bien des groupes à inflation à taux intermédiaires et supérieurs, mais il confirme que les données ne rejettent pas l'hypothèse selon laquelle la relation entre l'inflation et la croissance est négative pour de faibles taux d'inflation. De plus, l'auteur conclut : « *en outre, il n'y a aucun signe de l'existence d'une relation positive selon laquelle une inflation plus élevée produirait une croissance plus forte* » [BARRO R. 2000].

Dans le même contexte, une étude a été faite par Burdekin, Keil, Sitthiyot et Willet (2004) sur un groupe de pays qui comprend 21 pays industrialisés et 51 pays en voie de développement ; cette étude conforte nos résultats, et elle met en évidence aussi la non-lénarité dans la relation entre l'inflation et la croissance ;

La régression utilisée par ces auteurs est la suivante :

$$\Delta \ln y = \alpha + \beta_1.\inf + \beta_2.(\inf - \inf 1).break1 + \beta_3.(\inf - \inf 2).break2 +$$
$$\beta_4.(\inf - \inf 3).break3 + \beta_5.\Delta \inf + \theta_1.\ln y(-1) + \sum_j \nu_j.X_j + \varepsilon$$

Les variables ont la signification suivante :

y est le PIB par tête

inf est le taux d'inflation

inf_i est la valeur du taux d'inflation pour laquelle la i_ème rupture intervient (i=1,2,3)

break_i est une variable muette prenant la valeur 1 si inf > inf_i, 0 sinon

$\Delta \inf$: est le taux de variation du taux d'inflation (captant les effets de court terme sur la croissance, selon l'idée présentée dans la courbe de Phillips).

Y(-1) est la valeur prise par le PIB/tête au cours de la période précédente.

Xj est un ensemble de variables de contrôle dans l'équation de croissance (taux de croissance de la population, termes de l'échange, dépenses publiques).

Les seuils (ou les valeurs de rupture) sont sélectionnés de manière récursive.

Les résultats de l'estimation sont résumés dans le tableau suivant :

Tableau 3 : Résultats des travaux de Burdekin, Keil, Sitthiyot et Willet (2004)

Variable explicative	Coefficient
Différence première de l'inflation	0,15 (4,13)
Log du PIBpar unité du capital de la période précédente	-0,029 (6,25)
Inflation : en dessous de 8%	**-0,065 (1,38)**
Inflation : entre 8% et 25%	**-0,310 (8,17)**
Inflation : au dessus de 25%	**-1,713 (2,93)**
Inflation sans la présence de chocs structurels	**-0,214 (9,01)**

(Les ratios de Student sont donnés entre parenthèses)

D'après ce tableau, on voit que les coefficients associés à l'inflation, quel que soit son niveau, sont négatifs et significatifs, d'où la conclusion selon laquelle il y a une relation négative vérifiée entre l'inflation et la croissance. D'autre part, les auteurs constatent, dans cette étude que la relation entre l'inflation et la croissance est non linéaire ; les coûts marginaux associés à l'inflation en termes de croissance augmentent de concert avec le taux d'inflation.

Donc d'après nos résultats, on peut conclure que l'inflation en Europe et aux Etats-Unis agit négativement sur la croissance et le modèle qui explique le mieux cette relation est celui correspondant à la régression (7) qui donne à la fois un pouvoir explicatif plus élevé que les autres régressions ; en même temps pour l'ensemble des variables utilisées (excepté la variable relative au taux de croissance de la population), elles ont toutes des coefficients statistiquement significatifs.

3 COMBATTRE L'INFLATION ET LE RISQUE DE DEFLATION

3.1 LES EFFETS DE L'INFLATION SUR LA CROISSANCE

L'inflation a des inconvénients nombreux et graves sur la croissance ; on peut en citer à juste titre quatre :

- La répartition des revenus se trouve altérée, en effet l'inflation agit comme un puissant répartiteur secondaire : elle modifie la distribution des revenus. Les titulaires des revenus fixes (rentes, loyers, intérêts obligataires ou hypothécaires, etc.…), connaissent une chute de leurs moyens (au moins partiels) d'existence pouvant aller jusqu'à ce que Keynes appelait, l'euthanasie du rentier. D'autre part, l'augmentation des prix entraîne la diminution voire même la disparition des intérêts des obligations, le pouvoir d'achat des salariés tend à baisser même si la résistance des syndicats en obtient le réajustement. En sens inverse, les agents économiques endettés (que I. Fisher ou Keynes appelaient "les agents dynamiques" voient le poids de leur dette s'alléger si leurs revenus s'élèvent nominalement au rythme de l'inflation.

- L'affectation des diverses ressources productives se trouve détériorée par l'inflation ; si l'inflation stimule l'activité économique, elle le fait d'une manière malsaine. L'exemple le plus frappant est celui de l'Allemagne entre 1919 et 1923 ; on avait remarqué la multiplication d'emplois peu productifs, voire parasitaires dans le commerce de détail, dans les banques et dans les services comptables et fiscaux des entreprises. Concernant la consommation, elle se voit exacerbée par la dépréciation des revenus des ménages, l'épargne se trouve découragée. L'investissement se trouve encouragé par la hausse des prix et également par les marges bénéficiaires. Mais si l'inflation incite à l'investissement, elle ne l'oriente pas d'une manière satisfaisante ; elle tend à le canaliser vers des objectifs dont la rentabilité est à courte échéance, elle dérègle aussi le financement de ce dernier par un grand recours à l'autofinancement, elle fausse par suite les calculs économiques qui sous-tendent les projets d'investissement.

- L'inflation a de sérieuses conséquences monétaires. En effet, agissant comme une taxe prélevée sur les encaisses et reversée à ceux qui profitent de la hausse des prix, elle amène les agents économiques à « fuir » devant la monnaie, c'est-à-dire qu'ils évitent de conserver la monnaie sous son état liquide et essaient de la remplacer par des actifs réels, tels que l'or et d'autres actifs de "refuge".

- La quatrième conséquence est que l'inflation affecte le budget de l'Etat. Les dépenses publiques consistent surtout en traitements et salaires. Elles augmentent plus vite que les recettes fiscales, dans la mesure où celles-ci proviennent des impôts directs. Ce déséquilibre du budget de l'Etat, accroît le gonflement monétaire par le jeu des injections de liquidité dues au Trésor.

3.2 COMBATTRE L'INFLATION

Comme on l'a déjà vu précédemment et étant donné ses effets néfastes sur l'économie et le bien être en général, l'inflation est un « mal » en soi, d'où l'objectif de toute banque centrale et de toute politique économique qui est la stabilité des prix ; l'instabilité des prix est source d'incertitude, fausse le processus de décision économique et entrave la croissance économique. Faisons, tout d'abord, un historique des politiques de lutte contre l'inflation pour voir après ce qu'il en est à l'heure actuelle.

3.2.1 HISTORIQUE DES POLITIQUES DE LUTTE CONTRE L'INFLATION

Les politiques de lutte contre l'inflation datent véritablement depuis la fin de la seconde guerre mondiale. En effet, la gravité de la crise des années trente a amené les gouvernements à intervenir pour appliquer des politiques d'inspiration keynésienne ; ces politiques s'inscrivaient dans le contexte de la volonté de diminuer le chômage et de baisser les prix ; d'où, l'Etat jouait un rôle majeur dans le contrôle de l'activité économique, en la freinant quand elle risquait (on parle de l'activité), la « surchauffe » et en la relançant quand elle commençait à se ralentir. Les anti-keynésiens, eux, pensaient que l'Etat se souciait trop d'éviter le sous-emploi plutôt que de maîtriser les coûts de production et la croissance de la masse monétaire.

Dans ce qui suit, et pour avoir une idée sur les politiques de lutte contre l'inflation "d'autre fois ", on prendra comme exemple les cas de la France et celui des Etats-Unis.

- En France, par exemple, la lutte contre l'inflation a pris la forme de plans que leurs auteurs (les décideurs), ont élaborés dans le but de la stabilité des prix[6], on peut citer à juste titre : les plans Pinay et Gaillard (1952-1957-1958), le plan Fourcade (1974), les plans Barre (1976-1978).

En 1986, avec l'arrivée de Jacques Chirac à la tête du gouvernement (premier ministre), et malgré la réussite des politiques de désinflation et la réduction des déficits, celui-ci ne rompt pas totalement avec la politique du gouvernement précèdent, sa politique s'oriente essentiellement vers la lutte contre l'inflation comme objectif principal qui reposait sur la désindexation salariale vis-à-vis des prix, sur une politique monétaire rigoureuse et sur la réduction des déficits publics.

- Concernant les Etats-Unis, on retient, parmi les politiques de lutte contre l'inflation, celle adoptée à la fin des années quatre vingt pendant la présidence de Ronald Reagan ; elle s'est caractérisée par l'abandon du « Keynésianisme », et elle s'est inspirée à la fois du monétarisme et des idées des économistes de l'offre (Supply Siders) tels que Laffer, Feldstein et Boskin. Cette politique était basée, surtout, sur le renforcement du contrôle de l'émission monétaire, sur la réduction à la fois des dépenses fédérales pour limiter la demande intérieure et les prélèvements fiscaux pour désengager l'Etat et stimuler l'initiative privée. C'est l'offre qui doit être stimulée et non pas la demande.

Mais cette politique s'est heurtée à une difficulté majeure ; en effet, si on diminue les ressources de l'Etat, il faut réduire d'autant ses emplois, ce qui était impossible du fait du poids des dépenses incompressibles (administration, grands investissements en cours, dépenses militaires,…) ; cela a conduit à un accroissement du déficit budgétaire qui avoisina les 200 milliards en 1984 contrairement à l'objectif fixé de 50 milliards de Dollars en 1981. Au total, cette politique n'est pas parvenue à réduire la croissance de la masse monétaire et les taux d'intérêt élevés expliquent en partie la récession de 1982.

3.2.2 LES POLITIQUES DE LUTTE CONTRE L'INFLATION EN EUROPE ET AUX ETATS-UNIS A L'HEURE ACTUELLE:

Les banques centrales peuvent influencer le taux d'inflation en modifiant le taux de croissance de la masse monétaire à l'aide des instruments de politique monétaire. A cet effet, elles peuvent effectuer des opérations d'open-market (achat et vente d'effets publics) pour atteindre un objectif de taux d'intérêt à court terme, ou fixer directement le taux d'escompte (taux auquel la banque centrale prête aux banques commerciales). Lorsqu'elles vendent des effets publics (c'est-à-dire lorsque des particuliers achètent par exemple, des bons de du Trésor), l'offre de monnaie dans l'économie diminue et le coût de l'argent, c'est-à-dire les taux d'intérêt augmente. Une hausse des taux d'intérêt réduit la demande (surtout de logements, de biens de consommation durables et de biens d'équipement) et, en principe, l'inflation. Une opération inverse devrait avoir l'effet opposé. Ceci est un mécanisme qui est accepté comme valable de manière générale, mais voyons ce qu'il en est pour l'Europe et les Etats-Unis.

[6] *Voir tableau en annexes*

Pour l'Europe, et après la « naissance » de la Banque centrale européenne en 1999, la tache de la lutte contre l'inflation est confiée à cette dernière qui, grâce à sa politique monétaire, qui a été (et restera) le centre de toutes les critiques, essaie de maintenir les prix en baisse et dont la seule arme est le taux d'intérêt. D'autre part, et avec la naissance de la monnaie unique dont on a parlé dans le chapitre précédent, les critères de l'adhésion ont pour objet de que l'inflation soit maintenue à un niveau très bas (2%), pour tout pays candidat à l'adhésion. Avec les critères de Maastricht, les déficits ont été aussi maîtrisés. Mais toutes ces mesures, bien qu'elles aient permis la stabilité des prix, n'ont pas réussi à relancer l'économie européenne restée en stagnation. En Europe, on a toujours cherché à adopter une politique monétaire restrictive permettant de maîtriser la masse monétaire en circulation sans se soucier des retombés de cette politique ; le chômage n'as pas diminué (s'il n'a pas augmenté), la croissance est restée faible, elle a même été pratiquement nulle, dans des pays comme l'Allemagne, à certaines années.

Aux Etats-Unis, la politique de lutte contre l'inflation ressort du domaine de la Réserve fédérale qui, dispose, pour sa part de deux mandats : maintenir la stabilité des prix et relancer la croissance. En effet, En 1996, l'économie américaine, après plusieurs années de forte croissance, semblait aller droit à la surchauffe ; la pression sur le président de la FED pour ralentir l'économie était très forte. Le taux de chômage aux Etats-Unis était alors descendu à 5,5 %. La FED n'a pas fortement relevé ses taux après 1996, permettant au taux de chômage d'atteindre son plancher de 3,9 %. Là n'est qu'un exemple des interventions de la FED qui surveille avec beaucoup d'attention la croissance économique et intervient au moment opportun.

Mais, malgré tout les efforts consentis pour maintenir la stabilité des prix, et qui ont abouti à de bons résultats, la croissance a chuté pour augmenter d'une manière miraculeuse en 2004 ; les déficits ont augmenté à leur tour pour atteindre des valeurs records.

Donc, les politiques actuelles adoptées, que ce soit dans le cas de l'Europe ou dans le cas des Etats-Unis, malgré leur inefficacité concernant la croissance surtout pour l'Europe, ont prouvé leur efficacité en ce qui concerne l'éradication de l'inflation à un tel point, qu'on a pu croire que celle-ci avait disparu à jamais ; mais un autre danger qui ne manque d'importance et qui peut être lui aussi nuisible à la croissance, à savoir la déflation, est apparu dans plusieurs pays et il faut donc l'analyser ; c'est ce qui fera l'objet du paragraphe suivant.

3.3 LA DEFLATION EST ELLE UNE MENACE A LA CROISSANCE?

3.3.1 HISTORIQUE

La déflation n'est que le symétrique de l'inflation. Depuis la crise des années trente, les gouvernements considèrent que la déflation est tout comme l'inflation un risque à ne pas courir. Ces dernières années, et suite à une baisse énorme des taux d'inflation, la crainte au niveau mondial des risques d'une « catastrophe économique », ou plus précisément d'une déflation dont les coûts seraient énormes, s'est accrue. En effet, pour la deuxième fois en cinq ans, la déflation devient un sujet qui préoccupe les observateurs ; la première fois, c'était en 1997 et en 1998, à la suite de la crise asiatique. La deuxième fois est apparue comme la conséquence de la déflation connue au Japon[7], celle qu'ont connue la Chine continentale et plusieurs pays d'Asie à marché émergent en 2002, ainsi que la chute de l'inflation observée dans les pays industrialisés où le taux d'inflation (mesurée par l'indice des prix à la consommation) est descendu au dessous de 2%[8].

La déflation peut être modérée, les indices globaux ne baissent que de 1% et de façon temporaire, quelques trimestres seulement ; ou elle peut être modérée mais persistante sur plusieurs années ; ou elle peut être durable et virulente, une stagnation de l'économie et un chômage élevé accompagnant la baisse des prix et des coûts, comme durant la grande crise des années trente durant laquelle la déflation a été la plus grave du XX^{ème} siècle. Le premier type de déflation, observée par exemple au Canada, en Norvège et en Suède à la fin des années quatre vingt, résulte de l'éclatement d'une bulle des prix des

[7] De nos jours, seul le Japon enregistre une déflation soutenue ; en effet, le Japon a connu depuis la fin des années 1990 une situation monétaire particulière marquée par une grave crise déflationniste. En 1991, l'économie plongeait dans la récession après l'éclatement de la bulle spéculative ; la banque du Japon décide alors de baisser graduellement les taux d'intérêt jusqu'à 0,5 % en 1995. Du début de 1999 au milieu de 2000, devenue indépendante du pouvoir central, elle abaisse le taux d'intérêt à 0 %[7]. En mars 2001, elle adopte une politique dite d'« assouplissement quantitatif » qui tente d'accroître la liquidité et de faciliter le recours au crédit, basé essentiellement sur l'émission massive de monnaie, l'achat de bons du Trésor japonais et une large augmentation du montant des réserves des banques commerciales déposées auprès de la banque centrale.

[8] Un record depuis les années 50, tandis que l'inflation dans les pays à marché émergent est la plus faible depuis la fin des années 60.

actifs. Dans ce cas, la déflation s'accompagne d'un ralentissement de l'activité globale, mais le fléchissement de l'activité et des prix est temporaire.

Une déflation modérée et temporaire est parfois aussi le résultat d'une amélioration marquée de l'offre, comme ce fut le cas récemment en Chine, ou d'une baisse des prix des importations. Dans ces conditions, l'activité économique peut rester vigoureuse et les prix des actifs peuvent même parfois monter.

Néanmoins, dans les deux cas, surtout si elle n'est pas prévue, la déflation entraîne une redistribution du revenu des débiteurs vers les créanciers, ce qui déprime la demande. Avec des salaires nominaux rigides et des prix en baisse, la déflation accroît aussi les coûts réels de la main-d'œuvre et réduit la compétitivité.

Une question qui se pose : quels sont les effets de la déflation sur la croissance ?

3.3.2 LES EFFETS DE LA DEFLATION SUR LA CROISSANCE

Au XIX^{e} siècle et même précédemment, une déflation modérée et persistante n'était pas rare et elle était accompagnée de chocs positifs sur l'offre, mais généralement, même lorsqu'elle n'était pas sévère, la déflation semblait exercer un effet négatif sur le bien-être, ce qui provoquait des conflits sociaux et troubles politiques. Mais, le risque est qu'une déflation modérée devienne plus sérieuse, avec une intensification des baisses des prix et des anticipations de ces baisses.

La déflation a aussi des effets importants sur la répartition des revenus en provoquant des déséquilibres dans les comptes des entreprises et en minant l'efficacité des politiques économiques. Cet effet sur la répartition du revenu a été mis en évidence par Irving Fisher dans un article paru en 1933. Dans cet article, l'auteur montre comment, pendant les périodes de baisse des prix ou déflation, les agents économiques très endettés voient leur situation se dégrader rapidement.

Si la dette est d'un montant fixe, la déflation va avoir pour effet d'augmenter le poids de son remboursement, ceci relativement aux autres postes de dépenses, ce qui va alors engendrer, de façon globale, une réduction de la demande et donc de l'activité. Les principaux bénéficiaires d'une déflation sont donc les créanciers ; en revanche, les plus importants consommateurs, ceux qui ont tendance à consommer la plus grande part de leur revenu, sont aussi souvent ceux qui sont le plus endettés ; d'où l'effet hautement négatif sur l'économie, l'argent allant de ceux qui le dépensent vers ceux qui le thésaurisent.

En conséquence, plus le niveau d'endettement d'une économie est grand (ratio dette totale/PIB), plus une période de déflation a des effets néfastes. Durant le XIXe siècle, la croissance du crédit était limitée par les faibles infrastructures bancaires et la parité or des monnaies. En 1929, le niveau d'endettement a connu un maximum historique aux États-Unis. L'endettement a ensuite progressivement baissé jusqu'au milieu des années 1950. Il a depuis fortement augmenté et se situe désormais bien au dessus du niveau atteint en 1929.

Une autre conséquence de la déflation est le fait que les consommateurs peuvent être incités à reporter leurs achats afin de bénéficier de prix ou de promotions qu'ils espèrent toujours plus attractifs; ce phénomène, de report de l'acte d'achat, est donc, également, hautement négatif sur le niveau général de l'activité. En conséquence, plus la part de la consommation dans le PIB est élevée dans une économie, plus la déflation fait peser des risques importants. Actuellement la part de la consommation dans le PIB américain est bien au dessus des normes historiques et ce phénomène est commun à un moindre niveau pour l'ensemble des pays développés.

Dans une période de déflation, les entreprises subissent une réduction de leurs marges du fait que leurs prix de vente baissent alors que les coûts de production demeurent relativement fixes. Cette stabilité est essentiellement la résultante, non seulement, des contrats à long terme passés avec les fournisseurs, mais surtout de la stabilité des salaires liés aux contrats de travail et/ou aux conventions collectives. Certes, avec le temps, un ajustement s'opère, mais toujours avec du retard, ce qui mine la rentabilité générale des entreprises, les fragilise et augmente les risques de faillites.

3.3.3 QUELLES REMÈDES À LA DÉFLATION

Pour faire face à la déflation, les banques centrales n'ont qu'un seul moyen qui est la diminution du taux d'intérêt, mais cette politique a des défauts majeurs : le premier est que le potentiel de baisse des taux d'intérêt est naturellement limité

car, si ceux-ci peuvent être nuls, voire légèrement négatifs[9], ils ne peuvent pas descendre durablement en dessous de 0%. Le deuxième est que la baisse des taux peut conduire à reporter le problème à plus tard en l'aggravant. Les acteurs économiques très endettés et disposants d'actifs importants (immobilier, actions), profitent de la baisse des taux pour s'endetter un peu plus. On peut alors voir apparaître des bulles dans le prix de l'immobilier, des actions et ou des matières premières. L'expérience montre qu'il est difficile de sortir d'une crise de déflation par une simple diminution des taux d'intérêts ; en effet, le Japon souffre d'une déflation chronique depuis longtemps et pourtant il a maintenu une politique de taux zéro, laquelle n'a pas eu les effets positifs attendus, en termes de reprise de l'activité économique.

Les décideurs des politiques économiques doivent donc être très vigilants, afin d'intervenir le plus rapidement possible pour modifier les anticipations d'achats. C'est pour cette raison que les autorités monétaires américaines, européennes, mais aussi le Fonds Monétaire International n'hésitent pas à mettre l'accent sur ce risque, avec comme objectif l'affectation des anticipations des agents économiques.

Une autre proposition consiste en ce que la Banque centrale financerait la dépense de l'Etat en accordant, par exemple, des aides financières aux ménages ; or cette solution est loin d'être facile à mettre en œuvre, une telle pratique est inflationniste, elle nuit aux banques et autres acteurs privés qui vivent de la hausse de l'endettement et de la création monétaire par ce biais (c'est-à-dire par le biais de l'endettement). D'autre part, en Europe, les dépenses des États nationaux sont encadrées par les règles de gestion qui régissent l'euro, et il apparaît peu plausible que la Banque Centrale Européenne prenne en charge les déficits nationaux.

Ben Bernanke S.[10] voit que les autorités monétaires peuvent prendre des mesures pour jouer sur les anticipations ; en effet, même avec un taux d'intérêt nul et sans création monétaire, la Banque Centrale peut agir sur l'activité économique par l'intermédiaire d'autres canaux, comme par exemple, en promettant de maintenir les taux à court terme nuls pendant une période bien déterminée, ou en achetant des obligations à plus long terme. L'Etat peut encourager l'achat des obligations, en annonçant des objectifs de rendements, en s'engageant à acheter des titres pour un montant qui permettra d'atteindre ces objectifs (de rendement) et en abaissant les taux pour toutes les échéances.

De nos jours, plusieurs économies sont vulnérables à la déflation, d'autres connaissent une déflation modérée. Cette fragilité et cette vulnérabilité à la déflation trouvent leur explication dans l'atrophie de la croissance, des facteurs purement structurels, les contraintes de la politique économique,… . Cependant, les risques d'une déflation mondiale sont faibles ; néanmoins, une fois qu'elle est installée, elle engendre des coûts considérables.

Une expérience a été adoptée par quelque pays pour se prémunir des deux « dangers » à la fois, c'est-à-dire ne pas avoir une économie ni inflationniste ni déflationniste ; ce sont des politiques engagées dans l'expérience du ciblage de l'inflation.

4 LE CIBLAGE DE L'INFLATION COMME REMEDE ET A L'INFLATION ET A LA DEFLATION

4.1 HISTORIQUE DES POLITIQUES DE CIBLAGE

Depuis la fin de la deuxième guerre mondiale jusqu'au début des années soixante-dix, le système de changes fixes qui a été établi à Brettons Woods, faisait du taux d'inflation observé aux Etats-Unis d'Amérique, le point d'ancrage de la stabilité de l'inflation dans les autres pays. Après l'effondrement de ce système (Brettons Woods), quelques pays ont continué à l'appliquer afin de maîtriser l'inflation en rattachant leur monnaie à un autre pays dont le taux d'inflation est faible. Il s'est avéré que cette méthode avait un inconvénient majeur dans la mesure où elle limite la capacité de la Banque Centrale à riposter suite à un choc.

D'autres pays industrialisés ont opté pour un régime de changes flexibles, mais ils avaient besoin d'un point d'ancrage intérieur pour assurer la stabilité des prix. Au milieu des années soixante-dix, un bon nombre de pays (industrialisés) ont adopté des objectifs de croissance des agrégats monétaires (c'est-à-dire la masse monétaire définie de diverses manières). Cette démarche devrait conduire au résultat souhaité qui est la stabilité des prix. Or, bien que cette politique ait permis à certains pays de diminuer leurs taux d'inflation d'une manière assez remarquable par rapport aux taux enregistrés après la

[9] *Comme, par exemple, en Suisse en 1979*
[10] *Gouverneur actuel de la FED*

guerre, l'instabilité persistante de la relation entre la croissance monétaire et l'inflation ont poussé la plupart des pays à abandonner l'idée de cibler les agrégats monétaires pendant les années quatre vingt.

A la fin des années quatre vingt, beaucoup de pays appliquant un régime de change flexible[11], ont commencé à cibler l'inflation. Aujourd'hui plus de quarante pays visent une inflation faible et stable, mais d'après Almeida et Goodhart[12], seuls une poignée d'entre eux peuvent êtres considérées comme pays ayant établi de véritables cibles en la matière (voir tableau en annexes). Ces pays satisfont trois critères : (1) s'engager explicitement à atteindre un objectif donné en matière d'inflation dans un délai donné, (2) annoncer d'une manière régulière leurs objectifs au public, (3) mettre en place des mécanismes institutionnels pour assurer que la banque centrale est responsable de la réalisation de l'objectif.

4.2 EST CE QUE LE CIBLAGE DE L'INFLATION EST EFFICACE ?

Certains économistes pensent que le ciblage de l'inflation a donné de bons résultats jusqu'à présent : les pays qui l'ont adopté enregistrent des taux d'inflation faibles et stables sans sacrifier leur croissance économique. D'autre part, le ciblage de l'inflation représente un moyen concret d'exprimer la volonté de parvenir à la stabilité des prix et de la maintenir. En effet, les pays qu'on vient de voir avaient une mauvaise réputation en matière de lutte contre l'inflation avant qu'ils adoptent les cibles ; l'annonce de ces cibles puis le respect de celles-ci apparaissaient comme un moyen de renforcer la crédibilité de la politique monétaire axée sur la réduction et la maîtrise de l'inflation. Mais, étant donné que l'inflation a fléchi dans de nombreux pays au cours des années quatre vingt-dix, que des cibles explicites y aient ou non adoptées, il est difficile de se prononcer de manière catégorique sur l'utilité de ces cibles ; c'est dans ce contexte que se situe le point de vue de Almeida et Goodhart (1996) qui opinent qu'il est encore tôt pour tirer des conclusions : « il faudra que s'écoule encore un certain temps avant que l'on puisse déterminer si les cibles adoptées en matière d'inflation ont un effet appréciable sur le comportement des banques centrales. Certains indices portent à croire que l'établissement de ces cibles a peut-être eu un effet positif, en particulier dans les pays qui les ont adoptées les premiers (la Nouvelle-Zélande et le Canada), mais les observations sont, pour la plupart, propres au pays considéré. Il est difficile de dégager un profil systématique applicable à tous les pays qui ont opté pour de telles cibles »[13]

5 CONCLUSION

Dans cet article, on a essayé d'estimer la croissance (taux de croissance du PIB réel par habitant) en fonction de l'inflation (déflateur du PIB) et d'autres variables à savoir : la croissance du PIB réel décalé d'une période, le taux de chômage, le taux d'investissement, les dépenses publiques en pourcentage du PIB, le taux d'ouverture, le taux de croissance de la population et l'espérance de vie. La méthode utilisée est la méthode des données de panel, une méthode dans laquelle on a utilisé le logarithme des moyennes des taux de croissance de ces variables. Il ressort de cette estimation que, pour les pays étudiés, l'inflation agit négativement sur la croissance ; le coefficient de détermination R^2 est de 42%. L'ajout d'une variable muette, représentant les chocs pétroliers, n'a rien changé quant à la nature de cette relation entre l'inflation et la croissance ; de plus le coefficient du déflateur du PIB, n'as pas trop varié ; on a trouvé dans la septième régression (avant introduction de la variable muette), un coefficient de (-0.25) et après introduction de la variable muette, on a trouvé un coefficient de (-0.26). Quant au R^2, il est passé de 42% à 41%. D'où on peut dire que la régression n°7, est la meilleure régression qui puisse représenter notre problématique. Donc, d'après ces résultats, la relation qualifiée de négative entre l'inflation et la croissance a été confirmée dans le cas des Etats-Unis et l'Europe.

D'autre part, on a vu que l'inflation et la déflation, toutes les deux, sont néfastes et leurs dangers sont considérables ; une solution pour se prémunir contre ces dernières réside dans le ciblage de l'inflation. Les politiques de ciblage datent depuis la fin des années quatre-vingt, où quelques pays appliquant un régime de changes flexibles, ont commencé à l'adopter mais une minorité d'entre eux peuvent être considérés comme des pays ayant établi de véritables cibles en la matière.

[11] *Au début des pays industrialisés, ensuite des pays à marché émergent.*
[12] *Voir Almeida et Goodhart (1996)*
[13] *Traduction de l'anglais, p.58 dans Almeida et Goodhart (1996)*

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ANNEXES

Différents plans de lutte contre l'inflation en France : (1952-1980)

Plans	Principes
Les plans Pinay et Gaillard (1952-1957-1958)	-Pinay 1952 : emprunt (4,3 milliards), indexé sur l'or, exonéré de droits de succession ; blocage des prix ; contingentement des importations ; allègements fiscaux ; maintien de la parité du franc (un Dollar =3,50 francs) -Gaillard 1957 : restriction du crédit ; majoration de l'impôt sur les sociétés et de la TVA ; diminution du déficit public ; libéralisation partielle des prix ; nouveau contingentement des importations ; emprunt étranger (un Dollar = 4,20 francs). -Pinay 1958 : emprunt public et contrôle du crédit ; dévaluation de 17,5% (un Dollar=4,93 francs) ; création du « franc lourd » ; augmentation des impôts sur les sociétés (qui passent à 50%) et des cotisations sociales ; économies budgétaires ; libéralisation partielles du contingentement.
Les plans Giscard (1963-1969)	-1963 : blocage des prix ; réduction des hausses de salaires dans la fonction publique ; nouveaux impôts (plus-values foncières, hauts revenus, tiercé) ; encadrement du crédit ; emprunt de 2 milliards ; réduction du déficit budgétaire pour 1964 de 7 à 4,7 milliards de francs. 1969 : nouveau blocage des prix, puis « contrats de programme » ; réduction des dépenses publiques et de la création monétaire ; hausse des taux d'intérêts ; dévaluation de 12,5% (un dollar =5,50 francs et contrôle des changes.
Le plan Fourcade (1974)	Prolongation de l'encadrement du crédit ; élévation du taux d'escompte ; renforcement de la surveillance des prix ; pression fiscale accrue (impôts sur les sociétés et hauts revenus, taxe sur profits immobiliers et plus values nées de l'inflation) ; hausse du prix de l'énergie pour en réduire la consommation.
Les plans Barre (1976-1978)	-1976 : blocage des prix (4ème trimestre), gel des tarifs publics au premier semestre 1977, norme de 6,5% de hausse des prix et des salaires pour 1977 ; réduction des investissements publics ; majoration exceptionnelle de l'impôt sur le revenu, hausse de l'impôt sur les signes extérieurs de richesse, des taxes (alcool, vignette auto) ; moindre croissance de la masse monétaire (+ 12,5 % en 1977 contre 16 % en 1976), hausse du taux d'escompte ; fixation de la valeur des importations pétrolières à 55 milliards. -1978 : liberté des prix industriels ; hausse des tarifs publics et des cotisations sociales (ponction de dix milliards sur le revenu des ménages) ; dégrèvements fiscaux aux acheteurs d'actions.

Principaux pays qui ont adopté des cibles d'inflation

	Année d'adoption	Taux d'inflation en % l'année de l'adoption	Taux d'inflation en % établi comme objectif en 2001	Taux d'inflation en % en 2001
Nouvelle Zélande				
Canada	1989	7,5	0 à 3	2,6
Royaume-Uni	1991	7,5	1 à 3	2,5
Australie	1992	3,7	2,5	1,8
Suède	1993	1,8	2 à 3	4,4
République tchèque	1993	4,6	1 à 3	2,4
Israël				
Brésil	1997	8,6	2 à 4	4,7
Chili	1997	9,0	1 à 3 pour 2003 et au-delà	-5,0
Pologne	1999	4,9	2,6	6,9
Colombie	1999	3,3	2,4	3,6
	1999	7,3	5,4 à 6,8	5,5
Corée	2000	8,0	8 pour 2001	8,0 en 2001
Afrique du sud			6 pour 2002	6,3 en 2002
Thaïlande	2000	4,1	2,5	4,1
Hongrie	2000	5,1	3 à 4	4,8
Islande	2000	1,5	0 à 3,5	1,7
Mexique	2001	9,1	5 à 7	9,1
	2001	6,4	2,5 (+ ou -1,50)	6,4
Norvège	2001	6,4	6,5 pour fin 2001 4,5 pour fin 2002	6,4 en 2001, 5,0 en 2002
	2001	3,0	2,5	3,0

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OPTIMUM IRRIGATION OF WHEAT PRODUCTION AT BAU FARM

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ABSTRACT: Field experiment was conducted at the Bangladesh Agricultural University (BAU) farm during Rabi season (from 25 November 2011 to 24 March 2012) to investigate the effects of irrigation water and variety on wheat production. The experiment was set up using split plot design (SPD) with two modern-varieties (MV) of wheat BARI Gam-25 (V_1) and BARI Gam-26 (V_2), each of which received four irrigation treatments viz., T_1 (control), T_2 ((17-21 Days After Sowing (DAS)), T_3 (17-21) + (45-50) DAS) and T_4 ((17-21) + (45-50) + (75-80) DAS), that were randomly replicated thrice. Irrigation was applied IW (Irrigation water) and CEP (Cumulative Pan Evaporation) ratio. The study revealed that maximum grain yield was found BARI Gam-25 which was 4.11 t ha^{-1} where BARI Gam-26 produced 3.90 t ha^{-1} and the highest grain yield (4.32 t ha^{-1}) was found in treatment T_4, its water productivity was the lowest (289 kg ha^{-1}cm^{-1}) of all. On the contrary, treatment T_3, gave a yield of 4.25 t ha^{-1} which was highest one having the highest water productivity of 346 kg ha^{-1}cm^{-1}, indicating less use of water. The grain yield in treatments T_1 and treatment T_2 produced 3.47 t ha^{-1} and 3.99 t ha^{-1} respectively which were significantly lower as compared to T_3 and T_4. The highest irrigation requirement (7.78 cm) was found in the treatment T_4, while treatment T_3 needed only 5.08 cm of water saving about 2.70 cm of water. The effect of variety on plant height and harvest index was significant at 1% level of probability.

KEYWORDS: Split Plot Design, Irrigation treatments, Wheat production, Grain yield, BAU farm.

1 INTRODUCTION

Wheat (Triticum aestivum L.) is the second most important staple food crop of Bangladesh all over the world. It ranks first in area (214 M ha) and production (570 M t) among the grain crops in the world (FAO, 2003). During 2011-2012 the cultivated area of wheat was 3,58,022 ha having a total production of 9,95,356 metric tons with an average yield of 2.78 t ha^{1} (BBS, 2012). However, per hectare yield of wheat in Bangladesh is low in comparison with other wheat growing countries of the world. Even the average yield of 2.94 t ha^{-1} of wheat in 2002 (FAO, 2003) was much higher than that of Bangladesh. The yield of wheat can be increased up to 6.4 t ha^{-1} with appropriate technologies (RARS, 1993). So, there is an opportunity to increase production of wheat per unit area through adoption of improved irrigation and agronomic practices including high yielding varieties.

Boro rice and wheat growing season goes almost parallel in Bangladesh. It has been reported that the water productivity of Boro rice is as high as 3000-4000 litres per kg rice. On the other hand four times wheat can be grown with same amount of water (Sattar, 2004) which is very much promising as far as irrigation water saving is concerned.

The area under cultivation during 2003-2004 was about 0.70 million-ha producing 1.06 million metric tons of wheat with an average yield of 2.13 metric tons per ha (BBS, 2004). The area coverage of wheat in Bangladesh is 0.56 million hectares

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with an annual production of 0.98 million tons and average production is 1.74 metric tons per ha (BBS, 2005). Maximum wheat production so far achieved was 1.9 million tons from 0.85 million ha. However, after that both area and production of wheat started decreasing steadily due to huge crop competition in winter and low price support for wheat.

In a view of the above mentioned facts the present study was undertaken with the following objectives (a) Quantification of irrigation water requirement for wheat (b) Finding of the best judicious irrigation scheduling and (c) Determination of crop water productivity for wheat

2 MATERIALS AND METHODS

The experiment was carried out at the field located near the office of Chief Farm Superintendent (CFS) under block no.1, BAU, Mymensingh during the Rabi season of 2011-2012. The study area lies approximately between 24˚36′ to 24˚54′ N and between 90˚15′ to 90˚30′ E. The topography of the land is high. The morphological characteristics of the soil of the study area are given in table 1.

Table 1. Morphological characteristics of the soil

Sl. No.	Constitution	Characteristics
1	Location	Near CFS office
2	Soil tract	Old Brahmaputra Alluviam
3	Land type	Medium high land
4	General soil type	Non- calcarious dark gray flood plain
5	Agro ecological zone	Old Brahmaputra flood plain (AEZ-9)
6	Topography	Fairly level
7	Soil color	Dark gray
8	Drainage	Moderate

Source: Department of soil science, BAU, Mymensingh

The climatic conditions of the study area are characterized by an annual rainfall of 2030 mm, and mean annual temperature of 25.4°C. The climate is sub-tropical with an average rainfall of 2420 mm concentrated mainly over the month of May to September. Weather information on rainfall, temperature, relative humidity, pan evaporation and sunshine hours of the experimental site are presented in Table 2. for the year 2011-2012.

Table 2 Weather data of the experimental site for the wheat growing period of 2011-2012.

Parameters	Months			
	December	January	February	March
Rainfall (mm)	0.00	18	0.00	1.2
Mean maximum air temperature (°C)	26.04	23.56	24.94	29.42
Mean minimum air temperature (°C)	13.22	13.09	13.81	20.46
Mean average relative humidity (%)	83.55	84.32	74.03	80.87
Mean evaporation (mm)	2.10	1.65	2.83	3.35
Mean sunshine (hours)	6.52	4.11	6.53	5.30

The land was ploughed and all the weeds and stubbles were removed from the field and thus, the land was made ready for sowing. Prior to sowing seeds the whole experiment field was divided into unit plots maintaining the desired spacing.

2.1 DESIGN AND LAYOUT OF THE EXPERIMENT

The experimental plots (3m x2m) were laid out with split plot design (SPD) having four irrigation treatments and two varieties. There were three replications of combinations of both the treatments (Variety and irrigation). All of these events were randomly chosen to avoid any biasness towards the selection. The layout of the experimental field is shown in the Fig. 1.

2.2 SELECTION OF WHEAT VARIETY

Bangladesh Agricultural Research Institute (BARI) developed some modern varieties of wheat named BARI Gam-25 (released in 2001) and BARI Gam-26 (released in 2005). The two varieties were developed by BARI. These are temperature tolerant varieties. BARI Gam-25 variety attains a height of 95-100 cm and takes 105-110 days to complete the life cycle and it is resistant to leaf rust and leaf spot diseases. BARI Gam-26 matures at 107-114 days. The yield of BARI Gam-25 and BARI Gam-26 are 3.6-4.6 t ha^{-1} and 3.5-4.5 tha^{-1}, respectively (BARI 2006).

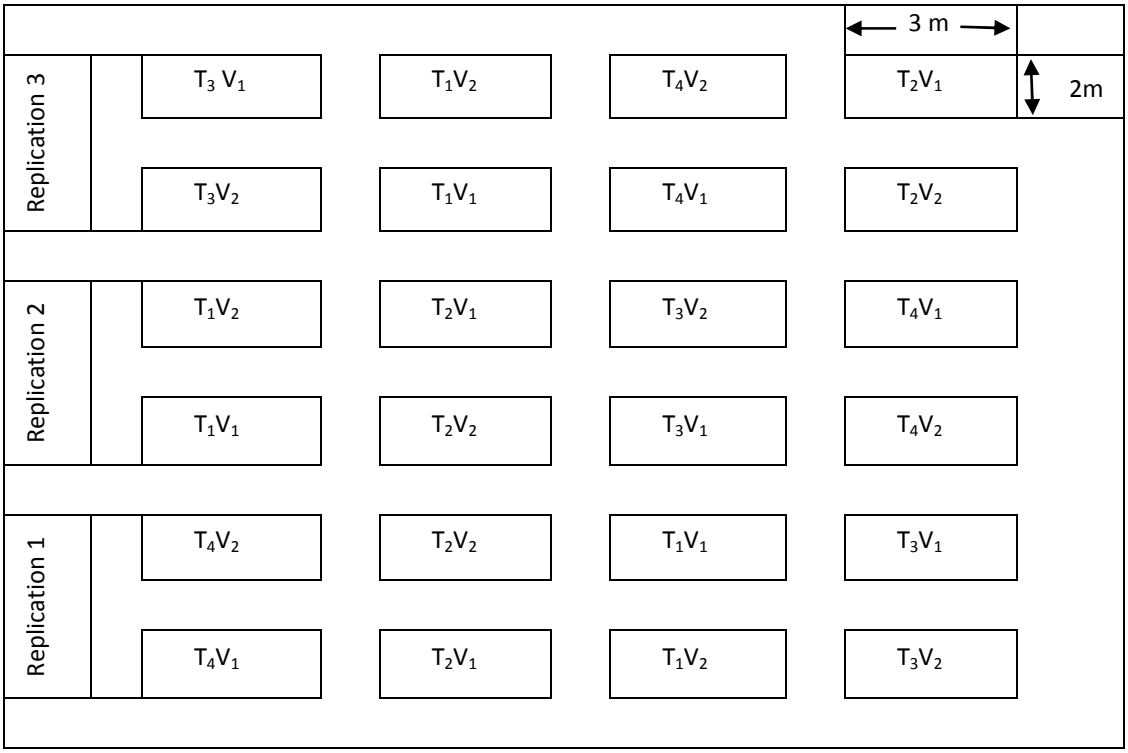

Fig.1 Layout of the experimental field

2.3 IRRIGATION TREATMENTS

The irrigation treatments were the only variable whose effect is expected from the experiment. The treatments were T_1: No irrigation (control), T_2: 17-21 days after sowing (DAS), T_3: (17-21 DAS) + (45-50 DAS), T_4: (17-21 DAS) + (45-50 DAS) + (75-80 DAS).

2.4 ESTIMATION OF EVAPORATION FROM EVAPORATION DATA

The relationship between evapotranspiration and pan evaporation are

Evapotranspiration = pan evaporation × crop factor

The value of crop factor for any crop depends on foliage characteristics, stage of growth, environment and geological location.

2.5 CALCULATION OF IRRIGATION WATER REQUIREMENT

The following equations ware used for calculating water related parameters:

i) $IW = (CPE \times k_p \times 0.75) - ER$

Where, K_p = pan coefficient, 0.7 (Michael, 1978), ER = Effective Rainfall, CPE = Cumulative Pan Evaporation

ii) The calculated amount of water was applied to individual plot as per treatment.

iii) The seasonal water requirements (WR) were computed by adding measured quantities of applied irrigation water, the effective rainfall received during the season and the contribution of soil water.

WR = IW+ ER ± Soil water contribution

iv) Water productivity (WP) = $\frac{Crop\ Yield\ (t/ha)}{WR}$

Where, WR = Water Requirement

2.6 SOIL WATER CONTRIBUTION

The moisture content was then determined using the following equation.

$$\%\ Moisture = \frac{W_2 - W_3}{W_3 - W_1} \times 100$$

Where, W_1 = weight of can (gm), W_2 = weight of can + weight of soil sample (g) and W_3 = weight of can + weight of oven dry soil (g)

2.7 DETERMINATION OF EFFECTIVE RAINFALL

Effective rainfall was estimated using the USDA Soil Conservation Method (Smith, 1992) as given:

$P_{effective} = P_{total}(125 - 0.2\ P_{total})/125$……(1) for $P_{total} < 250$ mm

$P_{effective} = (125 + 0.1\ P_{total})$ ……(1) for $P_{total} > 250$ mm

Where, $P_{effective}$ = effective rainfall (mm), P_{total} = total rainfall (mm).

However, this effective rainfall is an approximation.

Effective R – rainfall using FAO method:

$R_e = 0.8\ R - 25$ if R < 75 mm/month

$R_e = 0.6\ R - 10$ if R > 75 mm/month

Table 3 Calculation of effective rainfall from rainfall data

Month	Rainfall (mm)	Effective rainfall (mm)
December (2010)	0	0
January (2011)	18.0	17.0
February (2011)	0	0
Total	18.0	17.0

2.8 DETERMINATION OF CROP WATER REQUIREMENT (WR)

Mathematically, water requirement is expressed by the following relationship (Michael, 1985):

$$WR = IR + ER + \sum_{i=1}^{n} \frac{M_{si} - M_{hi}}{100} A_i D_i$$

Where, WR = seasonal water requirement (cm), IR = total irrigation water applied (cm), ER = seasonal effective rainfall (cm), M_{si} = moisture content at sowing in the i^{th} layer of the soil (%), M_{hi} = moisture content at sowing in the h^{th} layer of the soil (%), A_i = bulk density of the i^{th} layer of the soil (g cm^{-3}), D_i = depth of the i^{th} layer of the soil within the root zone (cm) and n = number of soil layers in the root zone.

The field water use efficiency (FWUE) was calculated as grain yield (kg ha^{-1}) divided by seasonal water requirement in the crop field (cm).

2.9 CALCULATION OF IRRIGATION WATER

a. Calculation of first irrigation water (18 days after sowing)

Cumulative pan evaporation for the period CPE = 39.5 mm, Effective rainfall, ER = 0 mm, K_p = 0.7

Irrigation requirement, IW = (CPE ×k_p ×0.75) – ER =1.96 cm

Volume of water applied per plot of size (3m × 2m) I_2 was 116 L.

b. Calculation of second irrigation water (49 days after sowing)

Cumulative pan evaporation for the period, CPE = 68.9 mm, Rainfall = 5 mm, Effective rainfall, ER = 4.96 mm, K_p = 0.7

Irrigation requirement, IW = (CPE ×k_p ×0.75) – ER = 3.12 cm

Volume of water applied per plot of size (3m × 2m) I_3 was 187 L.

c. Calculation of third irrigation water (78 days after sowing)

Cumulative pan evaporation for the period, CPE = 77 mm, Rainfall = 13 mm, Effective rainfall, ER = 12.73 mm, K_p = 0.7

Irrigation requirement, IW = (CPE ×k_p ×0.75) – ER = 2.70 cm

Volume of water applied per plot of size (3m × 2m) I_4 was 166 L.

3 RESULTS AND DISCUSSION

Analysis of Variance (ANOVA) indicates statistically significant effects of irrigation as an additive on growth and yield parameter of wheat, soil moisture retention, water use efficiency and water saving.

3.1 EFFECT OF TREATMENTS ON PLANT HEIGHT

The Statistical analysis showed that plant height was significantly influenced by different levels of irrigation (Table 5). At sowing time, moisture content of the soil was very high (about 24%, which is greater than field capacity of 18%). So treatment T_1 is rainfed. Treatment one and treatment two has no difference and the effect is same. The tallest plant height was found in the treatment T_3 (95.50 cm) and the smallest plant height was obtained by the treatment T_1. Fig.2 and Fig.3 showing the graphical representation of the effect of variety and irrigation on plant height.

3.2 EFFECT OF IRRIGATION TREATMENTS ON PANICLE LENGTH

The results obtained from the experimental findings showed that there was no effect of the variety on the panicle length. But level of irrigation had a significant effect on panicle length. It was found that increasing water supply increases the panicle length (Fig. 4).

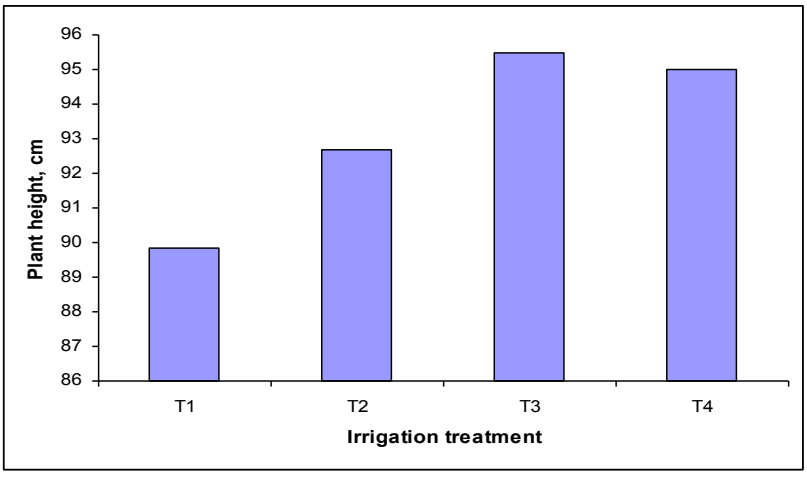

Fig. 2 Plant height for different irrigation treatments

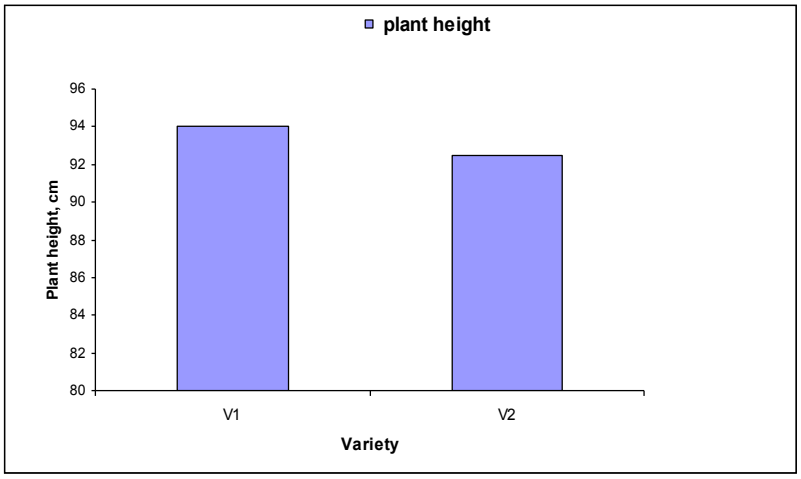

Fig. 3 Effect of variety on plant height

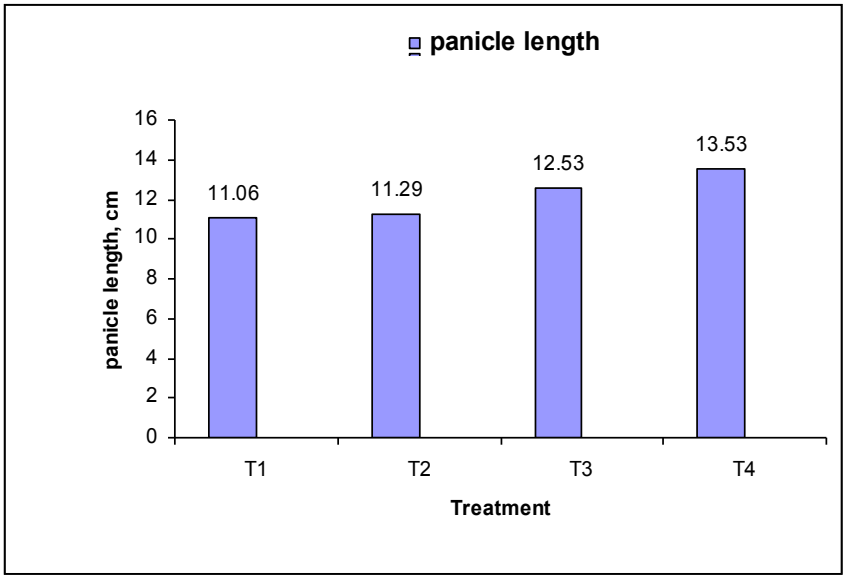

Fig. 4 Effect of irrigation level on panicle length

3.3 EFFECT OF IRRIGATION TREATMENTS AND VARIETIES ON 1000 GRAIN WEIGHT

The values of 1000 grain weight were found to be significant in this analysis for variety, treatment and interaction effects between the varieties and the treatments (Table 6). For variety effects BARI Gam-26 produced 40.81 g where BARI Gam-25 produces 44.66 g of 1000 grain weight. It was found that maximum weight of 1000 grain was 45.05 g for the treatment T_4 and minimum weight of 1000 grain was 39.59 g for the treatment T_1(rainfed) (Fig. 5). It was found that maximum yield was 40.15 g for the interaction V_2T_4, and minimum yield was 37.75 g for the interaction V_2T_1. There was a significant variation between the highest and the lowest value (Table 6).

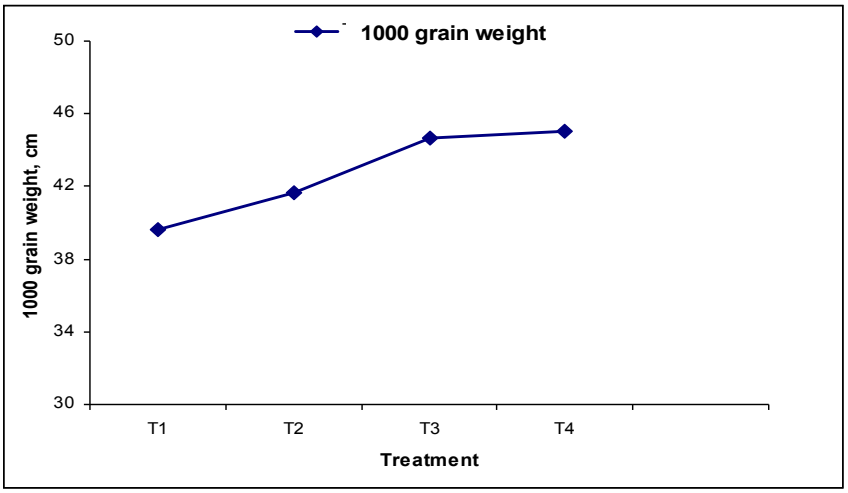

Fig. 5 Effect of irrigation on 1000 grain weight

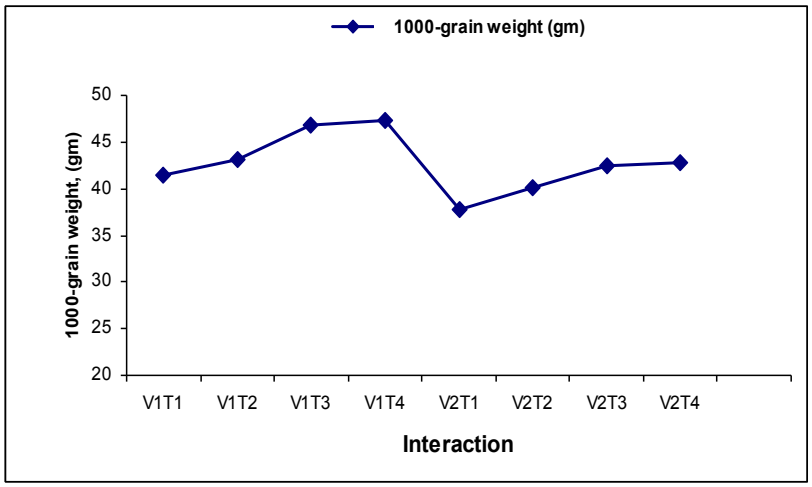

Fig. 6 Effect of interaction (variety × irrigation) on 1000 grain weight

3.4 EFFECT OF TREATMENTS ON GRAIN YIELD OF WHEAT

BARI Gam-25 produced higher yield (4.11 t ha^{-1}) than BARI Gam-26 (3.9 t ha^{-1}) (Fig. 7). The effect of irrigation treatments was significant at 1% level of probability. Water supply has a strong effect on production of wheat. Maximum yield was found 4.32 t ha^{-1} when T_4 treatment was applied. Minimum yield was obtained 3.47 t ha^{-1} for treatment T_1 (Rainfed condition). But the yield difference between the treatment of T_3 and T_4 were insignificant for 1% level of probability. Treatment T_3 produced 4.25 t ha^{-1} where T_4 produced 4.32 t ha^{-1}. It was found that additional application of irrigation water did not increase the considerable quantity of yield (Fig. 8).

Table 4 Varietal (BARI Gam-25 and BARI Gam-26) effects on the yield and yield contributing characters of wheat.

	Plant height (cm)	Panicle length (cm)	No. of filled grain/ panicle	No. of unfilled grain/ panicle	1000-grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)	Moisture content
V_1= BARI Gam25	94.00	12.16a	62.00a	0.51b	44.66a	4.11a	5.03a	9.14a	45.02	12.26
V_2= BARI Gam26	92.50	12.04b	58.17b	0.72a	40.81b	3.90b	4.82b	8.73b	44.76	12.35
LSD	1.441	0.040	0.481	0.063	0.857	0.063	0.028	0.093	0.28	0.129
Level of sig.	NS	*	**	*	*	**	*	*	NS	NS

** = Significant at 5% level of probability, ** = Significant at 1% level of probability, NS = Not significant*

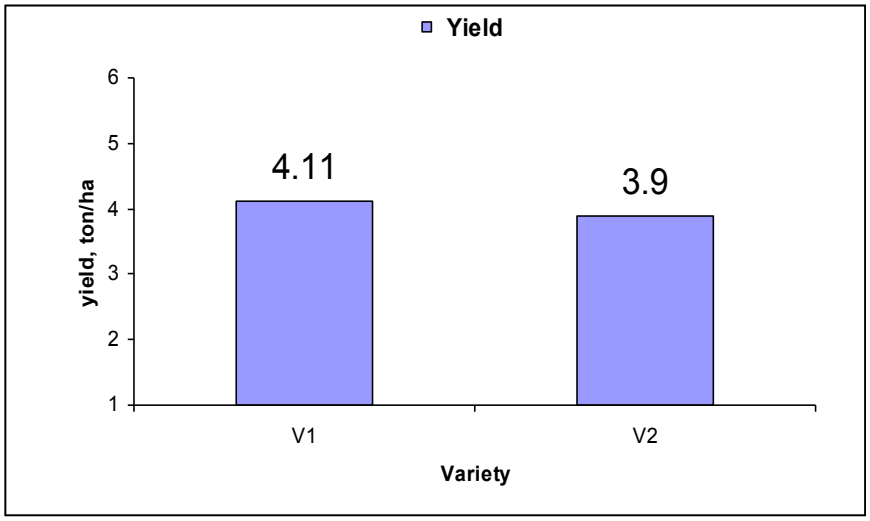

Fig.7 Effect of variety on grain yield

Table 5 Effect of different irrigation treatments on the yield and yield Contributing characteristics of wheat.

	Plant height (cm)	Panicle length (cm)	No. of filled grain/ panicle	No. of unfilled grain/ panicle	1000- grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)	Moisture content
T_1	89.83c	11.06c	54.67c	1.13a	39.59c	3.47d	4.24d	7.71d	44.95b	12.15b
T_2	92.67b	11.29c	59.17b	0.62b	41.65b	3.99c	4.78c	8.77c	45.55a	12.32ab
T_3	95.50a	12.53b	63.00a	0.45c	44.66a	4.25b	5.29b	9.71a	44.57b	12.40a
T_4	95.00ab	13.53a	63.50a	0.25d	45.05a	4.32a	5.39a	9.54b	44.49b	12.35a
LSD	2.038	0.056	0.680	0.089	1.212	0.089	0.40	0.132	0.39	0.182
Level of sig	**	**	**	**	**	**	**	**	**	**

** = Significant at 5% level of probability, ** = Significant at 1% level of probability, NS = Not significant*

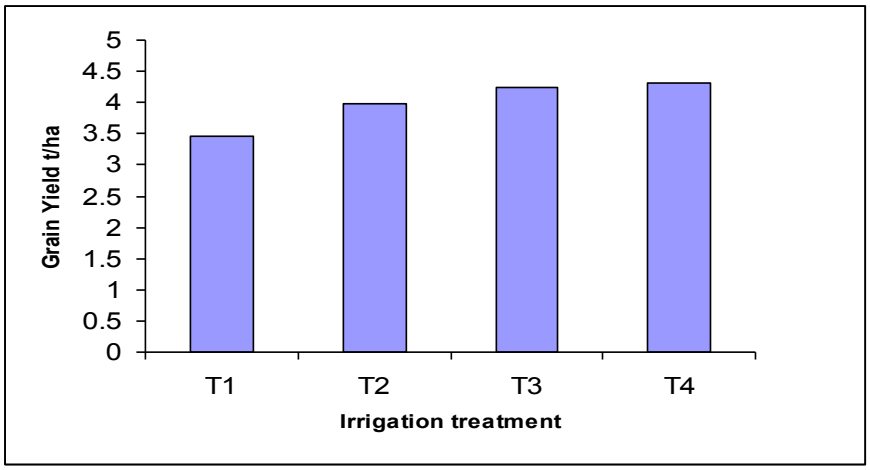

Fig. 8 Effect of irrigation on grain yield

Table 6 Effect of interaction between variety and treatment

	Plant height (cm)	Panicle length (cm)	No. of filled grain/ panicle	No. of unfilled grain/ panicle	1000-grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)	Moisture content
V_1T_1	90.33	11.06	56.33	1.04b	41.43cd	3.62f	4.31e	7.93f	44.67b	12.03
V_1T_2	92.67	11.34	61.67	0.49e	43.16b	4.07d	5.04c	9.11d	44.69cd	12.34
V_1T_3	96.00	12.59	65.00	0.29f	46.78a	4.37b	5.36a	9.70ab	45.69cd	12.35
V_1T_4	97.00	13.67	65.00	0.22g	47.28a	4.42a	5.40a	9.81a	46.95bc	12.32
V_2T_1	89.33	11.06	53.00	1.21a	37.75e	3.31g	4.17f	7.48g	44.23d	12.26
V_2T_2	92.67	11.25	56.67	0.76c	40.15d	3.92e	4.52d	8.44e	46.41a	12.30
V_2T_3	93.00	12.47	61.00	0.61d	42.53bc	4.32c	5.21b	9.37c	44.45cd	12.45
V_2T_4	95.00	13.39	62.00	0.28f	42.82b	4.35c	5.39a	9.61b	45.00d	12.38
LSD	2.882	0.080	0.961	0.126	1.715	0.126	0.56	0.187	0.56	0.258
Level of sig	NS	NS	NS	**	**	*	**	**	**	NS

** = Significant at 5% level of probability, ** = Significant at 1% level of probability, NS = Not significant*

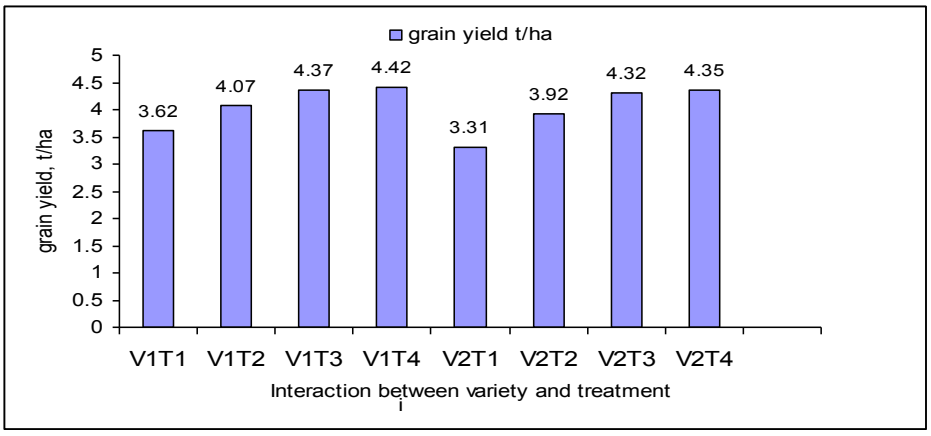

Fig. 9 Interaction effect on grain yield

The interaction between the variety and irrigation treatments was also significant at 1% level of probability. The highest yield (4.42 t ha^{-1}) was obtained in V_1T_4 and the lowest yield (3.31 t ha^{-1}) was in V_2T_1 (Fig. 9).

3.5 EFFECT OF VARIETY AND IRRIGATION TREATMENT ON STRAW YIELD AND BIOLOGICAL YIELD

Interaction of variety and irrigation treatment is not significant. But irrigation treatment has a significant effect on straw yield. The highest yield was found 5.29 tha^{-1} for the treatment T_3 and the lowest yield was 3.96 tha^{-1} for the treatment T_1 (Fig. 10). Effect of variety and interaction of variety and treatment is not significant in 1% and 5% level of probability. But effect of treatment is significant at 1% level of probability. Maximum biological yield obtained 9.71 ton/ha for the treatment T3 and minimum 7.71 for the treatment T1 (Table. 5).

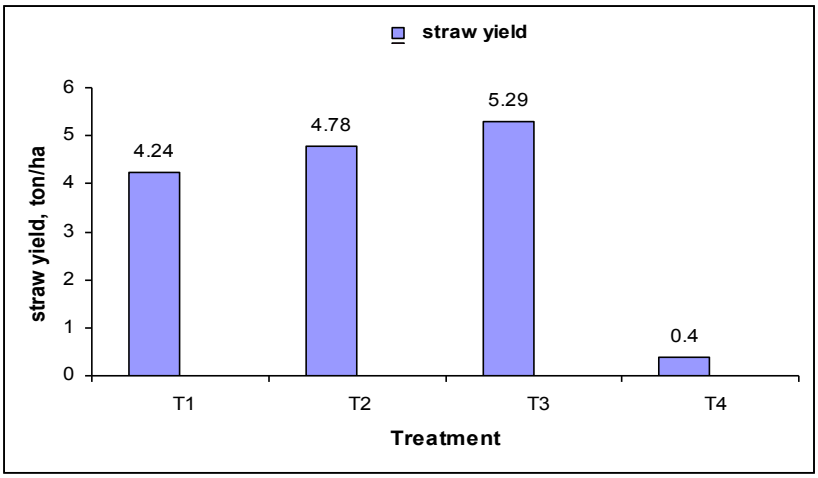

Fig.4.9 Effect of irrigation on straw yield

3.6 EFFECT OF VARIETY AND IRRIGATION ON HARVEST INDEX

Maximum harvest index was obtained 45.02% for the variety BARI Gam-25 where 44.76% for the variety BARI Gam-26. Effect of treatment was not significant for 1% and 5% level of probability. The interaction between variety and treatment was significant at 1% level of probability. Maximum harvest index was 46.97% for the interaction V_1T_4 and minimum 44.23 for the interaction V_2T_1 (Fig. 11).

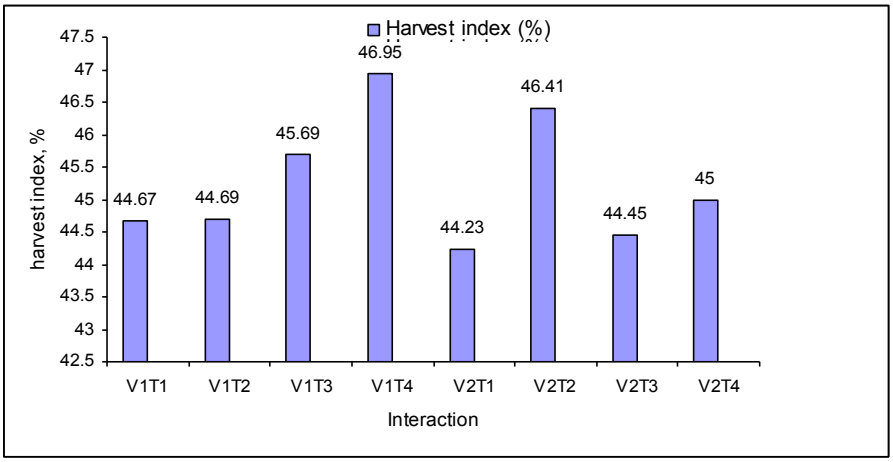

Fig. 11 Interaction effect on harvest index

3.7 WATER PRODUCTIVITY OF WHEAT

Calculations for water productivity of wheat are shown in the Table 7. It shows that maximum water productivity of wheat was 1954 kg ha^{-1} cm^{-1} and it was found for the treatment T_3. As treatment T_1 was control and no artificial water was

applied during the growing season, the water productivity is not applicable. Normally rainfall did not occurred in rainy season especially in January. But in this season 18 mm rainfall has occurred in January.

Table 7 Water productivity of wheat

Interactions	Effective rainfall (cm)	Soil-water contribution (cm)	Irrigation applied (cm)	Total water used (cm)	Grain yield (t ha^{-1})	Water Productivity kg $ha^{-1}cm^{-1}$ (kg m^{-3})
T_1	1.77	5.40	0	7.17	3.47	484 (4.84)
T_2			1.96	9.13	3.99	438 (4.38)
T_3			5.08	12.25	4.25	346 (3.46)
T_4			7.78	14.95	4.32	289 (2.89)

4 CONCLUSION

The analysis shows that the yield BARI Gam-26 (3.90t ha^{-1}) produced comparatively less yield than BARI Gam-25 (4.11t ha^{-1}). It was found that BARI Gam-25 was superior to BARI Gam-26 in terms of grain yield and biological yield. The highest grain yield (4.32 t ha^{-1}) was found in treatment T_4, but its water productivity was not highest. The treatment T_3 produced 4.25 t ha^{-1} grain yields which was slightly less than that produced under treatment T_4. Its water productivity was the highest than all. Treatment T_1 and T_2 gave the yield of 3.47 t ha^{-1} and 3.99 t ha^{-1}, respectively. The biological yield was 7.71, 8.77, 9.71 and 9.54 t ha^{-1} for the treatment T_1, T_2, T_3 and T_4, respectively. The maximum biological yield was found for the treatment T_3. Maximum plant height was obtained under treatment T_3 and it was 95.50 cm. The treatment T_3 would be the best choice for wheat production at BAU farm.

The highest grain yield (4.42 t ha^{-1}) was obtained for the interaction V_1T_4 and the lowest yield was 3.31 t ha^{-1} for the interaction V_2T_1. V_1T_3 (4.37 t ha^{-1}) and V_1T_4 (4.42 t ha^{-1}) produced nearly same amount. The tallest plant was observed 95.0 cm for the interaction V_1T_4 and the shortest plant 89.33 cm for the interaction V_2T_1. The highest panicle length was found as 13.67 cm for the interaction V_1T_4. The highest yield and yield contributing characters were obtained for the interaction V_1T_3.

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Molecular assay of Polyketide Synthase gene of Alternariol (AOH) produce by *Alternaria alternata*

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ABSTRACT: *Alternaria alternata* one of widely distribution plant pathogenic and saprophytic fungi. *A. alternata* producing more than 70 secondary metabolites, One of the important metabolites (AOH). The main effect of alternariol (AOH) lies in the generation reactive oxygen species (ROS) in rat's liver cytochromes. The aim of this work was studying the detection of polyketide synthase gene that responsible for Alternariol (AOH) production from *Alternaria alternata* by specific primer. Detection of AOH production by thin layer chromatography and the *PKSJ* gene by specific primer in PCR thermal cycle.43 sample of infected tomato by early blight disease in Karbala city collecting and cultured on PDA. For detection of mycotoxins (AOH) production. Designed this primer through the use of the complete sequence of the *PKSJ* gene (Gene bank sequence JX103645.1) from the site of Gene bank-NCBI and Primer3plus using the program to design primers and used in the PCR test. The result showed 23 out off 24 isolates were produced AOH toxin. TLC plate (Silica gel G60 20x20cm) was used for detection of AOH in comparison with OTA standard spot. 23 isolates was produced AOH toxin. TLC plate was used for detection of AOH in comparison with OTA standard spot. PKSJ primer that designed in this study was success for the detection and investigation of the gene responsible for the production of AOH, where the primer could amplify the target piece of *PKSJ* gene and produce bands by molecular weight 514 bp on agros gel for all isolates that produced the toxin according to the TLC results. Most isolates of *A.alternata* can produce AOH toxin. The specific PKSJ primer was success by PCR amplified the target gene with all isolates excepted isolate No. 2 which not produce AOH, finally the PKSJ primer is specific primer for detection of polyketide synthase gene.

KEYWORDS: *A.alternata*, AOH toxin, PCR, polyketide synthase gene, Iraq.

1 INTRODUCTION

The species *A. alternata* is one of widely distributed plant pathogenic and saprophytic fungi *A. alternata* cause plant diseases on many crops (Logrico et al., 2009), affecting the leaves, stems, contaminating fungi in wheat, sorghum and flowers, and fruits. And it is principal barley (Scott and Stoltz, 1980).

A. alternata produces more than 70 secondary metabolites, One of the important metabolites (AOH), and it common contaminants of food such as tomato fruits, fruit juices and grain crops. The main effect of alternariol (AOH) lies in the generation reactive oxygen species (ROS) in rat's liver cytochromes. Anther effects of this toxin are cytotoxic, apoptosis, senescence of cell and micronucleus formation (Schreck et al 2012).

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2 MATERIAL AND METHODS

FUNGAL ISOLATION AND IDENTIFICATION

43 sample of infected tomato by early blight disease in Karbala city collecting and cultured on PDA for 5-7 days at 25 ºC. Identification fungi according to (Ellis,1971; Booth, 1971 ; Koneman *et al*., 1997 ; Benson, 2002).

ANALYSIS OF MYCOTOXINS USING THIN LAYER CHROMATOGRAPHY (TLC)

For detection of mycotoxins (AOH) production. Three disks from each plate were extracted by shaking with 1 ml ethyl acetate for 1 hour. The solvent was vaporized in a speed vacum and the pellet resolved in 60 ml ethyl acetate. 20 µl were used for TLC with a mobile phase composed of toluol, ethylacetate and formic acid (5:4:1) on silica plates (Merck TLC silica gel 60) and visualized under UV light, 365 nm. with a standard.

PRIMER DESIGN

Designed this primer through the use of the complete sequence of the *PKSJ* gene (Gene bank sequence JX103645.1) from the site of Gene bank-NCBI and Primer3plus using the program to design primers and used in the PCR test. Primer have been equipped by the Korean company Bioneer (Table 1).

Table 1. Specific primer for detection polyketide synthase gene

Primer		Sequence	PCR product size
PKSJ	F	5´CTGCGGGAATGCTTTCGATG 3´	514 bp
gene	R	5´TGCCAATCTCGAAGGCCAAT3´	

SPECIFIC PCR AMPLIFICATION

The specificity of this primer was tested against isolates of a range of *A. alternata.* The program parameters for thermal cycling for the primer sets were as described Table (2).

Numbers and times of thermal cycles PKSJ gene

PCR Step	Repeat cycle	Temperature	Time
Initial denaturation	1	95 ºC	5 min
Denaturation	30	95 ºC	30 sec.
Annealing		58 ºC	30 sec
Extension		72 ºC	45 sec
Final extension	1	72 ºC	5 min
Hold	-	4 ºC	∞

3 RESULTS AND DISCUSSION

ISOLATION AND IDENTIFICATION

24 isolates of *A. alternata* from Karbala (Iraq) inoculated on PDA for 5-7 days at 25 °C identified macroscopically by shape and colour and microscopically depend on the shape, size and arrangement of spores and conidiophor. According to the characteristics incoming by (Booth, 1971; Koneman *et al*., 1997; Benson, 2002).

PRODUCTION AND IDENTIFICATION OF AOH

The identified isolates of *A.alternata* were tested for the production of AOH by using PDA . 23 isolates was produced AOH toxin and only one isolate No. 2 was not. TLC plate (Silica gel G60 20x20cm) was used for detection of AOH in comparison with OTA standard spot. TLC plate which contain previous samples spots developed by toluene-ethyl acetate-90% formic acid

(5: 4: 1 v /v) as reported by (Debjani et al., 2012). The AOH was detected by the use of UV light (336 nm) , the AOH appeared as a blue fluorescence spot , figure (1).

This results are aggregate with confirmed Li and Liangcheng (2006) of that most isolates fungus *A. alternata* have ability to produce AOH under different conditions and on the most host (Barkai-Golan, 2008.)

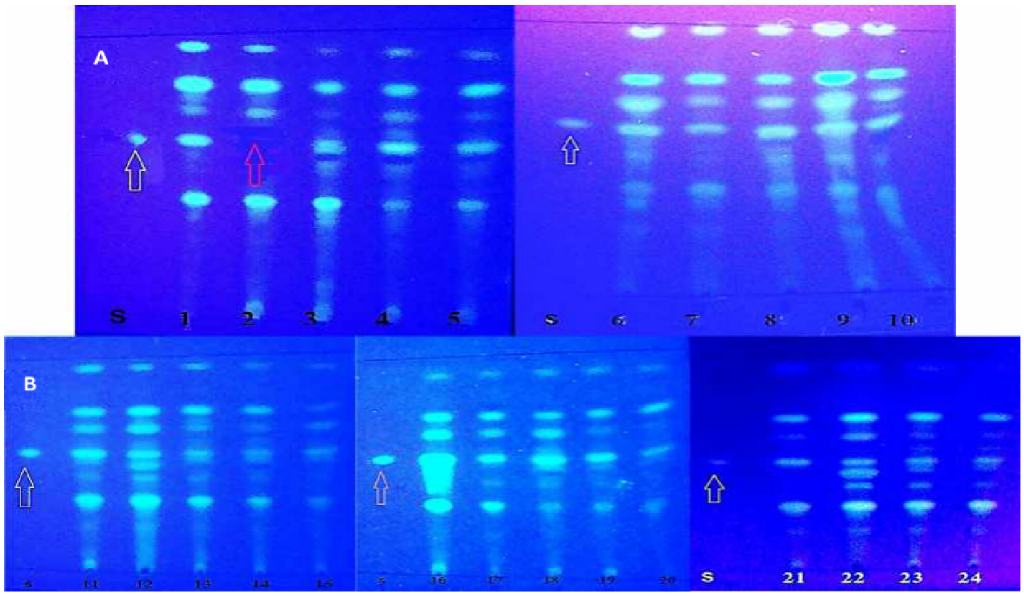

Fig. 1. TLC plate (Silica gel G60 10x5cm) under UV light (336 nm) illustrated AOH samples and standard spot by using development solution (toluene-ethyl acetate-90% formic acid (5: 4: 1 v /v).

DETECTION OF PKSJ GENE BY PCR

PKSJ Primer that designed in this study was success for the detection and investigation of the gene responsible for the production of AOH, where the primer could amplify the target piece of PKSJ gene and produce bands by molecular weight 514 bp on agros gel for all isolates that produced the toxin according to the TLC results. Primer is failure with isolate No. 2 which not have ability to produce AOH toxin.

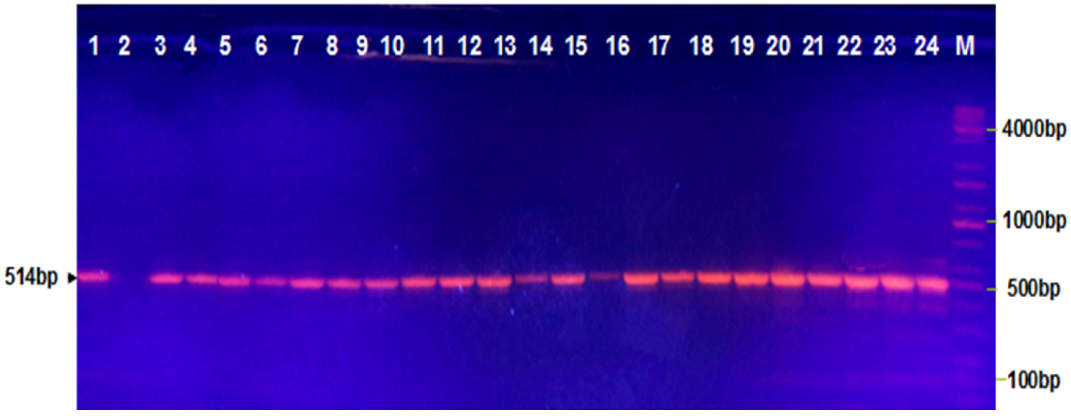

Fig. 2. Agarose gel electrophoresis for amplified PKSJ gene. Bands were fractionated by electrophoresis on a 1.5 % agarose gel (2 h., 5V/cm, 1X Tris-acetic buffer) and visualized under U.V. light after staining with ethidium bromide staining. Lane M: 4000bp ladder.

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STUDY OF ATTITUDES OF PARENTS, TEACHERS AND MANAGERS TOWARDS INCLUSIVE EDUCATION IN PAKISTAN

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ABSTRACT: Inclusive Education has gained sufficient ground in developed systems. Its extension to Pakistan and elsewhere emerged as a result of "Islamabad Declaration on Inclusive Education 2005". Government of Pakistan Ministry of Education in collaboration with UNESCO organized this National Consultation on Inclusive Education. This study intended to measure the attitudes of key stakeholders, teachers, head teachers, (managers) of the pilot project towards this initiative. Attitudinal scale and interview process will be evolved to collect the field-based data, together with school profiles to measure the level of their commitment. Statistical treatment in the form of tables, charts and graphs was assigned to the raw data. Factor analysis and other relevant analytic tools were equally used. Analysis of the data yielded that the teachers and head teachers were well aware of the concept of inclusive education. Integration of the two groups was at initial stage. Its full reorganization would gain ground with increased training. Socialization and developing belongingness, patterns of personality development and Health facilities, increased mothers' involvement formed major gaps for future research.

KEYWORDS: Inclusive Education, Attitude, Parents, Teacher, Manager.

INTRODUCTION

Inclusive education is a new term in the terminology of education. It traces its origin to the special education. It integration to the mainstream of education is a resent phenomena. The theme is that the children having disabilities should have the right to learn with the normal children. The theme is to integrate their tearing in the overall structure of mainstream. The concept is that general and special education be integrated as an inclusive system. This is the concept of inclusive education in global and elsewhere.

In education inclusion is an approach says that all pupils in the catchment area who have a disability, or who experience difficulties in learning, should enjoy the same rights of membership of the mainstream as all other pupils. They should be fully part of our school community and receive an education and social life according to their age, needs, aptitudes and ability.Education for All (EFA) is an international initiative and in this prospective the World Conference on Inclusive Education for All, Jomtien (1990) declared that education disparities existed especially vulnerable to discrimination and exclusion. Basic education should provide and improve the quality of education for the all children and also special attention should be provided to disabled.

An effective teacher in an inclusive classroom has the ability and skills to plan for the content coverage and takes into account the difference between students by scope and sequences their objectives. Moreover, effective teachers have good strategies to take advantage of time by maximizing academic time on- task and have good presentation skills including the

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variables which might influence the teaching process, thus making the presentation very clear and keeping the students active and engaged, monitoring the academic practices in the inclusive classroom with frequent questioning and giving immediate feedback (Mastropieri and Scruggs, 2004; Westwood, 2003).

Including the students with disabilities and having the knowledge of how to treat them are important characteristics of the effective school in this regard, Ainscow (1991) indicated that the effective school has effective leadership and staff who are able to deal with all students and their needs, is optimistic that all the students can progress and develop their abilities toward successful achievement, has a willingness to support its staff by meeting their needs and taking into account the curriculum and ensuring that the curriculum meets all the students needs and also effective school reviews its programs (teachers, curriculum, students progress) frequently making sure there is progress in terms of the effective teacher. Successful teachers challenge the students' abilities by setting good quality tasks, providing students with opportunities to choose their tasks, variegating learning strategies and providing facilities that contribute to student learning.

ATTITUDE

Allport(as cited in Deppler., et al, 2004,p.4) suggests that an attitude is basically a readiness to respond in a particular kind of way: but attitude also are very emotional because they reflects the ways we evaluate people (including over selves) and things. Attitude guide a person whether he/she likes or dislikes and whether he/she wants to avoid or approaches something or some person. People do not come on the earth with attitudes. They learn them from their society .social psychology considers how attitude are formulated during interaction with people and how people perceives one another. When we meet or avoid other people, our perception and our behavior are strongly influenced by a long period of time.

Callan, et al (199, p.49) describes that attitude are often defined as learned reactions for or against an object or a class of objects. In the definitions of attitude there are aspects worth emphasizing. First , attitude are always directed towards objects here should be understood generally to include physical objects , social objects, behaviors, social objects, second attitude are learned , presumably through socialization. Third, attitude are always concerned with evaluated dimensions of for or against, like or dislike, or approaches or avoidance.

INCLUSIVE EDUCATION IN GLOBAL PROSPECTIVE

Every society has long limited opportunities for an appropriate education to persons ladled disabled but now concept of inclusive education adopting all over the world.

INCLUSIVE EDUCATION IN NORWAY

Mithu. A and Michael.B (2005) reveals in their studies that in Norway inclusion is a political issue. From the 1930's Norway had compulsory unitary school system, which was free and open to every child regardless of social background and class. The schools have fixed catchment areas, there was no parental choice. All the children from the neighborhood went to the same schools. In Norway they created maximum. 4500 students, which mean that most of the children with special needs attended their local schools.In the 1960's when the ideas of integration and normalization reached at shore of Norway, things started to change. The government of Norway took initiatives and developed educational policies, revised teaching methods and curriculum. Now inclusive education program is running successfully.

PROGRESS OF INCLUSIVE EDUCATION IN AUSTRIA

A Global Report (2009) reported that inclusive education is rapidly progressing in Austria. The highest numbers of students are included in province Styria. In 1993, after a tradition of more than 200 years of special education in separate program in Austria, a new national law-based on the positive results of several inclusionary pilot project programs in the years before-suddenly changed the situation. Parents were given the choice either to place their children with a disability in a regular classroom setting or in a special school. Since then a dramatic transfer of special education resources and expertise has taken place from the special to the regular system. More than half of the school children considered having severe disabilities and about 80% of all students with special education needs are now already included in regular system.

INCLUSIVE EDUCATION IN CANADA

Canada is a nation of tremendous size and modest population, home to first entire system to achieve inclusion to every learner, but also a nation spilt on the issue of educational inclusion for all. In1986, the concept of inclusive education started

to approaches and practices in several schools. Supports were developed for teachers and students and training was focused on schools and classrooms practices. Instructional strategies were developed that emphasized multi-level instruction and curriculum adaptation. Officials at the OECD as well as UNESCO have recognized the success of the efforts of inclusive education of Canada (A Global Report 2009).

INCLUSIVE EDUCATION IN INDIA

Gary Bunch and Angela Valeo (2008) stated in their research that India is a huge in population, and more, which face daunting challenges in meeting the many needs of its people. India recently announced a national policy of inclusive education to signal its intent to move forward. The National Resource Center for Inclusion (NRCI) initiatives was an Indo-Canadian Project. This project enabled over 2,200 children to be placed in regular schools. The largest Slum in Asia, in public and private schools beyond NRCI engaged over 40 NGOs, 140 colleges and universities, 167 broadcast media, 32 government departments and 25 international agencies. These various interventions enable the project to initiate change across the level-from micro to mezzo-level change.

INCLUSIVE EDUCATION IN ENGLAND, GERMANY AND SPAIN

A nation in which number of school systems have moved to inclusion, but also one in which resistance to change remains strong. Germany is a recently reunified state with the need to come conservative attitudes towards disability and education.

The Salamanca Statement associated with Spain, but also a state yet to move strongly towards inclusion (Gary Bunch and Angela Valeo, 2008).

PAKISTAN PROSPECTIVE

In Pakistan, educational authorities also recognize that all the children have equal right to freedom of expression, quality education and have access to a safe and healthy environment.

HISTORICAL BACKGROUND

In 1972, the country witnessed a revolutionary change in the education system when the government nationalized all private institutions including private special schools. The Education Policy 1972 allocated funds for providing special education services for the first time in Pakistan (MoE 2008).In conclusion, the right of students with special needs to be educated in an inclusive classroom rather than educating them in an isolated environment has been a main concern, raising issues and interest for educators, policy-makers and researchers in recent times and eventually became the basic issue in terms of teaching students with special needs. Effective school and teacher characteristics influence positively students' achievement or outcome in an inclusive classroom, school characteristics such as: qualified leadership, learning environment, high expectation, positive reinforcement, monitoring student's progress and parent-school co-operation. Teacher characteristics such as: efficient use of time; good relationships with students; provides positive feedback; has a high student success rate; and in general provides support for the students with and without disabilities.

STATISTICS OF PEOPLE WITH DISABILITIES

A census in Pakistan was conducted by Govt of Pakistan and It was found that there were thirty two Lac eighty six thousand six hundred thirty (32, 86,630) people with disability constituting 2.54 percent of the population.2 of the total population with disability, 0.82 million (24.8 percent) are of school-going age (5-14 years). It is estimated that about 20,000 children with disability are aged between 5-20 years, 2.4 percent of the total are enrolled in special schools. The figure is underestimated, as the definition of disability did not include moderate and mild disability and data collectors for the census enumerators were not trained to identify and classify all forms of disability. A survey of the special needs children indicated that 10 percent of the population had some sort of disability, such as visual impairment, hearing impairment, mental retardation, physical disability, learning disability or multiple disabilities. Of these, only two percent had access to institutional facilities.

Table 1. Percentage with disability by nature, sex and areas

Nature of Disability	All Areas			Rural Area			Urban Area		
	Both Sexes	Male	Female	Both Sexes	Male	Female	Both	Male	Female
All	2.54	2.85	2.21	2.52	2.83	2.19	2.59	2.88	2.26
Blind	8.06	7.61	8.68	7.92	7.44	8.59	8.32	7.93	8.88
Deaf and hard of hearing	7.43	7.27	7.66	7.53	7.40	7.71	7.24	7.02	7.56
Physically handicap	18.93	19.84	17.65	20.52	21.40	19.30	15.81	16.83	14.34
Severely mentally retarded	6.39	6.22	6.63	5.94	5.72	6.23	7.28	7.18	7.44
Manually retarded	7.60	7.02	8.41	7.32	6.78	8.07	8.15	7.50	9.62
Having more than one disability	8.23	7.33	9.48	8.23	7.37	9.41	8.22	4.25	9.60
Other	43.36	44.71	41.49	42.55	43.89	40.69	44.97	46.29	43.07

(Bureau of Statistics 2008).

INITIATIVE OF PAKISTAN GOVERNMENT

The National Policy of Education 1998 envisaged about Inclusive Education and national policy for persons with disabilities 2002 also states about provision of education for such children and adults. In January 2004, Minister of Education in collaboration with UNESCO organized a series of Sub-Regional Meetings of Ministers of Tehran Cluster group on "EFA Planning". "Early Childhood Education" as well as on "Inclusive Education" culminating on Joint Declarations. Another National Consultation on Inclusive Education was arranged at Islamabad on 27th April 2005, which concluded by adopting a joint declaration called "Islamabad Declaration on Inclusive Education" (MoE 2008).

ROLE OF NGOS

According the organization of Save Disabled Women Pakistan held that Inclusive Education in Pakistan needed promotion, awareness, attention, and clear understanding of the concept for true implementation at grass root level in marginalized communities. Government and NGOs must have clear policy for training of concerned staff members in every district schools and institutions. General public lacked understanding of inclusive education, there was lot of discrimination seen and observed at community level. Mostly children disliked and did not accept their fellow children, who were deprived, needed care and love for inclusive environment. Teachers did not care to attend disabled, disadvantaged, poor and neglected children in classroom environment.In a current scenario a pilot project is running on Inclusive Education in 16 mainstream schools (boys/girls) of Islamabad under the Federal Directorate of Education, MoE Islamabad in collaboration with International Development Partner (IDP) Norway, Education, and Islamabad.

THE PROJECT ENVISAGES TO:

- Develop systems which enables, accommodates and stimulates effective implementation of education reforms and innovation
- To support the efforts of the Government of Pakistan to reach the goal of compulsory primary education for ALL by 2015;
- Develop quantitative and qualitative indicators for inclusive and child friendly education systems, schools and communities;
- Create and further develop inclusive and child friendly schools in Islamabad and under the authority of FDE;
- Set up small number pilot schools for demonstration and research purposes where all key elements of the three movements [Education For All; Inclusive education and Child friendly schools] are incorporated and
- Develop practical research programs related to implementation of inclusive practices in schools as well innovation and reform within established education systems (FDE, 2008).

OBJECTIVES OF THE STUDY

- To understand the concept, content and scope of Inclusive Education in global context.
- To measure the attitudes (in terms of perception) of parents, teachers and head teachers towards inclusive education.

RESEARCH QUESTION

The following research questions are formulated:

i. What are the current concepts and scope of Inclusive Education in global in global terms?

ii. What are the institutional facilities in terms of training and supporting services were provided for implementation of the project?

METHODOLOGY

The survey method was used during the research. Both quantitative and qualitative methods were used for analyzing the data. Research Was descriptive and it described the attitude of parents, teacher and manager towards inclusive in Pakistan.

Population of the study comprised of the pilot schools where the inclusive education has been launched in ICT. The teachers, head teacher and mothers of those schools constituted the population of the study. Sampling in research refers to a selection of units chosen to represent the target population. It is also knew subjects or respondents with in a study. It's that group(s) who are included in data collection and selection from the whole population. In this case 16 pilot project schools constituted the population, where inclusive education as in innovation in local context has commenced. Three typical schools in consultation with Federal Directorate of Education were selected for this exploratory study. In depth study of those schools was undertaken.

Two questionnaire were developed for teacher, head teacher and interview of parents. As the study was delimited to mothers, so third instrument was designed for the collection of data from mothers. The focus of decision was on family background, causes of disabilities, treatment of children, difficulty during admission, awareness of inclusive education, socialization, participation in co-curricular activities, over burden syllabus and visits of schools. Pilot testing of these instruments were done and refined on the bases of feedback. Expert opinion was sought to determent the validity of the instrument. The parental instrument was a kind of interview, which combined both structured and non-structured. This was regarded to necessary so the mothers might come up with their vision and experiences.

RESULTS

Data collected through questionnaires was tabulated and descriptively analyzed on the basis of different statistical tool i.e

Table 1 List three success of Inclusive Education at your school

No	Factors / Variable	Frequency	No	%
1	Availability of instructional materials		4	36.3
2	Social adjustment		3	27.2
3	Friendly atmosphere		3	27.2
4	Adequate Learning		3	27.2
5	Participation in activities		2	18.1
6	Remove gender disparity		2	18.1

Table 19 presents the factors or variables of the benefits. The highest attribute was 4(36.3. percent) assigned to availability of the instructional materials where as 3 (27.2 percent) in case of a set of variables (social adjustment, friendly atmosphere and adequate learning) were equally reported, that is three in each case. Two in the rest (participation and removing gender disparity) were reported 2(18.1 percent) in each cause.

Tabel-2 Awareness of Education

No	Factors	Frequency	No	%
1	Awareness about of inclusive education		3	100.0
2	Educational opportunity for all students		3	100.0
3	Friendly atmosphere among all students		2	67.6
4	Social adjustment		1	33.3

Table 2 presents the results about the listing at least three success of program. All 3-head teachers positively respondent that program has demonstrated awareness of the concept of inclusive education and providing equal educational opportunity to all students. Two respondents reported 2(67.6 percent) that the development of friendly atmosphere among the students. One expressed the value of social adjustment between teachers and students.

Table -3 Need of Inclusive Education

No	Factors	Frequency	No	%
1	Need more training program		3	100.0
2	Need more instructional facilities		3	100.0
3	Students with disabilities are suffer in mainstream schools		2	67.6
4	Lack of satisfaction by the parents of students with disabilities		2	67.6
5	Fake implementation by the educational authorities		1	33.3
6	No technical assistance from the special instruction		1	33.3

Table 3 of the instrument intended the result about listing at least three problems according to their experience. All head teachers 3(100.0 percent) were unsatisfied by the training program and facilities. Two respondents were reported that the students with disabilities were suffered in mainstream schools and lack of satisfaction by parents of the students with disabilities. One expressed that the fake implementation by the educational authorities and lack of technical assistance from the government.

Table-4 Mother's interview

Respondent	No of children	Sibling	Nature of disability	Cause of disability	Any disable in Family	Treatment of child	Admission in special school in past
Mother	2	1	Low vision	By birth	No	Special attention	NO
Moth	4	1	Over size head	Birth	NO	Special attention	NO
Mother	5	3	Right side paralyze	Polio	NO	Special attention	NO

FACTORS

Following factor leads:

1. All mothers reported that they were much worried when they came to know about disability.
2. All mothers reported that they didn't face any difficulty during admission.
3. Through teachers they were aware to this school offering inclusive schooling.
4. All mothers were not fairly satisfied with the process of socialization.
5. Also the peer group lacked the characteristics were developing belongs.
6. All the mothers expressed dissatisfaction of the participation of the children having disabilities in the co-curricular activities.
7. All the parents reported that the syllabus was lengthy, over burdened classes and inadequate attention of the teachers.
8. Parents reported few or far between they invited in school by head teachers.

FINDINGS

There were three sets of findings relating to teachers, head teachers and parents. Analysis of the data yielded the following majors findings

FINDING OF TEACHER

10(91 percent) teachers out of 11 knew the concept of inclusive education very well.7(64 percent) teachers were favorable to conduct classes for all learners together. All the teachers agreed about the need of inclusive training. 9(82 percent) teachers were satisfied about the appropriateness of lesson planning. All the teachers were consisted that inclusive education developed understanding and friendly relationships.8(73 percent) teachers expressed the learning quality of the students with disabilities was fairly affected.6(55 percent) teachers expressed that quality of the other students was relatively affected.7(64 percent) teachers were satisfied about the appropriateness of instructional materials.7 teachers (64 percent) expressed that students with disabilities participated very well.9 (82 percent) teachers agreed that only inclusive trained teachers could teach students with disabilities.10 (91 percent) teachers were very well satisfied with assistance of other teachers. (45 percent) teachers were satisfied with the concept, content and delivery of inclusive education. One question was open-ended relating to the benefits of inclusive education. 4(36 percent) expressed to availability of instructional materials, 3(27 percent) were satisfied with social adjustment, friendly atmosphere and adequate learning.Overburdened syllabus, overcrowd classes, Lack of training, lack of encouragement of the teachers and lack of A V aids formed the key concern.

FINDING OF HEADS

All the three head teachers were very well aware of the purpose of inclusive educative education. All the heads agreed that student having disabilities is taught together. All the heads were satisfied with the facilities to run inclusive program. All head teachers expressed that inclusive education developed socialization between both groups Two heads (67 percent) disagreed that inclusive education would lead the creation of stress and anxiety for teachers. Two head teachers were satisfied with the appropriateness of mainstream. Only one (33 percent) head was satisfied with the appropriateness of instructional materials. All heads teachers felt that teachers need of continuous inclusive teaching training to handle inclusive education.2 (67 percent head teachers disagreed about the willingness of teachers to teach both groups together. All the head teachers agreed that students with disabilities were academically benefiting from inclusive education. All the head teachers agreed that students with disabilities participated in co-curricular activities. All the heads teachers disagreed that the learning quality of students with disabilities was affect (67 percent) reported that students with disabilities academically suffered in mainstream schools, lack of parental participation of students with disabilities..

FINDING FROM PARENTS

A special interview was conducted for parents of students with disabilities. The school head teachers invited the parents for holding the interviews. A glance at the table would indicate size of each family along with the sibling of each case. The three children had different set of disability, one with low vision and other with large head and the third clinical disability. The two cases related to birth and third due to medical in care. No case related to heritage. The mother provided special care at home to their children with disabilities. All of them favored inclusive schooling instead of exclusive.

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EFFECT OF PARENTAL ECONOMIC LEVEL ON ACADEMIC ACHIEVEMENT OF UNIVERSITY STUDENTS

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ABSTRACT: The study reveals how much relationship between parental economic level and academic achievement of the university students. This study examines one important aspect. It studies the relationship between Parental Economic level and academic achievements of university students. For this study five discipline of Pir Mehr Ali Shah Arid Agriculture University were selected from Rawalpindi Pakistan. A sample of 270 students was selected from each discipline through stratified sampling technique. This research work used descriptive statistics to obtain relationship among parental economic level and academic achievement of the respondents. Pearson Product – Moment Correlation (r) have been used to test the hypothesis. The findings show positive and strong correlation between Parental Economic Level and academic achievements of the university students.

KEYWORDS: Parental Economic Level, Academic Achievements.

INTRODUCTION

Parents are the most prompt connection of a child. Their economic status and training do have an essential impact on the identity of child. Instructed parents can better comprehend the instructive needs and their Childs' bent. They can help their children in their initial instruction which influences their capability in their relative range of learning. Fitting in with solid economic foundation, parents can give most recent advances and offices in a best conceivable manner to improve instructive proficiency of their youngsters.

Parental training and financial components are of basic criticalness in effecting people's instructive accomplishments likewise. They are similar to spine in giving money related and mental trust to scholars. Express distinction might be seen between those scholars who fit in with diverse budgetary status and distinctive parental instructive level. Training is an essential need in this period of globalization. Training not just gives knowledge, it additionally grooms the identity, teaches good values, include learning and gives ability. Education is fundamental owing to the air of rivalry .In every field profoundly qualified individuals are required. As Battle and Lewis states; "In this period of globalization and mechanical unrest, instruction is considered as a first venture for each human action. It assumes a fundamental part in the improvement of human capital and is connected with a singular's prosperity and open doors for better living." Then again the scholars having financial issues need to face different obstacles. Their monetary issues occupy them from their studies and they neglect to get high evaluations and therefore need to languish over discovering a vocation. "The low socio-budgetary status causes natural lacks which brings about low self regard of people (US Department of Education 2003).

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Scholarly execution has been generally connected with numerous variables. Most learners are every day went up against with difficulties of adapting to scholastic under genuine passionate strains occasioned by long stroll to class, poor the earth, and being taught by unmotivated instructors. Riches is a standout amongst the most basic segments of prosperity and might be considered as a more faultless marker of the more drawn out term monetary assets of the family and family's right to gain entrance to circumstances and preferences (Oliver and Shapiro 1995).

Since training is a standout amongst the most vital determinants of work business sector results any positive impacts that parental riches may have on children instruction may decipher in the process of childbirth business advantage. Past these roundabout impacts there may be extra work business advantage from parental riches. For instance, riches can permit individuals to support longer and all the more expensive occupation seek methodologies which could bring about better employment matches, guaranteeing both more secure job and higher wages. Children riches amassing may likewise show a solid connection with parental riches (Charles and Hurst 2003). This correlation may emerge either by implication through its effect on human capital ventures and income or straightforwardly through parental riches moves (either as legacy or entomb vivos exchanges) (Jeynes 2002).

Hochschild (2003) says that students who have a low SES earn lower test scores and are more likely to drop out of school. Eamon (2005) believed that low SES negatively affects academic achievements because low SES prevents access to vital resources and creates additional stress at home. The intergenerational connection in sparing affinities and in the inclination of owning specific sorts of advantages (i.e. house, money related holdings with shifting level of danger and their relative weight in their riches portfolio) might likewise have essential impacts on the relationship between parental riches and their Childs' riches aggregation. To start with, consider instructive accomplishment. Majoribanks (1996) explains the importance of SES not only in student's life but also outside the school. In studying the impact of various factors on student's academic achievements he concluded that the determining factor is the SES of the family. The environment at home is a primary socialization agent and influences a child interests in school and aspirations for the future.

Parental riches can have paramount impacts both on ahead of schedule educating accomplishment and later on school leaving capabilities well beyond wage by permitting income to live in more unmanageable ranges with high performing schools or to reserve private schooling (either as private educating or as top up educational cost for children taught in the state segment) and other training improving exercises and products (e.g. music lessons, donning and social exercises, machines, books, treks and so on.). Past necessary educating parental riches may help families to store further or higher training (subsidizing for instance expenses, subsistence costs, lodging) or permit the scholar to commit their time to study as opposed to tackle term-time business. Obviously the criticalness of parental riches for higher instruction achievement relies on upon the presence of credit demands. Numerous studies by sociologists, economists, statisticians and academicians are led to study the connection between the parental investment level and the scholastic accomplishments of people at distinctive levels of their study, in diverse ranges and at diverse times.

OBJECTIVES OF THE STUDY

Objectives of the study were:

1. To assess the effect of parental economic level on their Academic Achievement.
2. To identify the parental economic level and their children academic achievement.

SIGNIFICANCE OF STUDY

The study will lead to the better understanding of the parental economic level and the academic achievement of the student. The overall impact would be the better understanding about the achievement of the student due to the economic level of their parental income. It will also help for the policy maker, educational manager and educationist for making policy keeping these factors in mind.

METHODOLOGY

The research designed to investigate the effect of parental economic level on academic achievements of university students. It is basically a descriptive research which required a survey of prevailing situation in an organized way, which required the collection of data from a selected sample by using some research instruments. In order to achieve the objectives of the study, the questionnaire survey method employed. Questionnaire used as a main source for the data collection. The main sources of data are student of Pir Mehr Ali Shah Arid Agriculture University Rawalpindi. There are eight hundred and

ninety five (895) students in undergraduate both morning and evening programs in different faculties of Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan A sample of five disciplines of the university i.e., B.sc (Hon) Agriculture, BSIT, BBA, BS Biochemistry and BS Economics are also taken as a sample. The stratified random sampling design adopted. Total two hundred and seventy (270) undergraduate students from both morning and evening programs were taken as sample through stratified random sampling technique.

After collection of the data, the responses of the selected sample were organized, quantified and thus data was tabulated through Statistical Packages for the Social Sciences (SPSS). Pearson Product – Moment Correlation (r) to determine the relationship between the parental economic level and academic achievement of their children. Data collected through questionnaires was tabulated and descriptively analyzed on the basis of different statistical tool i.e. percentage and mean score using SPSS

RESULTS AND DISCUSSION

To show the number of students admitted in various disciplines according to their family income three different income group are made. Here by family income we mean income from any person that is father, mother, both or guardian.

It is given in the following figure.

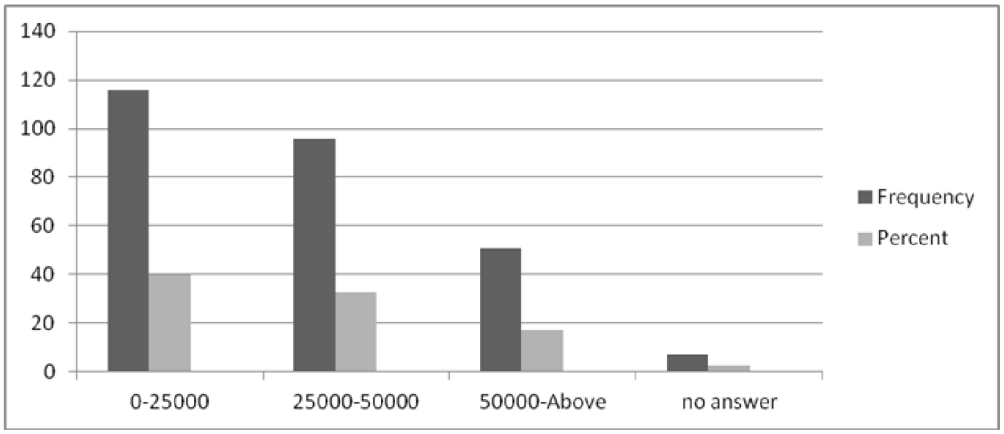

Figure 1: Mean and Percentage of parental income level of students

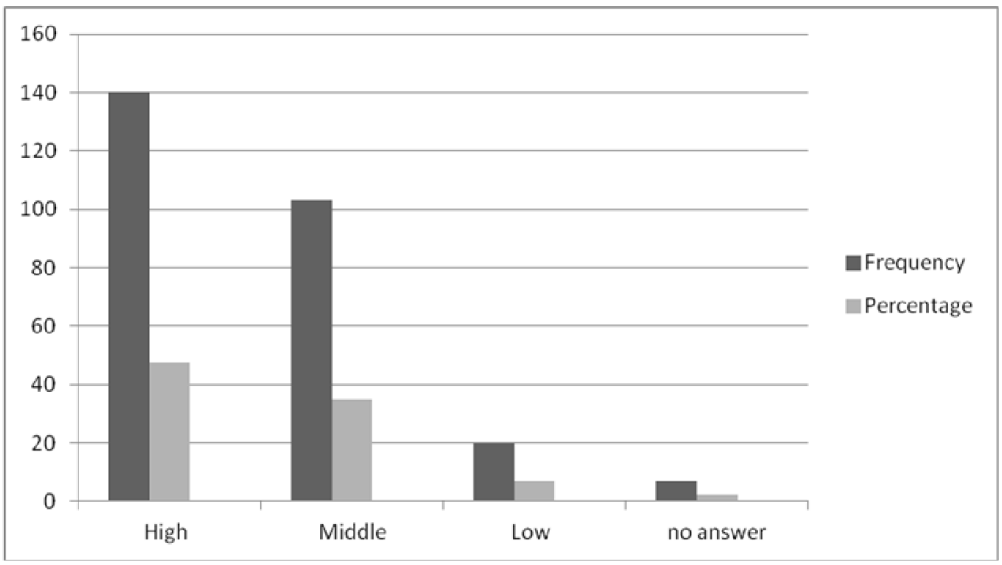

Figure 2: Frequency and Percentage of Academic Achievement of students

Table No. 1. Income wise position of students admitted in various disciplines of university Income Group

Income wise position of students admitted in various discipline of university Income Group.	Number of Students	Percentage
0 -25000	116	43
25000 - 50000	96	36
50000 and above	51	19
No Answer	7	2
Total	270	100

Table No. 2. Academic Achievement of students admitted in various disciplines of university

Academic Achievement of students admitted in various disciplines of university	Number of Students	Percentage
Low Achievement	20	7
Middle Achievement	103	38
High Achievement	140	52
No Answer	7	3
Total	270	100

The analysis of the table shows that as the income of the family increases the number of students admitted to various disciplines also increases. This shows that there is a positive relationship between income of the parents and academic achievement of the students.

Here r = 1.00

It shows that there is a strong positive correlation between parental economic level and academic achievements of the students.

CONCLUSIONS

By analyzing the data on the basis of the objective of the study and hypothesis . the following conclusion were drawn.There is a positive relationship between the socioeconomic status of the parents (calculated in terms of family income, either by father, mother or both) and the academic achievements of their children. The analysis of the data shows that the economics of parents positively effects the academic achievements of their children. It is also verified by the strong positive correlation between the two.

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ROLE OF A.V AIDS ON THE COGNITION OF STUDENTS AT SECONDARY LEVEL

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ABSTRACT: Audio-Visual aids are those aids, which assist the teaching process, by which teaching and learning both process become attractive, interesting and sophisticated. It solves the teaching problems which occur during teaching. This experimental study is designed to investigate the role of A.V aids on the cognition of students at secondary level. The objective of this study was to find out the use of A.V aids in teaching of Pakistan studies at secondary level and to find out the effect of A.V aids on the cognition of students. The population of the study was comprised of all the Govt Girls secondary schools. For the present study Govt M.C. Girl's secondary school was selected through purposive sampling. Quasi-experimental research design was adopted for the study intact classes were taken in this experiment. The instruments of this study were an inventory of A.V. aids and also developed an achievement test. The test reliability was found 0.75. The experimental group was taught by using technical audio- visual aids while the control group was taught by the traditional method. The results of pre and post test scores were calculated and analyzed through statistical tools and percentage was used for analysis of inventory responses. The mean achievement scores of student from experimental group was significantly higher than the control group It was therefore recommended that Pakistan studies teachers should use the audio-visual-aids to teach to teach students at 9th class. The findings of the study will provide useful knowledge for educators and teachers to improve their teaching methods. The results of this study might stimulate further research.

KEYWORDS: Audio-Visual Aids, Cognition, Traditional Method, Student.

INTRODUCTION

Education is a lifelong process. It is planned deliberated and transmitted to from generation to generation. It is termed as knowledge as a cognizant component. In a formal school system it's imported through a vigorous course of curriculum which is hub of an educational system. In cyclic process curriculum covers a set of prescribed courses. Their integrated objectives, material and methods, tools of teaching and assessment. Through the variety of courses. The teachers develop the cognitive component of learning. All courses develop cognition which is the forefront of learning. Within this framework, thus this study examines how Pakistan studies occupies the central position of citizenship development and to what extend the role of teaching aids enhance the cognitive domain of learning the concepts , the events , facts and perceptions which a degree of comprehension, retention , and assimilation.

Today the world is passing through rapid changes. In such a world, education cannot resist changes. Audio visual materials are produced, distributed and used as planned components of educational programs. It helps the process of learning. It provides significant gains in thinking and reasoning. Recent technological developments have opened many new possibilities for learning. All teaching can be greatly improved by use of visual aids because it can help make the learning experience impressive. The visual aid materials can promote the effective kind of learning experience impressive.

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The teacher of Pakistan studies is required to be aware of the need,importance, nature and scope of such instructional aids and the skill to utilize them effectively in teaching. Teaching aids are helpful for understanding. it is impossible to make suitable of such aids in every classroom because most of the schools suffer budget constraints and as the fact is clear i.e. audio-visual aids are expensive; The subject of Pakistan studies course as divided into two part currently students studies this subject from 9th class. Before 2013 Pakistan studies was taught in 10th class but now the strategy has changed. These processes include thinking, knowing, remembering, judging, and problem-solving. These are higher-level functions of the brain and encompass language, inanition, perception, and planning. Cognition, or cognitive processes, can be natural or artificial, conscious or unconscious. The idea can be transferred rapidly to a large number of people through the use of visual aids it is becoming more and more important .visual aids offers the extension workers a unique opportunity to contact mass people. They enable learners to contact mass people. (Malik, 2012)

Kochhar (2004) Audio-visual aids make a lesson or a lecture more interesting and a memorable experience not only for students but for teachers as well. They play a vibrant role in focusing the attention of individual student towards the teacher or the topic. Human beings' five senses are the doorway for effective learning, especially seeing, hearing and touching bring maximum knowledge for the individual. Cognition means thinking, gaining knowledge and dealing with knowledge. It may be related to the mental processes The lower level of cognition are Knowledge and comprehension and reaming four level of cognitive domains were considered higher level of cognition

REVIEW OF LITERATURE

In 1946 Edgar dale took the same construct and developed the Cone of Experiences, we start from the learner as participant in the actual experience, then move to the learner as observer of the actual event, to the learner as observer of a medicated event and finally to the learner observing symbols that represent an event. Dale contented that learner could make profitable use of more abstract instructional activities to the extent that they had built up a stock of more concrete experiences to give meaning to the more abstract representations of reality. The concept of cone of experiences was first introduced in this book "Audio visual methods in teaching."

Flawell 1985 has explained the concept of cognition, as originated by its founder, genetic epistemologist as how the knowledge begins and develops in individual and how thinking and reasoning abilities developed in the human mind. Paget's work is widely recognized a true counts; his stages of cognitive development and his process of cognitive functioning. His four stages include sensorimotor (0-2) , preoperational(2-7), concrete operational(7-11) and formal operational (12-15). It is the formal stage. The study focuses on pargets process in three four interactive disequilibrium, variations between individual's views and current world views assimilations filling up in the individual of new experiences into existing world views and accommodations changing the scheme and worldviews to interoperate new experiences. The modern teaching psychologist Ormrod 1994 summarized the Paget's basic assumptions about child cognitive development in the following seven ways.

i. Children are active and motivated learners.
ii. Their knowledge of the world becomes more integrated and organized over time.
iii. Children learn through the process of assimilation and accommodation.
iv. Cognitive development depends on interaction with one's physical and social environment.
v. The process of equilibrations (resolving disequilibrium) helps to develop increasingly complex level of thought.
vi. Cognitive development can occur only after certain genetically controlled neurological changes occur.
vii. Cognitive development occurs in four qualitative different stages

OBJECTIVES OF THE STUDY

Following are the major objectives of the study:

1. To find out the use of A.V. aids at secondary level
2. To explore the effect of A.V. aids on the cognition of students

HYPOTHESES

Following directional hypothesis will be formulated after reviewing the literature:

RESEARCH HYPOTHESES

H_1: The mean scores of students who were taught through A.V. aids are significantly higher than those students who were taught through traditional method. **H_1:** $\mu_E > \mu_C$

NULL HYPOTHESIS

H_0: The mean scores of students who were taught through A.V. aids are not significantly higher than those students who were thought the traditional method. **H_1:** $\mu_E > \mu_C$

SIGNIFICANCE OF THE STUDY

This study will be significant because A.V. aids will be used as a tool by the teachers to improve their teaching practices. It will examine the ways of teaching and learning processes and how they will be more effective through using A.V. aids .The findings of this study will be helpful for teachers to understand those elements that can be considered to improve the teaching/learning process and will ultimately make them an effective teacher. By using A.V. aids teachers will be able to restructure their teaching strategies to meet the needs of students.

DESIGN OF THE STUDY

Design

Quasi-experimental research design was adopted for the study. Specifically, the study used non-randomized pretest-posttest group design. Quasi-experimental design was used because intact classes were used instead of randomly composed samples (Oladejo, Olosunde, Ojebisi, & Isola, 2011; Osokoya, 2007; Owusu, Money, Appiah, & Wilmot, 2010). The diagrammatic representation of the design is shown below:

$O_1X_1O_2$	Experimental group
$O_3X_2O_4$	Control group

Where

O_1 and O_3 represent pretest
O_2 and O_4 represent posttest
X_1 represents treatment (audio-visual aided instruction)
X_2 represents treatment (traditional method)

Population

The totality of under considerations elements are called population therefore, students studying at Secondary level constituted the population of study. All the secondary schools of district Rawalpindi will be the population of this study and all the 9^{th} grade enrolled students were considered the target population of this study. The head teachers, SST, and Subjects Specialist were included in the population.

Sample and Sampling Technique

Govt .M.C. Girls High School Rawalpindi was selected through purposive sampling. The intact classes were taken for experiment. There were 90 students from 9^{th} class were considered as a sample. The participants were selected from that school which represents population of typical government schools in Pakistan i.e. The experimental and control group have equal strengths.

RESEARCH INSTRUMENT

The data was collected from the instruments to meet the objectives of the study therefore an inventory of A.V. aids and achievement test was developed.

Inventory of A.V. aids

The researcher developed an inventory list about A.V. aids for measuring the teacher's opinions about the use and utilization of A.V. aids in Pakistan studies subject. It consisted of 17 items. The researcher was administrated this inventory on secondary school teachers, subject teachers, subject specialist and headmistress.

Achievement Test

The researcher was developed an achievement test of Pakistan studies. The test was consisted of 50 MCQs. It was prepared from the Pakistan studies text book. It was developed from the three chapters of Pakistan studies. The test was administrated on experimental and control group. The pre-test was administered before the experiment and post-test was applied after the treatment. The pre-test and posttest was same.

The instruments use in present study were tried out and tested on the additional samples in order to collect evidence about their validity and reliability. Validity was established by careful analysis of test specifications and consultations with teachers and other experts. Kuder-Richardson 21 reliability coefficient was used to establish the reliability of the instrument since items were scored dichotomously (correct/incorrect). The reliability of test was 0.75.The reliability and validity coefficient obtained was positive. Further improvements could be made in preparing more valid and reliable instructions. However, no experiment could be perfectly reliable

Difficulty Level (DL)

"It is also called item facility which means a measure of the ease of a test item: item difficulty has to do with how easy or difficult an item is from the view point of the group of students or examinees taking the test of which that item is a part" the difficulty level of the fifty test items ranges from 0.52 to 0.70.The test items difficulty was measured 0.6736.

The following formula has been used for estimating the difficulty level of each item:

$$DL = \frac{HC + LC}{N}$$

Discrimination Power (DP)

It means a measure of the extent to which a test item is sensitive to differences in ability among those who take the test. A suitable procedure for calculating discrimination power is to compare the responses of test takers ranking in the upper 27 and the lower 27 of the sample on the basis of the total test score.

To find the discrimination power of each item, the following formula is used.

$$DP = \frac{RU - RL}{1/2\ T}$$

DP of an item is 0.30 and above, the item is acceptable. If the item discriminatory index is less than 0.30, the item is a weak and needs to be modified or changed .The results obtained after the application of the formula of the item DP range between 0.30 and 0.80.All the items were acceptable because the discrimination power is 0.5148.

Process

The first step of this experimental study was to select the school, so the researcher met the headmistress of M.C. school in Nov, 2013. After permission researcher met the class teachers from 9^{th} class. The researcher observed the resources of the school and also got the information about the availability and utilization of A.V. aids in this school. The class teachers were provide the list of 9^{th} class. The two sections were taken as it is because it was not allowed that she select participants randomly as experimental and control group. Quarcoo-Nelson (2012) had used this quasi experimental design in his study. This present study was also based on quasi experimental study. The groups were assigned as Section A was considered experimental group or other remaining section B was considered as control group. The strength was equal in both groups therefore 45 students were in each section. Achievement test was applied before the treatment on both groups. The purpose of pretest was to know the understanding level of students. Both groups' were almost equal. The pretest scores in ordered farm. It was found that both groups were same . The experimental group was taught with teaching aids while the control group was taught through conventional teaching. All conditions were equal for both groups and also try to provide the same facilities as similar as possible. The researcher taught both groups because there were no volunteer was available for teaching. The experimental and control groups were exposed to all other learning conditions and facilities as similarly as possible. The experiment limited to six weeks. She applied two different treatments on groups and the lesson plans were also used in teaching but the experimental group .was taught through the A.V. aids. The researcher was taught both groups daily

under the similar environmental conditions. The duration of treatment was six weeks. The post test was conducted after the treatment.

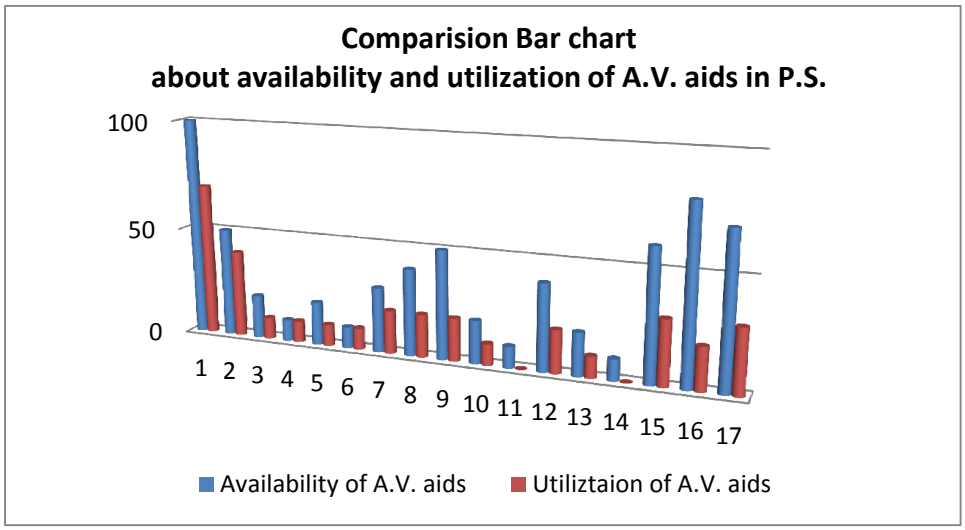
DATA ANALYSIS

Inferential statistics were conducted to analyze the data obtained from the study. Specifically, null hypothesis one was tested at $p \leq 0.05$ significance level using t-test. The pretest achievement score was used as covariate. Null hypothesis two was tested using independent samples t-test. The researcher developed an inventory list to achieve the first objective of this study. The sample was drawn from the population. The sample distribution.50% sample was drawn from the school heads, 20% from SS (Pakistan studies), 20% from class teachers and10% was taken from the colleges(Lecturer Pakistan studies).

Table 1. List of the Responses

Serial #	Teaching Aids	Available	Utilization
1	**Chalk board**	100%	70%
2	**Bulletin board**	50%	40%
3	**Flannel board**	20%	10%
4	**Documentary /films**	10%	10%
5	**Graphs**	20%	10%
6	**Still pictures**	10%	10%
7	**Posters**	30%	20%
8	**Models**	40%	20%
9	**Globs**	50%	20%
10	**Maps**	20%	10%
11	**Supplementary books**	10%	-
12	**T.V**	40%	20%
13	**V.C. R /DVD**	20%	10%
14	**Video tape recorder**	10%	-
15	**Radio**	60%	30%
16	**Computer**	80%	20%
17	**Charts**	70%	30%
Total	-----	**38%**	**22%**

The responses of inventory indicated the responses of teachers.it showed that 38% agreed that that teaching aids were available in their school but only 22% respondents reported that they used these aids during teaching. Most of the teachers explained their point of view that they had limited time or lack of resources they did not use these aids especially in teaching of Pakistan studies. It (bar graph) present the results of table one.



After finding the availability and utilization of A.V. aids The experiment was conduct on Government M.C. Girls High School. The results of pre-test and post-test were measured after six week treatment. The results of experimental and control groups on pretest and posttest have been presented in tables and data was analyzed through the use of mean, S.D, standard error and t-test.

Table 2. Significance difference between mean achievement scores of experimental group and control group before the experiment

Group	N	X	SD	Std. Error Mean	Df	t-value	p-value
Results of pretest of Control Group	45	21.8444	4.98614	.74329	88	.095	.924
Results of pretest of Experimental Group	45	21.7556	3.77886	56332			

t-value at 0.05=1.98

Table 1 shows the mean difference between pretests of control & experimental groups. The result shows that there was no difference between the scores of pretests of control & experimental groups. The means achievement scores on pretest control & experimental groups were 21.8444 and 21.7556 respectively. The standard deviation from the mean on pre-test was 4.98614 and 3.77886 respectively. Since the p-value is 0.924 which is greater than 0.05.this result shows that there is no difference between the scores of pretests of control & experimental groups' Hence, both the groups were found to be almost equal.

Table 3. Significance difference between mean scores of control group on Pre and Post Tests Control group

Group	N	Mean	SD	Std. Error Mean	Df	t-value	p-value
Results of pretest of Control Group	45	21.8444	4.98614	.74329	44	8.739	.000
Results of post-test of Control Group	45	26.6000	6.15482	.91751			

t-value at 0.05= 2.00

Table 2 shows the mean difference between pretest and posttest of control group. The result shows that there was significant difference found between the scores of pre and posttests of control group. The Average scores on pretest and posttest wereM1= 21.8444 and M2=26.6000 respectively. The standard deviation from the mean achievement scores on pre-test and post-test were SD1= 4.98614 and SD2=6.15482 respectively The result indicate that there was significant difference found between the scores of pre and posttests of control group. 'Since the p-value is .000 which is less than 0.05. It means that there is significant difference between pretest and post mean achievement scores of control group after being treated by traditional learning method.

Table 4. Significance of difference between mean scores Pre and Post Tests of Experimental Group

Group	N	Mean	SD	Std. Error Mean	Df	t-value	p-value
Results of pretest of Experimental Group	45	21.7556	3.77886	.56332	44	16.598	.000
Results of posttest of Experimental Group	45	34.3333	5.23537	.78044			

t-value at 0.05=2.00

Table 3 shows the mean difference between pretest and posttest of experimental groups. The result shows that there is significant difference found between the scores of pre and posttests of Experimental groups. The mean achievement scores on pretest and posttest were M1= 21.7556 and M2= 34.3333 respectively. The standard deviation from the mean on pre-test

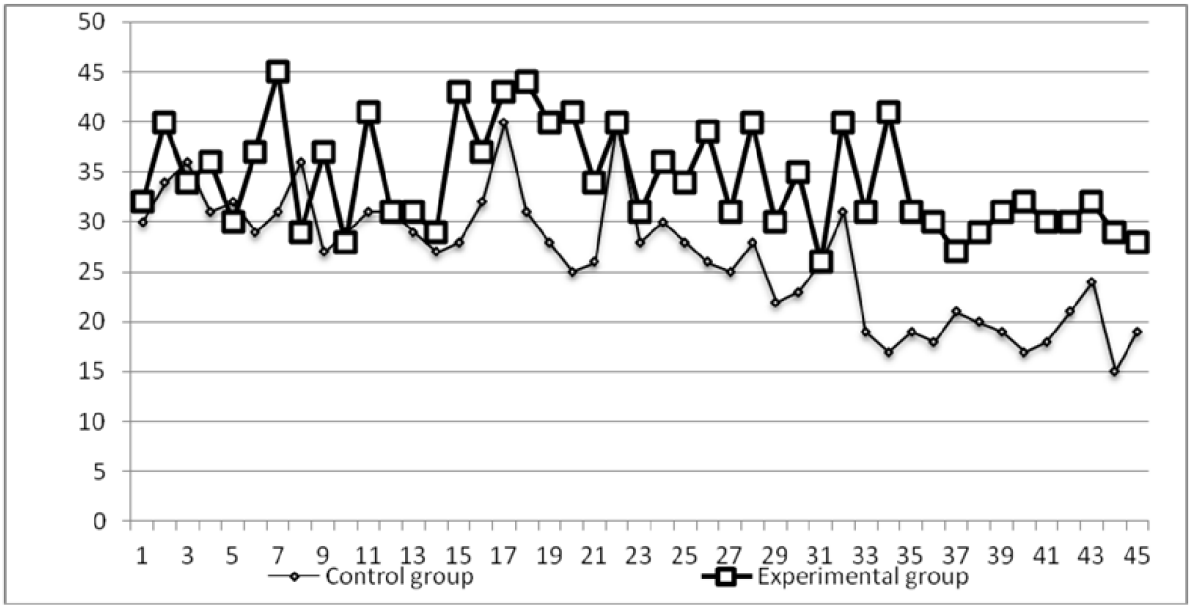
and post-test were SD1= 3.77886 and SD2 =5.23537 respectively. 'Since the p-value is .000 which is less than 0.05. It means that there was significant difference between mean scores on pretest and post of Experimental group after being treated by A.V. aids teaching.

Table 5. Significance of difference between mean scores of Posttests of Control and Experimental Group

Groups	N	Mean	SD	Std. Error Mean	Df	t-value	p-value
Results of posttest of Control Group	45	26.6000 .	6.15482	.91751	88	8.682	.000
Results of posttest of Experimental Group	45	34.3333	5.23537	.78044			

t-value at 0.05=1.98

This table 4 shows the mean difference between posttests of control and experimental group. The result shows that there is significant difference between mean scores of control groups and experimental group. The average scores on posttest were M1=26.6000 and M2=34.3333 respectively. The standard deviation of experimental group is less than control. The standard deviation from the mean on post-test were SD1= 6.15482 and SD2= 5.23537 respectively 'since the p-value is .000 which is less than 0.05. It means that students of experimental group who taught through A.V. aids performed well as compare to control group who taught through conventional method of teaching. Hence the difference greatly sported to experimental group.



The null hypothesis was rejected because the calculated value (8.682) is greater than tabulated value (1.98).The result showed that there was a significant difference between post- test mean scores of both groups Its mean the results were in favor of experimental groups.

This study results indicated that the mean scores of the experimental group who taught through the use of A.V. aids was higher than the control group who taught without A.V. aids. It was the Research hypothesis and also null hypotheses were formulated. The research hypothesis was accepted but the null hypotheses were rejected except one that there is no significant difference between pretest scores of both groups before the experiment. The mean score shows that they are almost equal. So the null hypothesis was accepted

CONCLUSION AND RECOMMENDATIONS

The study has shown that when appropriate audio-visuals are integrated into the curriculum to complement the traditional method, higher learning outcomes in terms of achievement scores would probably result. The present study was

conducted to examine the effect of A.V. aids on the cognition of students. There is strong evidence from the findings of this study that the experimental students taught with the audio-visual aided instruction achieved better than students taught with the traditional method. Performance was significantly improved by the use of audio-visual aided instructional approach in teaching Pakistan studies. The mean achievement scores of both experimental were significantly improved by the use of audio-visual aided instruction.

The study has shown that the use of audio-visual-aided instruction enhances student achievement in Pakistan studies better than the use of the traditional method at the secondary level. The Pakistan studies teachers should therefore be encouraged to adopt the method in their teaching. It is also suggested that researchers and teachers should explore the use of audio-visual-aided instruction to teach other subjects.

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Talent Management: Strategic Priority of Organizations

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ABSTRACT: Talent management concept deemed as cornerstone in human resource management studies as it covers different features of human recourses by polishing employees' skills and expertise with different methods. Banking sector is paying great attention to develop the effective mechanisms regarding talent management. The purpose of this study is to identify the strategic importance of talent management and to create a link between talent management and organizational performance. Researchers examined the role of talent management in overall organizational effectiveness. Study is descriptive and qualitative in nature. Data collected from managerial staff of banks through interviews. Results revealed that effective talent management strategies have significant and positive relationship with organizational performance. Study results also highlight that talent management also has positive and strong association with competitive advantage, performance and talent position within the banking sector. This study will provide great insight for understanding of talent management concept and its importance in banking sector. Banks can utilize these results to shape their talent management practices. Limitations, practical implications and future directions also mentioned at the end of the article.

KEYWORDS: Talent Management, Strategic Priority, Organizations.

1 INTRODUCTION

The twenty-one century is the era of technology and globalization, companies are no more working in isolation and large scale technology sharing can easily observed. Hence, business leaders' start promoting such resources as human capital which can give them competitive advantage against competitor. Companies have now access to new technological developments with right kind of resources. The only thing that differentiates one company from the other company is utilization of human intellect. Organization's performance and competitive advantage depends on intellectual employees. It is becoming inevitable for organizations to address this issue and to develop proper strategy [1]. However, the walk on this road does not turn out very easy due to the fact that human resource is available but skilled human resource is scarcely found. Hence, the scarcity of competent employees leads organizations to develop strategic schemes. This can be used to fill the gap of talented human resource within organization. In this era companies are facing the war of talent.

The idea of talent management starts taking its root in 1980s. Organizations were filtering out the best human resource from the rest. That era was considered as having more control over individuals and their career planning but that was changed after 1990s. That time employees were given the responsibility of their career planning. While after 2000, companies start talking the control of employee career development by giving them opportunity [2]. Watkins [3] coined the term talent management which indicates the importance of managing employee for the organizations. Companies are making it their strategic priority to recruit, retain and develop employees. Talent management is about analyzing the need of skilled employee and developing strategies to meet that need [4]. It improves their performance and financial position in the industry and accelerates organizational success. In 1990's a research was done by McKinsey group who recognize employees

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as irreplaceable assets and devise the term "War for Talent" [5]. However, in 1997, a serious question had aroused about skilled workforce and companies realization about that issue. Joshi and Rain [3] found out that talent management practices are important for organizational performance and assists business leaders in making a proper strategy about retention that helps the organization to ensure that skilled employees are working at the right place. Makela *et al.* [6] indicated that there is a dearth of skilled employees which is now creating alarming situation in organizations. Managers need to enhance their ability to translate the business needs into talent strategies for the better performance of organization [7]. In 21st century, change is the only constant factor which makes talent management the only answer of organizations woes. Companies are facing the acute dearth of talented people. This era requires competitive strategies build with the help of intellectual capital. It will help the companies to better perform than their rivals. In this scenario retention, engagement and attraction of the competent employee is a crucial factor. Talent management plays an important role in this regard by placing the competent employees according to their job ability. The purpose of this study is to determine that organizations ability to attract, retain and engage key employees. This ultimately leads an organization in the betterment of its performance and gives it a competitive advantage. The research [8] has proved that to attract, retain and engage employees are the key issues banks are facing these days.

In global as well as local scenario's, banks are paying great attention to gain competitive advantage through talented employees. They are introducing different innovative tactics to enhance their employees' capabilities. In response to these existing problems importance of talent management motivated us to conduct study on this stream of line. The purpose of this study is to identify the strategic importance of talent management and to create a link between talent management and organizational performance. Study is descriptive and qualitative in nature. Data collected from managerial staff of banks through interviews. This study will provide insight of talent management concept and its importance in banking sector. Banks can utilize these results to shape their talent management practices.

2 OBJECTIVES OF STUDY

Current study has following objectives.

- To identity the strategic importance of talent management.
- To understand the role of talent management in organizational effectiveness.
- To examine the relationship among attraction, retention, engagement and talent management

3 LITERATURE REVIEW

Hale [9] studied that 86% employers faced difficulty in attracting employee and 58% came across the problem to retain their employees. Such issues motivate organizations to focus on talent issues. Rothwell [10] suggested that if organizations engage in strategic practices to retain and engage employees, it would be beneficial for the organization. Another, study Neill and Heinen [11] discussed that successful organizations always give importance to attracting, retaining and developing the talent and it also assists the organization in making the company's strategy that align the business plan with skilled employees. However, if an organization fails to utilize human capital then the result will be in the form of business decline. There are different features of talent management like recruitment, selection, on-boarding, mentoring, performance management, career development, leadership development, replacement planning, career planning, recognition and reward [11], [12]. It is suggested that the organizations who wants to achieve competitive position and to increase its productivity should adopt the approach of attraction, recruitment, retention and development of intellectual capital [13]. Some researchers [14] summed up that talent management decisions lead towards the improvement of talent in organization and enhance the quality of business design that influences the choices regarding employees. Talent management polishes employee's skills and career planning opportunities. It ensures companies that competent employees will enhance the organization's reputation and performance [15]. Holland et al. [16] emphasized that the companies can improve their performance by using resource based view (RBV) in recruitment, retention and development process and can get competitive advantage. Hughes and Rog [17] elucidated that the CEO of the company plays an important role in the effective implementation of talent management. Talent management strategy must be integrated with all levels of organization and its objectives must be clear. The people assessment system must be analytical. It must be able to ensure that people have right skills according to their jobs. Managers need to enhance their ability to translate the business need into talent strategies for the better performance of organization [7].

Talent management covers different features of human recourse as it includes growth of employee by different methods. Organizations should seriously make talent management a company's priority and a part of company's culture [18]. Attraction and retention deemed as significant key factors of talent management [19]. Blass [20] described six different

perspectives on talent management which companies consider while selecting talent management approach. In process perspective, the company believes the success of companies operations depend upon employees. Further in cultural perspective, talent management act as a part of organization culture and allows employees to grow successfully and independently. In competitive perspective, it is focused on determining employee's own strengths and weakness and to develop strategies to compete rivals successfully. In developmental perspective, it is focused on the growth of individuals. It puts right people with right kind of skills to the place where they grow and help the organization to grow. In change management perspective, employees use a way to bring change in organization. Low [21] had discussed that talent management always enables an organization to become successful and to perform better. Study found out that talent management practices integrated with the company. If company strategically implements it, it will improve their employee's skills and performance. Further, study reveals that 83% people agree that talent management practices have a relation with the management working, succession planning and compensations. 76% people claims that these practices enhance people performance in organization [1]. The companies who recognize the importance of talent management practice are able to achieve competitive position than the organizations that do not. More time is required to execute talent management process as it involves planning for talent evaluation and development , however, this approach is usually [22]. Organizations ability to retain, to engage and to develop talent determines its position in the industry. Talent management has become a success or failure factor for an organization. The successful talent management helps an organization to achieve its goals and objectives [23].

The good talent management program consists of recruitment, retention, development and promotion of talented employee and the companies with sound leaders were able to perform 13 times better than their competitor [24]. Hence, Kumar [25] recommended that the strategic use of talent management will result in better performance of the companies. A research highlighted that talent management considered strategically important in today's competitive world as companies are competing on the basis of human capital and by searching, attracting, retaining, and developing talent companies will have competitive advantage [26]. Sheehan [22] noted that attraction and development of key employees of organization resulted in optimal performance of organizations and it would sustain competitive advantage. Talent management has greatly influence the organizational performance. It enhances the productivity, profitability and output of the firm. The study also indicated that retention of the key employees plays an important role in giving companies competitive advantage [8].

3.1 ATTRACTION

Albinger and Freeman [27] study indicated that the reputation of organization is important factor in attracting key employees. It reveals that corporate social companies greatly attract new employees. The study Neal & Gebauer [28] elucidated the factors (monetary and non-monetary) which made people attracted toward a certain organization. These factors affected individual's choices concerning the work opportunity in an organization and selection of an organization. The factors like work-life balance, competitive pay and challenging work are one of the important factors to attract employees.

3.2 EMPLOYEE RETENTION

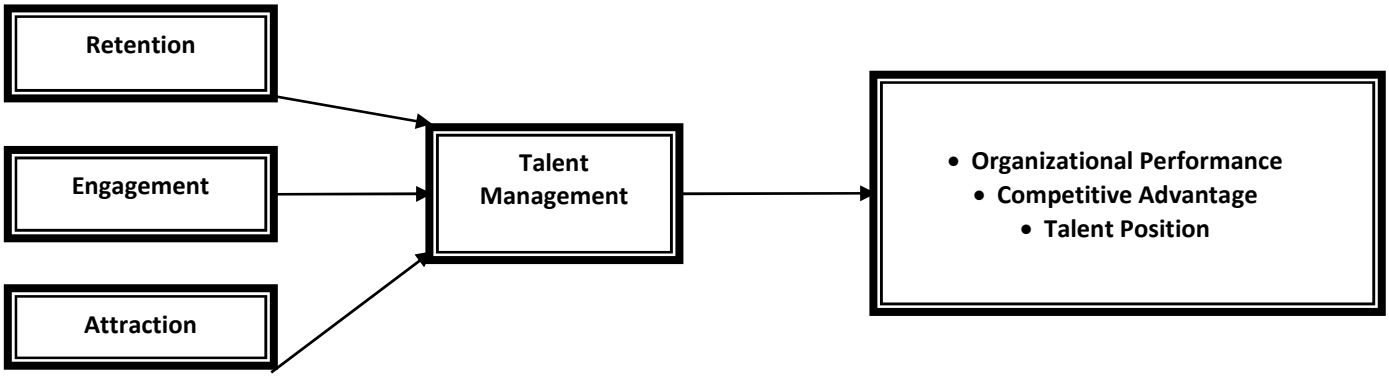
Stalcup and Pearson [29] examined that opportunities of career advancement, organization culture and work life balance reduce the rate of turnover in an organization. Retention of employees for a longer time gives an image of employer branding to any organization [30]. In any industry attraction and retention of key employees depends upon the positive and strong employer brand [31]. Neal & Gebauer [28] indicated that the culture of an organization, in discriminatory decisions, an understanding management, work-life balance and employer branding considered important forces behind the employee's retention in a particular organization. Motivational work, growing and learning environment proves to be a key to retain the talented employees. Managers play important role in this regard [32]. Investigation had done on the effects of work life balance on employee decision to retain and to leave an organization [33].

The successfully implemented talent management strategies in companies enhance the rate of retention. It deals with crucial employee issues and enhances company's competitive position. The reputation of company also improves and turns out to be a distinct and desirable employer and aids in the retention of key employees [17]. Deery [34] gave insight about the issue of employee's retention. There are different key factors that play an important role in employee's intention to stay and leave. An optimum balance between work and personal life and the culture and environment of organization plays an important role. It is important factor for management to manage employee talent. There are different drivers that influence employees to stay like culture and organization practices. Studies show that 60% of the feedback indicates culture of the company is an important factor [3].

3.3 EMPLOYEE ENGAGEMENT

According to Gibbons [35] "employee engagement is a heightened emotional and intellectual connection that an employee has for his/her job, organization, manager, or co-workers that in turn influences him/her to apply additional discretionary effort to his/her work". After reviewing many article top 12 factor identified for employee engagement i.e. trust and integrity, nature of the job, the connection between individual and company performance, career growth opportunities, pride about the company, coworkers/team members, employee development and personal relationship with one's manager. Talent Management strategies exhibit strong relation with employees which results in more employee engagement and lower turnover rate. Employee engagement has positive impact on retention [32]. In addition, opportunity to learn and to make contribution in decision making, customer-centric approach and fair management were the key drivers of the employee engagement. Engagement in employees found out by doing survey in various countries e.g. UK and Mexico [28]. Talent Management improves employee engagement in an organization [17]. The factors like Career planning, effective leadership, training, inspiration and innovation improve employee engagement in the organization [8].

THEATRICAL FRAMEWORK



4 METHODOLOGY

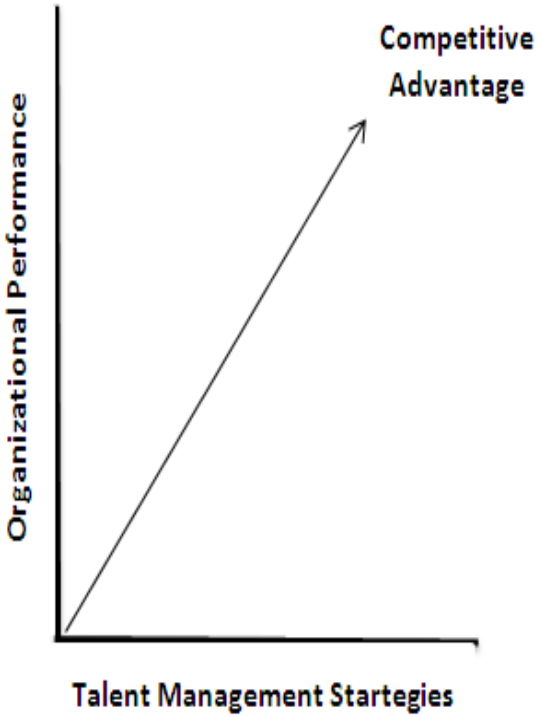
The prime purpose of this study is to identify the strategic importance of talent management and to create a link between talent management and organizational performance. Based on the study objectives and literature review, the theoretical framework deals with how to sustain talent and its effectiveness in organizational performance. Literature review provided us a space for comprehending the concept of talent management. Researchers examined the role of talent management in overall organizational effectiveness. Study is descriptive and qualitative in nature. This section of study will map out the methods which are adopted to throw a light on the research objectives of this article.

4.1 PARTICIPANTS AND PROCEDURE

Descriptive and qualitative research method is deployed. Given the nature and scope of the research, an interview method was used for investigation. Data is collected from managerial staff of different banks in an order to have the diverse opinion about talent management and to get an understanding that whether the particular framework is congruent with the thinking of managers working in banks operating in Pakistan. Open-ended interview questionnaire was used to collect the respondents' responses. Before conducting interviews, appointments from relevant banks managers are taken. Unstructured set of questions were being asked by bank managers to probe the role of talent management in banks effectiveness. Interviewing process has been completed within one month.

5 RESULTS

Study objective is to understand the concept and role of talent management in organizational effectiveness. The link between talent management and organizational performance is identified. Data is gathered from managerial staff of different banks to have their diverse opinion about talent management. Open-ended interview questionnaires were used to collect the respondents' responses.



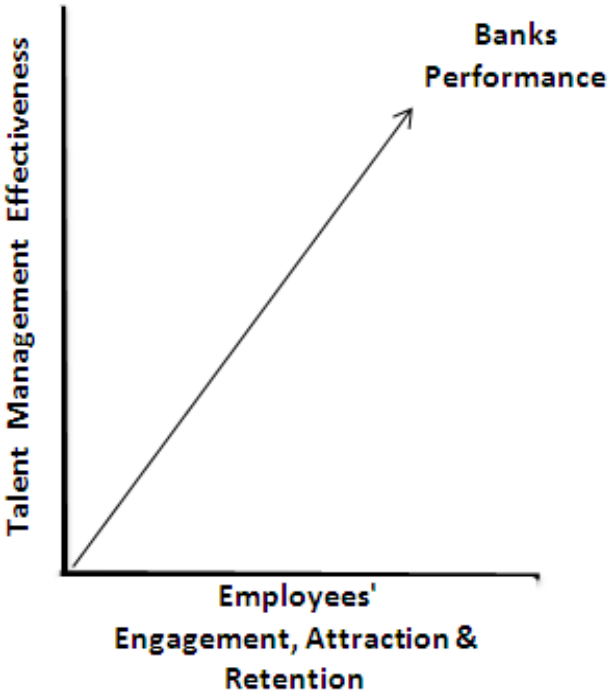


Figure1.1 *Figure 1.2*

Figure 1.1 shows that effective talent management strategies play an important role to enhance the banks overall performance and due to alignment in talent management strategies and banks performance, banks can gain competitive advantage. Similarly **Figure 1.2** shows that employees' engagement, retentions and attraction play crucial role in talent management effectiveness and as a result banks performance can be improved. Results revealed that effective talent management strategies have significant and positive relationship with organizational performance. Study's results also signifies that talent management also has positive and strong association with competitive advantage, performance and talent position within the banking sector. This study will provide insight of talent management concept and its importance in banking sector. Banks can utilize these results to make, build or mend their talent management practices. Findings suggest that the practices like attraction, recruitment and engagement plays an important role while managing talent in the banks. To get benefit from the competent employees and to develop employee for the future of the banks, talent management must be taken under consideration. Different factors like work-life balance, learning environment and succession planning plays an important role in keeping employees and utilizing them for company's advantage.

6 PRACTICAL IMPLICATIONS

For better understanding of effective talent management, banks can invest time and money in making world class talent management strategies. It masters the banks in winning competent employees and improves the position of the organization. Banks can utilize these results to improve their talent management mechanisms to enhance their performance, to gain competitive edge and to make strong talent positions. Better talent management and sound strategies to attract, retention and engage may imply the following strategies.

1. Identify the talent need in the organization and develop strategies to fill the gap by attracting and utilizing the organization resources.
2. Management is in the better position to face the current workforce challenges, retention and engagement of the company's employee.
3. Improve firm reputation and performance trigger by the employee and employer relationship.
4. Create a mentor nurturing environment which treats employees as assets of organization.

7 LIMITATIONS OF THE STUDY

The study has its limits for not considering many moderating and mediating factors which may affect the research. However, this research can be further carried out by identifying any other industry in Pakistan. Being a new concept, there is limited research on this topic in Pakistan. Different sectors like hospitals, construction companies, call centers are emerging markets and are still not tasted this concept in Pakistan.

Talent management can be assess by different measures as well. There are different items which measures attraction, retention and engagement of the employee. Neal & Gebauer [28] indicate culture of organization is important for retention, work life balance is significant for attracting new employees and learning environment plays a vital role for employee engagement. Future by using different research techniques significance of variables can be measured i.e. correlation to study the association and regression to measure strength of dependent and indecent variable relationship. The effects of different moderating variable can be taking under study.

8 CONCLUSION

Workforce challenges and rapidly changing environment are the key causes that banking sector need to develop strategies about managing talent within banks. Banks can take into consideration different perspective on talent management given by Blass [20]. The practices like attraction, recruitment and engagement plays an important role while managing talent in the banks. To get benefit from the competent employees and to develop employees in banks talent management must be taken under consideration. Different factors like work-life balance, learning environment and succession planning plays an important role in keeping the employees and utilizing them for company's advantage. Effective talent management requires commitment from all stages of organization. To reshape the banks structure employee engagement is important. Organizations can well-position their place in the market by using effective workforce performance.

Talent management plays an effective role and its integration at all levels of the banks, improves performances. Hence, banks should give proper attention in attracting new employee, recruiting current employees and engaging them for the betterment of employees and companies it-self. Talent management is a relatively new concept for effective management of key employees that should be made part of company's strategy. Organizations in developing countries like Pakistan should address this issue. Being a relatively less researched area it has a wide scope and opportunity for new researcher's in Pakistan. Study results also shows that talent management also has positive and strong association with competitive advantage, performance and talent position within the banking sector. This study will provide i understanding of talent management concept and its importance in banking sector. Banks can utilize these results to shape their talent management practices. Study results supported by previous studies. Managerial staff can play its role to reshape the talent management strategies to improve banks performance. Banks can invest time and money in the development of better talent strategies. It masters the banks in competent employees and improves the position of the organization. Banks can utilize these results to improve their talent management mechanism to enhance their performance, to gain competitive edge and to make strong their talent positions.

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ASSESSMENT OF FARMERS' PARTICIPATION IN ON-FARM ADAPTIVE RESEARCH IN SOUTH-WESTERN, NIGERIA

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ABSTRACT: This paper addresses farmers' participation in On-Farm Adaptive Research (OFAR) in South-western Nigeria. The concept of OFAR entails full participation of farmers in the research process, direct contact between researchers and farmers and intensive investigation of farmers' situations to strengthen Research-Extension-Farmers Linkage. Farmers' level of participation is critical in creating room for consideration of local ethics, culture, environmental and socio-economic characteristics to enhance successful and accepted programmes. This study sought to assess the farmers' level of participation based on four major phases of OFAR process: diagnostic survey phase, research phase, field test phase and demonstration phase. A multi-stage sampling technique was employed to collect cross sectional data from 350 farmers in Southwestern Nigeria. Farmers were favourably disposed to participation and inadequate input, capital, access to information; time and non-availability of market were major constraints against participation in OFAR. The implications of these findings for both research professionals and farmers are discussed.

KEYWORDS: Trials, OFAR, extension, linkage, research phase.

1 INTRODUCTION

Adaptive research is designed to adjust technology to the specific needs of a particular set of environmental conditions by taking into account the different bio-physical and socio-economic circumstances of the farmers.

Over the years, Nigerian Agricultural research programmes have undergone various changes with a view to develop viable technologies that are well adapted to Nigerian conditions. In 1991, National Agricultural Research Project (NARP) was established to revitalize the national agricultural research management system through financial support and strengthening of research - extension - farmer linkage. Also, new research structures were put in place in 1996 in accordance with new National Agriculture Research Strategic Plan and the mandates of the National Agricultural Research Institutes (NARIs). These structures resulted in the establishment of 24 National Coordinated Research Programmes [1]. Despite the huge public investment which reflected in the number of federally-funded National Research Institutes, their output is yet to have significant effects on the farmers' productivity. The agricultural sector is still beset with low per-hectare output, slow pace of innovation, poor management practices, minimal post-harvest value addition and other efficiencies [2].

1.1 ON-FARM ADAPTIVE RESEARCH (OFAR)

The agricultural extension service system is operated by Agricultural Development Programmes (ADPs) territory in Nigeria. On-farm Adaptive Research (OFAR) is one of the Agricultural Development Programme (ADP) activities uses to develop recommendations for representative groups of farmers. The concept of OFAR entails full farmers' participation, direct contact between researchers and farmers and concerted multi- disciplinary investigation of farmers' situations. Only

when this is done that farmers will have the opportunity of articulating their felt needs and the technologies fashioned around such needs become relevant, appropriate and adoptable (Subair, 2002). In Nigeria, research institutes and extension agencies such as ADP are the institutions responsible for technology generation and development, hence the need to investigate the farmers' involvement in this process in line with the subject of the workshop.

Farmers' participation in the OFAR also affords them the opportunities of identifying farming system constraints, problems and its priorities, managing experiment and evaluating results. Participation in this context means the active involvement of all the stakeholders in OFAR process of diagnostic survey, research, field test and demonstration phases. Strong farmer participation is essential in order to identify farmers' goals and problems (Farrington and Martin, 1988). However, there is a dearth of information on the extent and degree of farmers' participation in OFAR trials in Nigeria. This study intends to assess farmers' involvement in major phases of OFAR process: diagnostic survey phase, research phase, field test phase and demonstration phase.,

2 METHODOLOGY

The study was conducted in southwestern Nigeria. Three states, namely Oyo, Osun and Ekiti where OFAR trials were reportedly conducted in the past few years were purposefully selected for the study (Auta and Dafwang, 2010). A multi-stage sampling procedure was used to select two zones of the ADP in each state making a total of six zones. The zones were Ibadan/Ibarapa and Ogbomoso in Oyo state; Iwo and Ife/Ijesha in Osun state and Aramako and Ikole in Ekiti state. The next stage includes a random selection of two Local Government Areas (LGAs) in each of the zones. The selected LGAs were Akinyele, Ibarapa central, Orire, Ogo-Oluwa, in Oyo state; Ola-Oluwa and Atakumosa in Osun state; Ijero and Ido-Osi in Ekiti state. Three villages where farmers have participated in OFAR trials were purposively selected from each LGA. Thereafter, ten (10) farmers were randomly selected from each of the selected villages through the assistance of the ADP extension agents to arrive at a sample size of 360 farmers. However, a sample size of 350 farmers was eventually considered for the study due to some logistic reasons. Their level of participation was also measured using a 9 – item statement rated on a 3 point scale of Highly involved (2), Less involved (1), Never involved (0). A structured interview scheduled was used to collect information for the study. Frequency counts, percentages and means were used to describe the collected data while, Pearson Product Moment Correlation (PPMC) was used to test the relationships between the selected personal characteristics and level of participation in OFAR.

3 RESULTS AND DISCUSSION

3.1 PERSONAL CHARACTERISTICS

The majority (74.7%) of the farmers fell within the age range of less than or equal to 30 - 50 years with a mean age of 49.3 years. This is an indication that the farmers were still in their active and productive age group. This is likely to make them more responsive to adoption of innovation. The farmers were still smallholders with an average farm size of 4.3 hectares. A mean farming experience of 27.9 years showed that the farmers were highly experienced in agriculture. The majority of the farmers had one form of formal education or the other (Table 1).

3.2 FARMERS' INVOLVEMENT IN OFAR TRIALS

Results in Table 2 revealed that farmers in the study area had participated in different OFAR trials in the past few years. The maize varietal trial was among the OFAR trials in which 50% of the farmers participated while only 9.4% of the farmers indicated their involvement in the Pig crossing breeding trial. Less than half (45.7%) of the farmers participated in cassava trial and 25.7% of them were involved in soybean trial. Cocoyam and cowpea trials participated by 27.4% and 9.1% of the farmers respectively. Hen cross breeding trial was least participated by 5.7% of the farmers.

3.3 EXTENT OF FARMERS' PARTICIPATION IN OFAR STAGES

The study revealed lesser involvement of farmers in OFAR stages of problem diagnosis, identification of research needs and design and identification of constraints (Table 3). This is an indication that most of the decisions on research ideas and designs are still carried out by officers from several national research institutes, universities and ADPs without farmers' representations. Reference [5] also confirms that, identification of annual research needs was done through a joint problem diagnostic survey by the national officers and thus rendering farmers' level of participation in research - extension -farmer-input supply linkage to be very weak. Hence, non-representation of farmers at the crucial stages of OFAR may lead to the

inability of the outside agents to develop and recommend appropriate technologies that are compatible with the target group [6].

3.4 CONSTRAINTS AGAINST PARTICIPATION IN OFAR

Table 4 shows the constraints to farmers' participation in OFAR trials. The major constraints to participation as identified by farmers were lack of fund (77.1%); inadequate input supply (53.1%) and insufficient technical knowledge (63.4%). Reference [7] stated these as major constraints to participate in agricultural projects.

The farmers' perception of derived benefits from participating in OFAR trials were as shown in Table 5. The benefits as perceived by the farmers were increasing in yield (51.7%); acquisition of new skill (46.9$), increase in income (42.9%) and increase in the level of interaction between researchers and the farmers (30%). The perceived benefits of OFAR as indicated by the farmers could serve as a motivating factor to participate in OFAR trials.

3.5 DERIVED BENEFITS THE

Results in Table 5 show the benefits derived by the farmers as a result of participating in OFAR trials. About 52% of the farmers reported increase in yield as a benefit. Other benefits include, acquisition of new skill (46.9%), increase in income (42.9%) and Increase in level of interaction (30%).

3.6 RELATIONSHIPS BETWEEN PERSONAL CHARACTERISTICS AND PARTICIPATION IN OFAR

All the selected personal characteristics had significant relationships with the farmers' level of participation in OFAR trials as indicated in Table 6. This is an indication that an understanding of farmers' characteristics is likely to assist the researcher in focusing and formulating appropriate technologies and recommendations for different categories of farmers.

4 CONCLUSION

This study had clearly indicated that farmers were actively involved in OFAR trials in the study area.

Nevertheless, this study revealed that farmers were less involved in the decisive phase of OFAR which is diagnostic survey a situation which could probably contribute to the generation and development of technologies that will be more relevant, appropriate and adoptable. The survey also identified some constraints if properly addressed could enhance effective participation of farmers in OFAR. The study, therefore, recommends the involvement of farmers at the early stages of planning and the design of OFAR to ensure expected transformation that brought about the establishment of OFAR.

Table 1: Distribution of farmers by personal characteristics n =350

Characteristics	Frequency	Percentage
Age in years		
≤ 30	55	15.7
30 – 40	102	29.2
41- 50	104	29.8
Above 50	89	25.9
Mean = 49.3		
Total	**350**	**100.0**
Sex		
Male	231	66.0
Female	119	34.0
Total	**350**	**100.0**
Household Size		
1 - 5	62	17.7
6 - 11	251	61.8
> 11	37	10.5
Total	**350**	**100**
Farm size (Ha.)		
1 – 2	132	37.7
3 – 4	58	16.6
5 – 6	56	16.0
> 6	104	29.7
Mean = 4.3		
Total	**350**	**100.0**
Farming experience (Years)		
≤ 10	24	6.9
11 -20	23	6.6
21 – 30	183	52.3
< 30	120	34.2
Mean = 27.9		
Total	**350**	**100.0**
Education		
No formal education	123	36.1
Primary school	145	41.4
Secondary school	67	19.1
Tertiary	15	4.3
Total	**350**	**100.0**

Table 2: Distribution of farmers by their involvement in OFAR trials n=350

OFAR trial	*Frequency	Percentage
Maize varietal trial	175	50.0
Pig cross breeding trial	33	9.4
Cassava trial	160	45.7
Soybean trial	90	25.7
Cocoyam trial	96	27.4
Cowpea trial	32	9.1
Hen cross breeding trial	20	5.7

**Multiple Responses*

Source: Field survey, 2013.

Table 3: Distribution of the Farmers by Their Extent of Participation in OFAR Stages n=350

S/N	Stages of OFAR	Highly Involved	Less Involved	Never Involved
A.	**Diagnostic Survey Phase**			
1.	Problem diagnosis	0 (0)	72 (20.6)	278 (79.4)
2.	Identification of research needs and design	0 (0)	149 (42.5)	201 (57.4)
3.	Identification of constraints	0 (0)	186 (53.1)	164 (46.9)
4.	Identification of opportunities	26 (7.4)	165 (47.1)	159 (45.4)
B.	**Research Phase**			
5.	Design interventions	35 (10.0)	94 (26.7)	221 (63.1)
C	**Field Test Phase**			
6.	Provision of input plot	121 (34.6)	67 (19.1)	162 (46.3)
7.	Determination of management conditions	108 (30.9)	83 (23.7)	159 (45.4)
D.	**Demonstration Phase**			
8.	Implementation of the experiment	129 (36.9)	79 (22.6)	142 (40.6)
9.	Evaluation of the experiment	193 (55.1)	142 (40.6)	15 (4.3)

Source: Field survey, 2013. Figures in parenthesis are percentages.

Table 4: Distribution of farmers by constraints militating against their participation in OFAR trials n=350

Constraints	*Frequency	Percentage
Lack of fund	270	77.1
Inadequate Input supply	186	53.1
Insufficient technical knowledge	222	63.4
Non-availability of market	90	25.7
Lack of understanding between famers and the concerned agency	113	32.3

**Multiple Responses*

Source: Field survey, 2013

Table 5: Farmers' Derived Benefits for Participating in OFAR n=350

Benefits of participation	*Frequency	rcentage
Increasing in yield	181	51.7
Acquisition of new skill	164	46.9
Increase in income	150	42.9
Increase in level of interaction	105	30.0

**Multiple Responses*

Source: Field survey, 2013.

Table 6: Relationship between personal characteristics of the farmers and level of participation in On-farm Adaptive research n = 350

Characteristics	R	P – value	Decision
Age	-0.559**	0.000	Significant
Gender	0.124*	0.018	Significant
Educational attainment	0.301**	0.000	Significant
Household size	0.297**	0.000	Significant
Farming experience	0.372**	0.000	Significant
Farm size	0.422**	0.000	Significant

***Correlation is significant at 0.01 level (2 -tailed)*

** Correlation is significant at 0.05 level (2 -tailed)*

Source: Field survey, 2012

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BROILER PRODUCTION BY USING POLYHERBAL MEDICATION (NEEM, NISHYINDA, TULSI AND TURMERIC EXTRACT)

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ABSTRACT: The present work was aimed at knowing the effect of polyherbal extracts {neem(N), nishynda(N), tulsi(T) and turmeric(T) i.e. NNTT} as growth promoter at the (i) growth performance of broiler and on the (ii) dressing percentage, relative weight of heart, gizzard, liver, spleen and pancreas of the broiler. A total of 50 day-old broiler chicks were purchased from kazi farms limited and randomly divided in two groups, viz., A and B. Group A served as control and was without any supplementation in drinking water. Whereas group B were supplemented with 1ml of polyherbal (NNTT) extracts per liter drinking water. Live body weight was recorded at on 7th day and the final weight was recorded on 42nd day, total feed consumption, feed efficiency and blood parameters of birds were recorded on 21st day and on 42nd day. The treatment groups i.e. B (1700±51.73) recorded significantly ($P<0.05$) higher means for live body weight than that of control group A (1600±31.23). The birds in group B supplemented with 1ml polyherbal extracts gained the highest live weight among the treated groups and showed the best feed conversion ratio (1.85). It is, therefore, concluded that dietary inclusion of polyherbal (NNTT) extracts in the drinking water may be used for economical and efficient production of broiler.

KEYWORDS: Growth Promoter, Dressing Percentage, Blood Parameter, Feed Conversion Ratio and Dietary Inclusion, Weight Gained.

1 INTRODUCTION

Most of the poultry farmers are interested in broiler production due to its quick returns, smaller marketing age, less space requirement, and higher weight gains. Several chemical compounds and antibiotics have been identified in herbaceous plants by researchers, which play a key role in human and animal health. Due to favorable conditions, many herbaceous medicinal plants are found in Bangladesh. The medicinal plant turmeric (*Curcuma longa)* is commonly used as a spice in human food. Turmeric is a perennial herb, and a member of *Zingiberacae* family. The plant grows to a height of 3 to 5 feet and has oblong pointed leaves, which bears funnel shaped yellow flowers. The rhizome is the part used both as spice and medicine. It is usually boiled, cleaned, and dried, yielding a yellow powder. The active ingredients found in turmeric are curcumin, demethoxycurcumin, bisdemethoxycurcumin, and tetrahydrocurcuminoids. Plant extracts were found to have and anti-oxidative value. Some pharmacological activities of Turmeric as nematocidal and anti-inflammatory were demonstrated. More over, protective effects of turmeric as food additives on aflatoxin-induced mutagenicity and hepatocarcinogenicity [14].

The poultry industry has become an important economic activity in many countries. It is conceivable that herbal agents could serve as safer alternatives as growth promoter due to their suitability and preference, lower cost of production, reduced risks toxicity and minimum health hazards. Interestingly recent biological trials of certain herbal formulations in India as growth have shown encouraging results and some of the reports have demonstrated improvement with respect to weight gain, feed efficiency, lowered mortality, increased immunity and increased livability in poultry birds [7]. Also these

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herbal growth promoters have shown to exert therapeutic effects against liver damage due to feed contaminants like aflatoxin [3]. Indo-Pak subcontinent is abundant in herbal wealth and innumerable medicinal plants possessing interesting pharmacological properties and still awaits exploitation by scientific evidences in the field of poultry feeding. Therefore, it is a matter of great interest to try some of our indigenous medicinal plants or herbs as growth promoter in poultry diets. Various herbal products are being used as growth promoter in the poultry rations like neem, tulsi,.nishyinda and Turmeric. The present work was designed to following objectives.

(i) The growth performance of broilers supplemented with neem, nishyinda, tulsi and turmeric extract in broiler.

(ii) The effect of neem, nishyinda, tulsi and Turmeric extract on body weight performance and on blood parameters of broiler.

2 MATERIALS AND METHODS

2.1 COLLECTION OF PLANT MATERIALS

Neem, nishyinda, tulsi leaves and Turmeric were selected for effectiveness as growth promoter on poultry. Mature and disease free neem, nishyinda and tulsi leaves were collected from BAU campus. Turmeric was purchased from K.R. Market, Bangladesh Agricultural University, Mymensingh.

2.2 PREPARATION OF LEAVES NEEM, NISHYNDA, TULSI AND TURMERIC (NNTT) EXTRACT

For the preparation of dust, the herbal leaves neem, nishynda, and tulsi and turmeric were dried in sun for 10 days and followed by oven at 55-60°C for 2 days. The dried herbal leaves NNTT were pulverized with a blender. A 25 (unit) mesh diameter sieve was used to obtain the fine dust, after that dust was preserved in airtight plastic container until they were directly used for screening and preparation of water extract. A total 10g of herbal powder (2.5 gm from each ingradient i.e. neem, nishynda, tulsi and turmeric) was added to 90ml of distilled water and was shaken overnight at room temperature, filtered and distilled water was added upto 100ml to make 10% extract.

2.3 COLLECTION AND MANAGEMENT OF CHICKEN

Broiler chicks of 1 day old were collected from Kazi Farms Limited. The finally selected 50 chickens were allowed to acclimatize for 7 days in the experimental shed. The body weights (b.wt.) of assigned chicks were taken with digital weighting machine and the results were recorded. During acclimatization the chicken were supplied with recommended feed and water, whereas the chicks on both the extremes were discarded. During the acclimatization period the birds were fed a commercial broiler starter mash *ad libitum*. These chicks were randomly divided into 2 experimental units (replicates) having twenty five chicks each. These experimental units were further allotted to one treatment groups *viz.*, A control; B 1ml of Polyherbal (NNTT) extract . The experimental birds were fed (*ad libitum*) an experimental ration with or without supplementation of polyherbal. Group A served as control and without any supplementation of polyherbal (NNTT extract) in drinking water. Whereas group B supplemented with 1ml of polyherbal (NNTT extract) in drinking water. The experimental rations consisted of broiler starter mash and broiler finisher mash, which were fed from 2-4 and 5-6 weeks of age, respectively.

The experimental units were kept on a floor litter system in separate pens each measuring 3 x 4 square feet. The pens were thoroughly cleaned, white washed and disinfected before putting the experimental chick into these. All the birds were provided same management conditions like floor space, temperature, relative humidity, ventilation and light. Twenty-three hour light was provided daily through out the experimental period. The chicks were brooded at 35°C during first week and thereafter; the temperature was reduced by 3°C every week until the temperature reached to the room temperature i.e., 25±1ºC. All the groups were reared under the similar conditions of temperature, humidity, light, ventilation and floor space. A weighed amount of the ration was offered to the birds twice a day and the left over feed was collected to calculate feed consumption of the birds. Fresh and clean water was made available at all the times. The experiment was conducted according to the completely randomized design and data about per replicate initial body weight, Final body weight, total feed consumption and mortality were recorded during the experimental period (1-6 weeks of age). The data collected were utilized to calculate growth rate, efficiency of feed utilization and mortality percentage. The data collected on the production cost of broiler were used to find the commercial viability of the herbal growth promoter, Cost of production of the broiler in each group was calculated on per kg basis to work out the economics of production of the birds for each group, three birds from each replicate were picked up randomly and slaughtered for their dressing percentage and giblet weight (heart, liver,

gizzard & spleen) on 42nd day. The weight of pancreas was also recorded. The slaughtered birds were scalded by immering them into the water at temperature ranging from 180-190°F [6]. After that, the birds were manually plucked by hanging them on shackles by their feet. The weight of each carcass was recorded and dressing percentage was calculated on the basis of dressed meat including giblets and skin. After evisceration, the heart, liver, gizzard, spleen and pancreas of the slaughtered birds were taken out and weighed for their absolute weight. The data thus obtained were used for the calculation of (a) dressing percentage (%) (Dress weight of bird/Live weight of bird) × 100) (b) relative weight of (i) heart (ii) liver (iii) gizzard (iv) spleen and (v) pancreas. After evisceration, relative weights (g) [(weight of organ/live body weight) X 100] of various internal organs such as liver, heart, gizzard, spleen and pancreas of the slaughtered bird were recorded. The data thus collected regarding weight gain, feed consumption, feed conversion ratio, dressing percentage and relative weights of heart, gizzard, liver, spleen and pancreas were subjected to the analysis of variance (ANOVA) technique in completely randomized design. The differences in the means were compared by the Duncan's Multiple Range following [15].

2.4 EXPERIMENTAL DESIGN

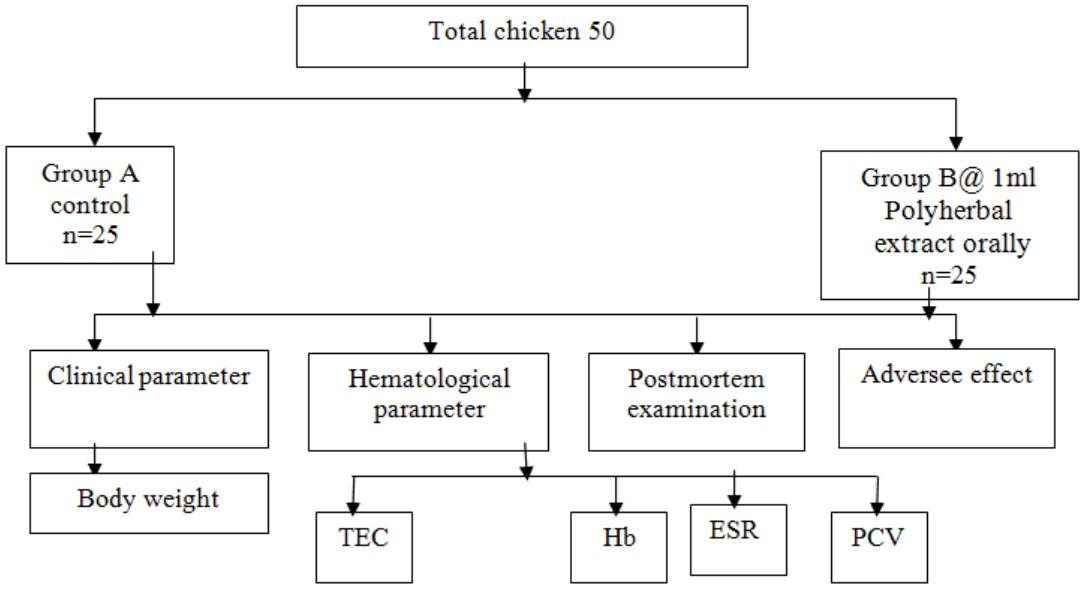

Fig. 1 Layout of the experiment

All the 50 chicks are randomly divided into 2 groups (A and B) for assessing the efficacy of Plants leaves extract as growth promoter on broiler

Chickens of group 'A': was kept as control and was not treated.

Chickens of group 'B': was treated with Polyherbal (NNTT extract) @ 1ml by dropper for consecutive six weeks.

All the chicken of treated and control groups were closely observed for 42 days after treatment and following parameter were studied:

2.5 CLINICAL EXAMINATION

I. The effect of the Polyherbal extract on body weight and feed consumption was recorded before and during administration of treatment.

II. Chickens under treatment and control groups were weighed with electric weighing machine. The weight of each chicken was taken before feeding in the morning, at noon and afternoon. The average of these three weights was calculated and recorded.

Mean live weight gain of each group of fowls on 7th and 42nd days was recorded.

2.6 HEMATOLOGICAL PARAMETERS

Blood samples were collected from wing vein of chicken of both control and treated groups on 21st and 42nd days. The effects of the polyherbal (NNTT) extract and the following parameter were observed:

(a) Total erythrocyte count (TEC)

(b) Hemoglobin estimation (Hb)

(c) Packed Cell Volume (PCV)

(d) Erythrocyte sedimentation rate (ESR)

2.6.1 DETERMINATION OF TOTAL ERYTHROCYTE COUNT (TEC)

Total erythrocyte count was done following the method described by [8]. Well-mixed blood sample was drawn with red blood cell diluting pipette exactly up to 0.5 marks of the pipette. Outside of the tip of the pipette was wiped with cotton. Then the pipette was immediately filled with the red cell diluting fluid (Hayem's solution) up to 101 marks. The free end of the pipette was wrapped around with the rubber tube stretching to both the ends and held with thumb and middle finger. The content of the pipette was mixed thoroughly by shaking with 8-knot motion for 3-5 minutes. Then the counting chamber was placed with special cover glass under microscope using low power (10x) objectives. After discarding 2 or 3 drops of fluid from the pipette, a small drop was placed to the edge of the cover glass on the counting chamber as the entire area under the cover glass was filled by the fluid. One-minute time was spared to allow the cells to settle on the chamber under the cover glass. Taking 5 larger squares (4 in the 4 corner and the central one) of the central large square, the cells were counted from all the 80 small squares (16 x 5) under high power objectives (45x). After completion of counting, the total number of RBC was calculated as number of cells counted x 10, 000 and the result was expressed in million/µl of blood.

2.6.2 DETERMINATION OF HEMOGLOBIN CONCENTRATIONS (HB)

The N/10 hydrochloric acid (HCl) was taken in a graduated tube up to 2 marks with the help of a dropper. Well-homogenized blood sample was then drawn into the Sahli pipette up to 20 cm. mark. The tip of the pipette was wiped with sterile cotton and the blood of the pipette was immediately transferred into the graduated tube containing hydrochloric acid. This blood and acid were thoroughly mixed by stirring with a glass stirrer. There was a formation of acid hematin mixture in the tube by hemolysing red blood cells by the action of HCl. The tube containing acid hematin mixture was kept standing in the comparator for 5 minutes. After that distilled water was added drop by drop. The solution was mixed well with a glass stirrer until the color of the mixture resembled to the standard color of the comparator. The result was read in daylight by observing the height of the liquid in the tube considering the lower meniscus of the liquid column. The result was then expressed in g %. The above procedure was matched by the Hellige hemometer method as described by [8]

2.6.3 DETERMINATION OF PACKED CELL VOLUME (PCV)

The citrated well mixed blood sample was drawn into special loading pipette (Wintrobe pipette). The tip of the pipette was inserted up to the bottom of a clean, dry Wintrobe hematocrit tube. Then the Wintrobe tube was filled from the bottom by pressing the rubber bulb of the pipette. As blood came out, the pipette was slowly withdrawn but pressure was continued on the rubber bulb of the pipette so as to exclude air bubbles. The tip of the pipette was tried to keep under the rising column of blood to avoid foaming and the tube was filled exactly to the 10 cm mark. Then the Wintrobe hematocrit tube was placed in the centrifuge machine and was centrifuged for 30 minutes at 3000 rpm. Then, the hematocrite or PCV was recorded by reading the graduation mark; the percent volume occupied by the hematocrit was calculated by using the following formula [8]

PCV% = **Erreur !** X 100

2.6.4 DETERMINATION OF ERYTHROCYTE SEDIMENTATION RATE (ESR)

The fresh anticoagulant blood was taken into the Wintrobe hematocrit tube by using special loading pipette exactly up to 0 marks. Excess blood above the mark was wiped away by sterile cotton. The filled tube was placed vertically undisturbed on the wooden rack for one hour. After one hour the ESR was recorded from the top of the pipette. The result was expressed in mm/in 1st hour.

2.7 POSTMORTEM EXAMINATION FOR SIDE EFFECTS

Three chickens from each group were slaughtered to see if there were any pathological changes present on 42th day of treatment. There was no significant pathological change in any internal organs of the chickens of treated groups.

2.8 STATISTICAL ANALYSIS

The data were analyzed statistically between control and treated groups of chicken by the well know *student's test* ('t' test).

Plate 1. Neem tree (Azadirachta indica)

Plate 2. Neem leaves powder (Fine grinding)

Plate 3. Nishyinda plant (Vitex nigundo)

Plate 4. Leaves of tulsi (Ocumum sanctum)

Plate 5. Grinding of tulsi leaves.

Plate 6. Tulsi leaves extract.

Plate 7: Turmeric rhizome

Plate 8: Turmeric powder

Plate 9 : Day old broiler chicks

Plate 10: Broiler chicks (Growing stage)

Plate 11: Broiler in control shed.

Plate 12. Measuring weight of chicken

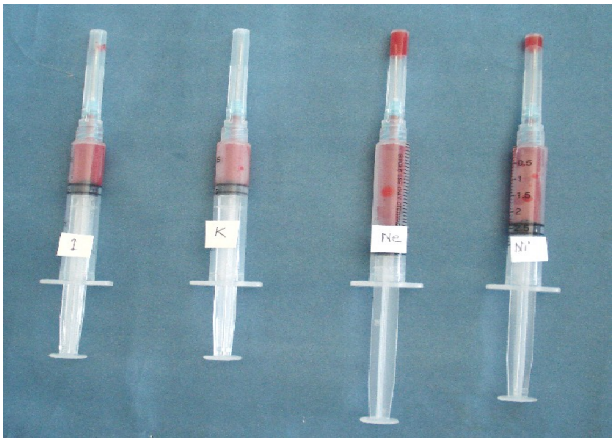

Plate 13: Blood samples for Haematological test

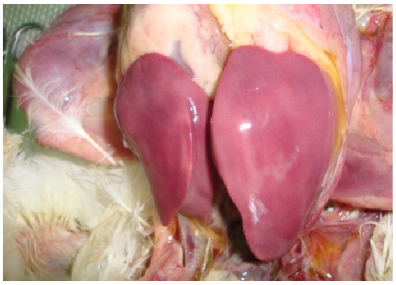

Fig: Liver

Fig: Liver

Fig: Bursa

Fig: Bursa

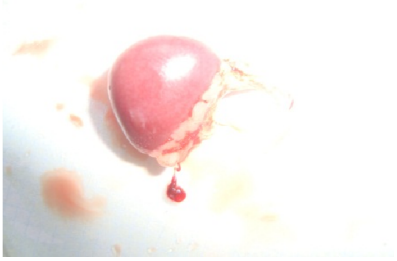

Fig: Spleen

Fig: Spleen

Fig: Gizzard

Control (group A)

Fig: Gizzard

Treatment (group B)

Plate 14: Post mortem examination of chicken

3 RESULTS AND DISCUSSION

3.1 EFFECT OF POLYHERBAL EXTRACT SUPPLEMENTATION ON GROWTH IN BROILER

The observations for live body weight (ml) means of A and B, groups for six weeks of the experimental period were 1600±31.23 and 1700±52·88, respectively. It is observed from the results in Table 1, that supplementation of polyherbal extract in A and B groups of broiler effected significant (P<0.05) increase in mean live body weights as compared to control (A) group. Similarly [9]. Supplemented neem leaf extract @ 1-2 ml/kg feed and reported significant increase in the live body weight of broiler in the neem fed groups when compared with control group. It is observed from Table1. That, the means of weekly gain in weight (ml) for A and B groups were 112±8.77 and 110±8. Respectively. All the treatment groups of broiler showed numerically higher body weight gain as compared to control (A) group.

The birds supplemented with polyherbal (NNTT extract) group B gained the highest live weight among the treated groups (Table I). Statistical analysis of the data revealed that the supplementation of polyherbal (NNTT extract) in the broiler rations did exhibited significant effect on the feed intake when compared to those of the control group (Table 1). Statistical analysis of the data did not show any difference (P<0.05) between the dressing percentages of the birds of different feeding groups (Table 2). Statistical analysis of the data did not show any difference between the relative gizzard weights of the birds of different feeding groups (Table 2). Statistical analysis of the data did not show any difference between the relative spleen weight of the birds of different feeding groups using ration with or without supplementation of polyherbal.

Table 1. Initial and final live weight, weight gain, feed consumption and feed conversion ratio of broiler fed on polyherbal (NNTT extract) from 1 to 6 weeks of age

Variables	Control	Treatment
	A	B
Initial live weight (g) on 7th day	112±8.77 n=25	110±8.70 n=25
Final live weight (g) on 42nd day	1600±31.23 n=25	1700±52·88 n=25
Weight gain (g)	1488±21.26 n=25	1590±42·02 n=25
Feed consumption (g)	3100	3155
Feed conversion ratio	1.93	1.84

Mean values within the same row, which have different supercripts, were significantly different (P<0.05). In this and other tables, A = control, B = 1ml

Table 2. Dressing percentages, relative giblet weight (heart, gizzard, liver and spleen) and pancreas weight of broiler fed on polyherbal (NNTT extract) from 1-6 weeks of age

Variables	Control	Treatment
	A	B
Dressing percentage	65.40	63.90
Relative heart weight	0.45	0.442
Relative gizzard weight	1.422	1.429
Relative liver weight	2.61	2.59
Relative spleen weight	0.11	0.10
Relative pancreas weight	0.27	0.25

Table 3. Data showing economics of broiler production kept under treatment group from 1 to 6 weeks of age

Description	A (n=25)	B (n=25)
Cost/chick (Tk)	47.00	47.00
Average feed consumed (Kg)/chicks	3.100	3.155
Feed price/kg (Tk)	40.00	40.00
Cost of herbal growth promoter (Tk)	0.00	3.00
Feed cost (Tk)	124.00	126.20
Miscellaneous (Tk)	16.00	16.00
Total cost/broiler (Tk)	187.00	189.20
Average live weight (Kg)	1.600	1.700
Sale price/Kg live wt. (Tk)	140.00	140.00
Sale price/broiler (Tk)	224.00	238.00
Net profit/broiler (Tk)	37.00	47.80
Profit/ Kg live weight (Tk)	23.13	28.12

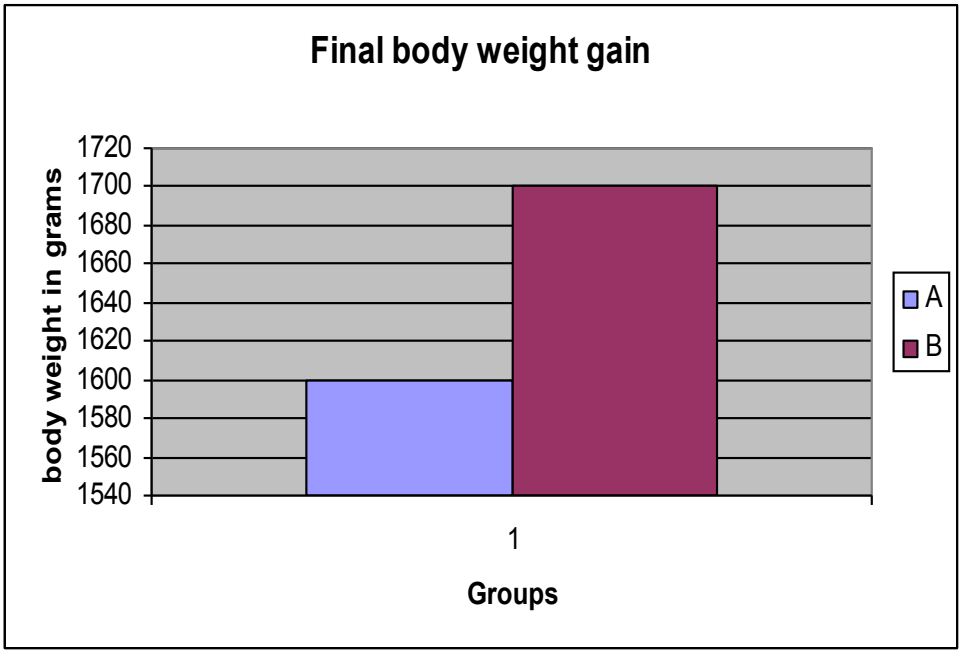

Figure.1 Final Body weight gain

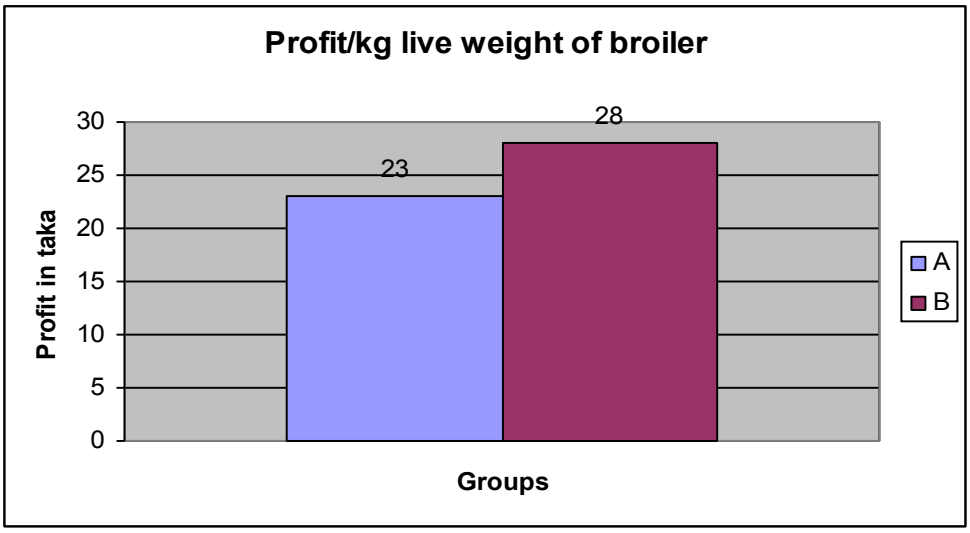

Figure.2 Profit/kg live weight

Ration without the addition of these growth promoter. Supplementation of polyherbal was found to be more profitable than 1.0% level in broiler rearing. However, dietary inclusion of Turmeric extracts fetched the maximum profit as compared to the other treatment groups. The results of the present study are in line with the findings of [1], who reported that dietary inclusion of polyherbal in the rations was more beneficial in broiler production. Similar results have been reported by [5], where the broiler fed rations with added Turmeric, fetched more profit than those using rations without supplementation of this herbal growth promoter. Increase in the profit margin of the birds fed rations containing herbal growth promoter may be attributed to the better efficiency of feed utilization, which resulted in more growth and better feed to gain ratio, ultimately leading to higher profit margin in the broiler reared on polyherbal supplemented rations.

3.2 STUDY OF POLYHERBAL ON HEMATOLOGICAL PARAMETER OF POULTRY.

Observation of hematological parameter (RBC, Hb, PCV, ESR) on 21 day and 42 day did not show any significant difference ($P<0.05$) between the control and polyherbal (NNTT extract) treated groups (Table 2). Observation of birds also revealed low mortality rate among the birds without any vaccination programme.

Table 4. Study of Polyherbal on hematological parameter of broiler

Days	Parameters	Treatment (Neem, Nishyinda, Tulsi and Turmeric)	Mean±SEM	n value	P value	Significance value
21st day	RBC (mm^3)	Control	190.31±6·39	5	0.044	NS
		Polyherbal	190.87±7·50			
	Hb (gm%)	Control Polyherbal	5.98±0·10	5	0.11	NS
		Polyherbal	6.50±0·08			
	PCV (%)	Control	17·41±0·75	5	0.419	NS
		Polyherbal	20·02±0·59			
	ESR mm in 1st hours	Control	11·59±0·79	5	0.026	NS
		Polyherbal	8·81±0·90			

Days	Parameters	Treatment (Neem, Nishyinda, Tulsi and Turmeric)	Mean±SEM	n value	P value	Significance value
42nd Day	RBC (mm^3)	Control	249.60±12·82	5	0.238	NS
		Polyherbal	277·64±12·10			
	Hb (gm%)	Control Polyherbal 3ml	7..03±0·22 7.61±0·20	5	0.049	NS
		Polyherbal	7·67±0·20			
	PCV (%)	Control	17.0980±0·58	5	0.218	NS
		Polyherbal	22·02±0·29			
	ESR mm in 1st hours	Control Polyherbal 3ml i	7.10±0·58	5	0.236	NS
		Polyherbal	5.320±1·00			

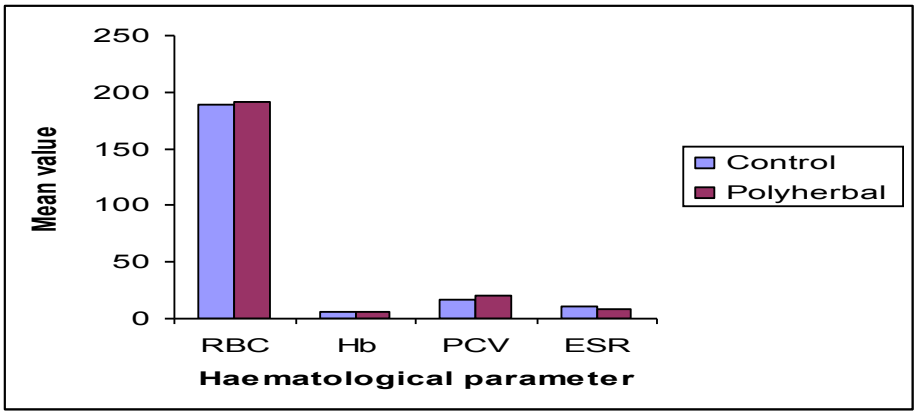

Fig. 3. Haematological parameter of broiler on 21st day

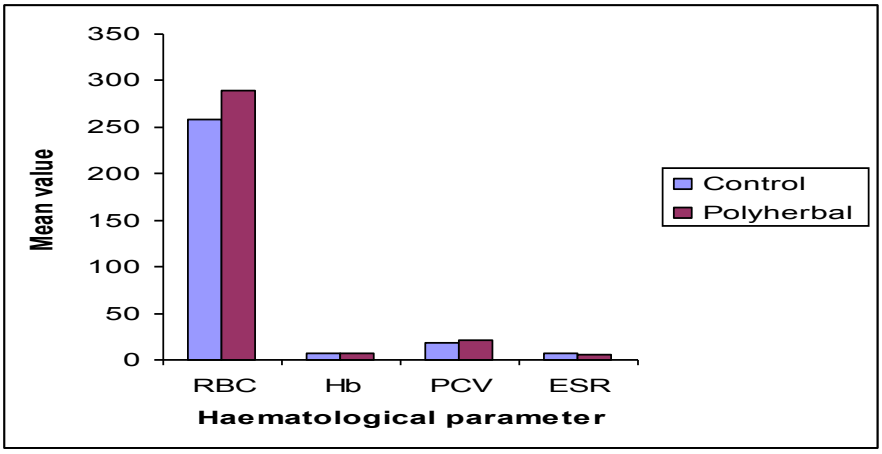

Fig. 4. Haematological parameter of broiler on 42nd day

Supplementation of polyherbal (NNTT extract) in the treatment caused improvement in the feed efficiency as compared to that of control group. Similarly [10] reported increase in feed efficiency in Neem fed groups, which is in agreement with the findings of the present study. Birds supplemented with polyherbal (NNTT extract) had higher body weight, weekly gain in weight, feed consumption and feed efficiency. These results may be due to antimicrobial and anti-protozoal properties [2] of neem and tulsi leaves, which help to reduce the microbial load of birds and improved the feed consumption and feed efficiency of the birds. It is concluded that supplementation with 1ml of polyherbal (NNTT extract) per liter of drinking water of treatment groups caused significant increase in live body weight and improvement of gain in weight and feed efficiency as compared to that of control group of poultry.

A mixed herbal growth promoter, polyherbal (NNTT extract) improved the weight gain of the broiler in this study. These results are in line with those reported by [12] in broiler fed rations containing turmeric. The improvement in weight gain of the birds using turmeric in their rations may probably be due to the fact that turmeric extract inhibits growth of intestinal bacteria such as *S. aureus* and *E. coli* as reported by [4]. Resultantly, when the load of these bacteria in the intestine is low, birds may absorb more nutrients, thus leading to the improvement in weight gain of the birds using rations supplemented with turmeric. The birds fed rations supplemented with herbal growth promoter, polyherbal utilized their feed more efficiently than those feed ration without addition of the growth promoter these results are in line with the findings of [1] who reported higher weight gain in broiler fed rations supplemented with turmeric. The use of polyherbal showed more increase in live weight of the birds as compared to 1% level in this study, which is also in agreement with the findings of [11] who concluded that powdered turmeric may be incorporated as a growth promoter in the ration of Japanese quails. Better feed conversion ratio of the broiler using rations supplemented with may be attributed to the antibacterial properties of these supplements, which resulted in better absorption of the nutrients present in the gut and finally leading to improvement in feed conversion ratio. Supplementation of of polyherbal (NNTT extract) did not exhibit any effect on the dressing percentage values of the broiler in this study. The results of the present study are in line with those observed by [1] who reported a non-significant effect on broiler dressing percentage values due to the inclusion of polyherbal in drinking water of broilers. Supplementation of polyherbal in drinking water did not exert any effect on the mean relative heart, gizzard, liver, spleen, pancreas weights of the broiler used in this study. The results of the study are consistent with those observed by ([1],[13]).

The effects of polyherbal (NNTT extract) on broilers after administration of 1 ml/ liter in drinking water for consecutive 36 days (from 7 day to 42 day). Blood sample were collected on 21st and on 42nd day (Table 4) showed no significant change in treatment group (TLC, PCV, Hb and ESR) than control group. This may be due to the medicinal plant did not produce any harmful or beneficial effects and this results have similarity with [2].

Therefore, concluded that polyherbal (NNTT ecxtract) has effects as alternative growth promoter on broiler. Care should be taken to ensure its safe use for medicinal references.

4 CONCLUSION

It is concluded that supplementation with 1ml of polyherbal (NNTT extract) per liter of drinking water in treatment group caused significant increase in live body weight and improvement in weekly weight gain and feed efficiency as compared to that of control group of broiler. Treatment groups are suitable for human health because there is no residual effect of commercial antibiotics therapy and also cost effective. My study showed that this formulations could be used as an alternative to growth promoters in broilers that helps to meet protein demand.

In Bangladesh, no much trial has been performed to evaluate the medicinal value of NNTT extracts. I performed this work in short-term basis (only 42 days) and modern equipments were also not available. To establish the polyherbal (NNTT extract) as growth promoter, it is necessary to do more intensive research works. I found in this experiment, the treatment groups are more profitable in comparison to the control group.

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The Author

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Model of an Improved Waste Power Plant in Dhaka

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ABSTRACT: The amount of waste in the developing Dhaka city is reaching a point where the Metropolitan is running out of space for discarding. This increasing waste is becoming an issue not only for the lack of space but also due to it being the cause of illness, pollution, destruction of natural beauty of the city. The city has already successfully polluted its once primary water source, the Buriganga River. In the current scenario, waste management has become an essential factor. Both quantitative and qualitative disposal is absolutely crucial. In this study a new model of a waste power plant has been proposed which will require less manpower, will create lesser pollution than existing waste power plant models and will put use to a large mass of waste that goes unused in the city.

KEYWORDS: Waste Minimization, energy from waste, waste management, waste power plant, power generation.

1 INTRODUCTION

The inevitable byproduct of any process of production is waste. Whether is it something as small and regular as cooking or production of something as massive as airplane; any processes is bound to produce a certain amount of waste. With the growing economy, population and urbanization this waste has equally gown in complexity as well as in amount, this not only hampers the growth in the processes causing them but also causes pollution resulting into various problems, such as: decrease in fertility of soil, increase in production of greenhouse gas, human health risks …etc. Along with this, mismanagement [e.g.: open dumping] also causes problems such as clogging the urban drainage system and contaminating the water supply. The waste is a definite by product which cannot be helped, management and disposal of the waste can definitely help decrease the degradation of the environment- this is an aspect that has been explored to a certain extent in Bangladesh. The process had begun in 1995, when a national research organization for waste concern was established. A decade later (in 2005) the Waste Concern Group was formed as a Social Business Enterprise that involved numerous social purpose companies. With the main objective of using the waste as a resource the Waste Concern put into perspective the categorization of waste and identifying the type of management involved with such. Numerous initiatives have been taken by both the Concern and the Govt. of Bangladesh; keeping the 3R strategy in mind the focus has been on the composting and reduction of the area of landmines used. Even though the concerned sectors have accomplished much to mention and is still being worked on at every level, the prospect of energy conversion and recovery has been nearly untouched. Combination of energy shortage with this gives the issue a new potential. This aspect has been explored by various countries in Europe [1].

In this paper we explore the possible ways of energy extraction from disposed waste, along with which possible improvement of existing methods of waste disposal and possible use of other renewable sources is mentioned

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2 IMPROVED MODEL OF A WASTE TO ENERGY POWER PLANT

2.1 WASTE TO ENERGY

Waste to energy is a well explored sector where various methods have been established with variable efficiency. We mainly explore the industrial aspect of this. The current system of waste to energy conversion is combination of several processes; such as waste separation, gas extraction, heat powered steam turbine and fuel powered gas turbine. The illustration of which shown in Fig.1.0. In the currently existing process extra work is needed in carrying the waste from the waste storage to the fuel tank, regardless of whether it is done by automated machines or manual labour. The gas cleanup process does not extract gases such a dioxin, nitrogen oxide, mercury etc. along with the overall heat produced during the process—released into the atmosphere causes harm to the environment.

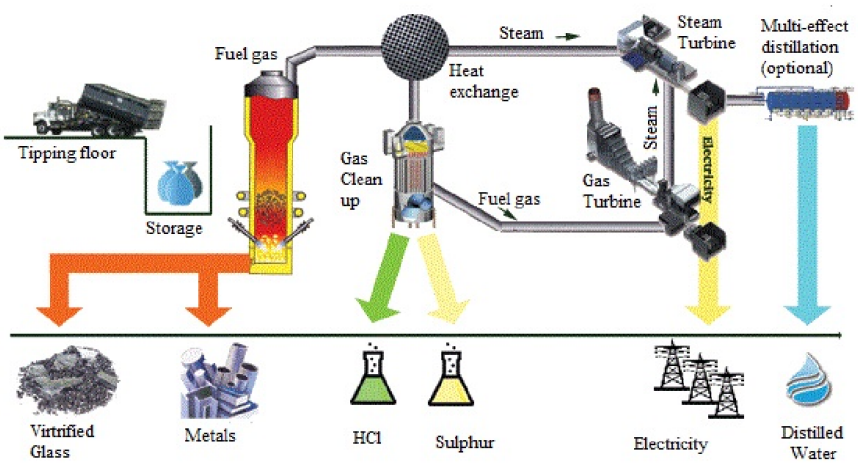

Fig. 1. Existing Model of a Waste Power Plant

2.2 PROPOSED WASTE POWER PLANT

Since this system causes waste of a lot of energy that can be easily used; hence we have come up with an alternative design with better efficiency with same input waste material shown in Fig. 2.

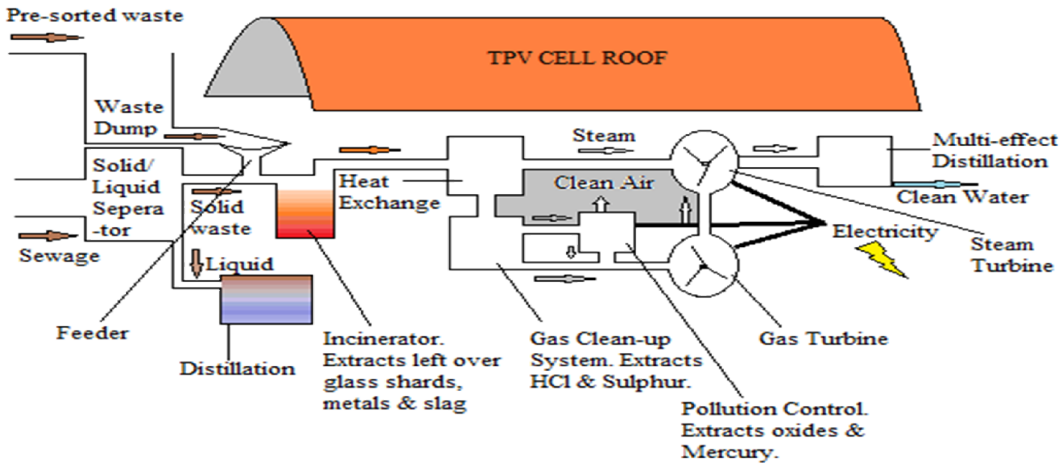

Fig. 2. Proposed Model of Waste Power Plant

- This design saves energy/labour cost for waste transfer due to storage being directly linked to feeder.
- Addition of the pollution control system to the gas clean-up tank—reduces production of harmful gases and ensures release of clean gas into the atmosphere; vapour produced in this process also contributes to the gas turbine, making it faster.
- The addition of TPV dome at the top ensures use of heat produced in production of additional electricity.
- Note that this process works analogous to the currently existing design only with increased efficiency and less pollution. The amount of heat produced during the incineration and also other processes like steam production, does not just release into the atmosphere to eventually add to the greenhouse effect, instead this heat is used by the TPV cells to generate further electricity.

2.3 WASTE POWER PLANT DATA

There are 212 recorded Waste Power Plants according to the data found in Global Energy Observatory website [3] that range in capacity from 1.1 to 677 MW. These power plants generate tons of carbon dioxide gas during the process of incineration of the waste products; municipal solid waste is a big part of this, which is primarily carbon. For example, a waste to energy treatment of 1 ton of household waste can produce almost the same amount of CO_2. This amount might seem a lot; however the same amount of waste dumped into a landfill can produce up to 62 m^3 of CH_4, which in turn is more harmful to the environment than 1 ton CO_2. The pollution control system in the proposed design however reduces this production of this carbon dioxide as well, making is more environmentally feasible compared to the existing.

2.4 ECONOMIC FACTOR

- Cost feasibility is a major issue in the context of Bangladesh. According to the comparative data provided in [1]—waste to energy conversion is economically feasible for Bangladesh in the current condition. According to [5] there has been a contract signed between the Management Environment Finance SRL Ltd and the local Govt. of Dhaka (north and south) in February 2013, where the Italian company is supposed to construct 2 waste power plants for the govt. Management Environment Finance SRL Ltd however has failed to deliver any results so far. The project deadline has been extended four times till date. This is mainly due to lack of funds claim MEF SRL Ltd. The dead stated the local govt. is to lease 43.4 acres of land to the company for 6.944 million taka, where the investors pay 300 million dollar- the lease amount would increase 20% every 5 years. The generated energy was discussed to be purchased by the DPDC at 8.75 taka per unit. This plan however is currently at a position where the Govt. is considering cancelling the plan altogether.
- In the context of Dhaka itself, the process of generating power has advantages compared to any other country, considering the already established market of waste sorting. Table I shows an example of the sorted waste products (in percentage) in Dhaka city in the year 2006 [6]. This saves one step from the separation and filtering, thus saves energy and labor.

Table 1: Collection of Waste in Dhaka

Waste composition	Dhaka (% by weight)
Food & Vegetable waste	70
Paper products	4
Plastics	5
Metals	0.13
Glass and ceramics	0.25
Wood	0.16
Garden Waste	11
Other (Stone, dirt etc.)	9.40

- It should be highlighted that after being dumped in the landfills surrounding Dhaka, the organic waste is entirely left to rot while the waste sorters only sort out plastic, paper, metal and glass waste and use them for recycling. Therefore receiving the primary raw material, organic waste, for a waste to energy plant is plentiful in Dhaka.

3 CONCLUSION

- In the current state of the environment, we have no other way but to consider renewable sources of energy. With the increasing everyday waste—it emerges as the best solution to the current energy crisis which in turn is also environment friendly. With approximately 30 million people living in Dhaka, household waste can be easily considered as a renewable source of energy.
- The existing model of the system causes a lot of harm to the environment resulting into the 'environment friendly' aspect to be nullified; since 100% efficiency is not achievable, the best possible alternative is to utilize all possible harmful aspects of the system to generate more power. And by practically implementing the proposed model it is possible to eradicate two of Dhaka City's major problems at once: a) generating much needed electricity and b) reducing the ever growing amount of waste in the city.
- Further research can be conducted in this field of study to make the model even more environment friendly and more efficient.

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The Trends and Developments of Human Resource Information System: A Case of Azad Jammu & Kashmir Public sector

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ABSTRACT: The major objective of the study are to explore the trends and developments of human resource information system in public sector department of Azad State of Jammu and Kashmir. The paper examines the current HRIS uses, benefits and barriers in these selected public sector organizations. A questionnaire was developed specially based on previous studies done in this area. The result showed that benefits of HRIS are quick response and easy access to information and reducing manpower while the lack of funds and trained staff are the greatest barriers. This study gives an overview of Information system implementation initiatives taken by government of AJ&K, Pakistan.

KEYWORDS: AJKCDP, BIS, EDP, MIS, SAP and HRIS.

1 INTRODUCTION

The State of Azad Jammu & Kashmir is considered an independent state governed by Pakistan as free Kashmir. The IT and MIS initiatives were introduced in health and Education sector. But mostly the organizations have traditional HR system. All the public sector organizations have manual system. The human resource information system(HRIS) is planned and predetermined course of action that reflects organization/government objectives. With the changing dynamics of business, human resources now play the role of strategic partner. HRIS is about improving processes and changing behavior is not just implementing technology, it is about consolidating, streamlining, re-engineering and automating manual HR processes, gathering, managing and delivering business related information to the stakeholders. HRIS is an efficient and responsive system for managing the human resources. HRIS are of three types such as Electronic data processing (data processing, data, storage, processing payroll and basic personnel information), MIS management information system and the decision-support system. Some organizations use all three while some use partially. In this study AJKCDP and Accounts office are using HRIS partially. As Azad Jammu & Kashmir community development programme (AJKCDP) is using MIS while Accounts office is using payroll system and electronic data processing system.

The goal of AJKCDP is to improve the wellbeing of rural poor through consolidation, strengthening and expansion of gender sensitive community based participatory village development planning. The M&E system is a key tool to monitor the results of the project activities or project process, against the set targets for outputs and objectives to determine performance of the project. The intended objective of the AJKCDP would be achieved if the activities are planned and implemented in accordance with the schedule. Hence challenges for the AJKCDP management has been multiplied which would be tried to be covered up to the maximum level, which have to be tackled especially by the management as per new policy. Monitoring of program activities at all levels on a regular basis is important to attain and maintain program success. Institutional arrangements for proper functioning of M&E system is required to put in place with assurance of necessary human and financial resources available.

The CDP is designed on demand driven participatory approach hence the necessity of M&E know how with the beneficiaries is important. If the community organizations can plan and execute their projects (community/ village based)

why not let them share in monitoring the progress and evaluate results to identify where they went wrong and why. These departments are providing need-based services to the rural community. AJKCDP implemented the MIS in order to achieve its objectives properly. The management of AJKCDP gave training to representatives of line department about MIS. The MIS is a system that provides information needed to manage organizations effectively. MIs regarded to be subset of internal control procedure in a business which covers the application of people, document, technology and procedure. MIS is a system using formalized procedure to provide management at all level in all functions with appropriate information based on data from both internal and external sources. MIS helps to achieve objectives, plan and control their process and operation, to deal with uncertainty ant initiates the change. There are lack of management involvement in design, poor appreciation of management support are the barriers (Deoti-A Dekeye, 1997). MIS is basically processing data into information which is thus concentrated to various departments in an organization for appropriate decision-making. Juma Hemed Lungo(2003) identified the barriers such as information efforts seen as burden, unavailability of data registers and lack of feedback. He also identified the benefits of this system such as improve the efficiency, wide variety of output and reducing duplication of work. Accounts office deliver the Salaries, pensions etc of all government employees. They used manual system but recently they introduced the HRIS in AJ&K.

1.1 OBJECTIVES OF THE STUDY

1) To explore the uses and benefits of HRIS in AJKCDP & Accounts Office
2) To examine the barriers to HRIS implementation
3) Identify the trends and developments in in the field of IT and IS

1.2 SIGNIFICANCE OF THE STUDY

The study will provide insight into the implementation of HRIS by the public sector departments in AJ&K and will help the practitioner better understanding the benefits and barriers to the implementation of HRIS. The most important is that this is a first study in the government sector of Azad Jammu & Kashmir.

1.3 LITERATURE REVIEW

Raija & Hlonen(2009) described the role of information systems in the process of combining district organizations which use information system in financial administration, HRM and social welfare. They explored the role of IS in decision-making in public sector of AJK.

Dr. Karishna & Meena(2010) identified the various functional areas to which ICT is deployed for information administration in Higher Education institutions. Current level of usage indicates a clear integration of ICT for managerial or information based administration in higher educational institutes.

Matthew & Douglas(2009) analyzed that nature of developing IS in any organization is characterized by multi dimensional and often messy problems, involving technical organizations and personal dimensions.

Miltiadis ,Davidet,al(2010) analysed the main traits of efficient firms and the main sources of firm's efficiency through samples of catalan firms. Firms efficiency shows a significant improvement when advanced ICT uses are combined with human resource practices.

Dileep (2010) indicate that HRIS is an integration of HRM and information systems. HRIs helps HR managers perform hR functions in a more effective and systematic way using technology. HRIs system usually a part of the organization's larger management information system which would include accounting, production and marketing functions.

Fernandez,Joseet.l(2006) identified the realization that the use of business HRIS in developing and retrieval, recognize the positive influences that these systems have recruiting the process. Better performance is expected from people recruited internally.

Ikhlas&Zaid(2010) indicate that the quick response and access to information were the main benefits of HRIS implementation. They also identified the cultural and financial barriers to the implementation of HRIS.

Kristine &David(2010) identified the implementations or upgradation of HRIS has been undertaken with the aim of utilizing HRM functions.. Barriers also associated with the acceptance of new or upgraded HRIS.HRIS play an important role in shaping user perception and behavior.

1.4 RESEARCH METHODOLOGY

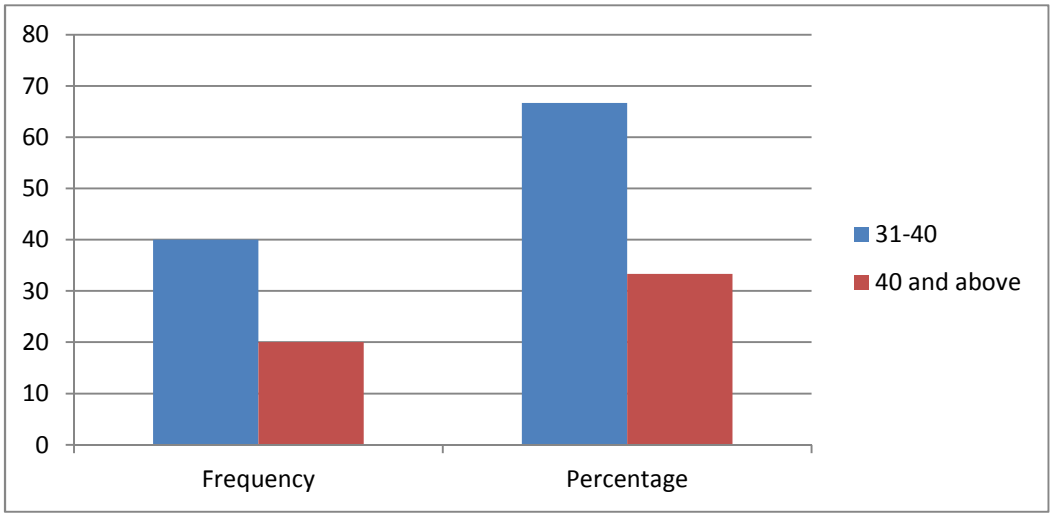
Questionnaire was designed to get information from the staff of AJKCDP and accounts office of AJ&K. Questionnaires are sent to the respondents. 30 respondents from the AJ|KCDP as well as 30 from the Accounts office. The respondents were selected on the basis of HRIS user organizations.

1.5 DATA ANALYSIS

The analysis of data was explain/done through tabulation and graphs.

Table-1 The Profile of the Respondents

Age of employee	Frequency	Percentage
31-40	40	66.67
40 and above	20	33.33

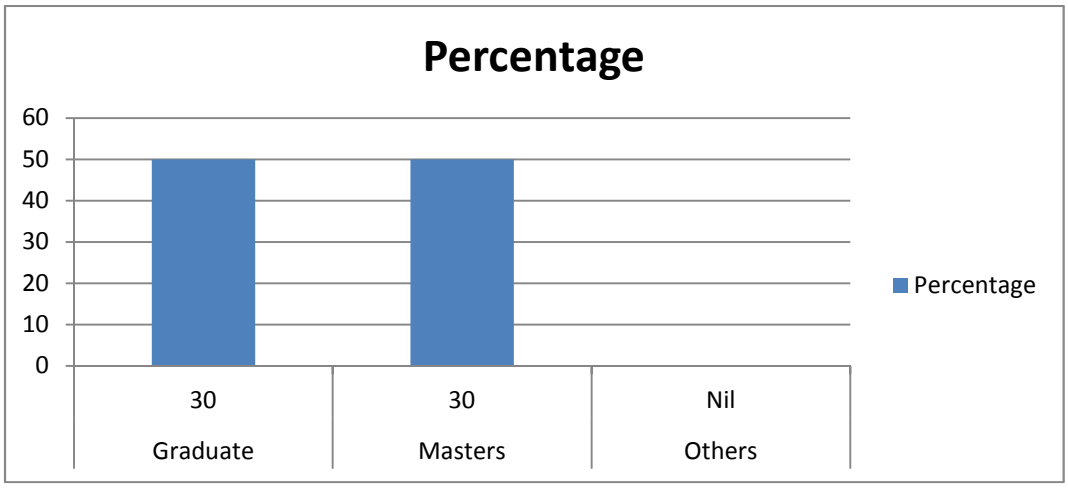


Source: Developed from data by Authors

Age is an important factor to know about the involvement of people in the usage if IS. The large proportion of sample falls in the age between the 31-40 as 66.67 % while 33.33% falls in the category of 40 and above.

Tabe-2 Education Level

Education level	Frequency	Percentage
Graduate	30	50
Masters	30	50
Others	Nil	



Source: Developed from data by Authors

Education plays an important role in the usage of Technology. The fifty percent of respondents were postgraduate while 50% were graduate.

Table-3 Work Experience

Work Experience	Frequency	Percentage
1-2years	15	25
3-6 years	30	50
7 and more	15	25

Job experienced was measured in terms of the length of service as25% of the respondents have the experience of 1-2 years while 50 % of the respondents have the experience between the range of 3-6 years while 15 % of the sample has the experience of 7 and more.

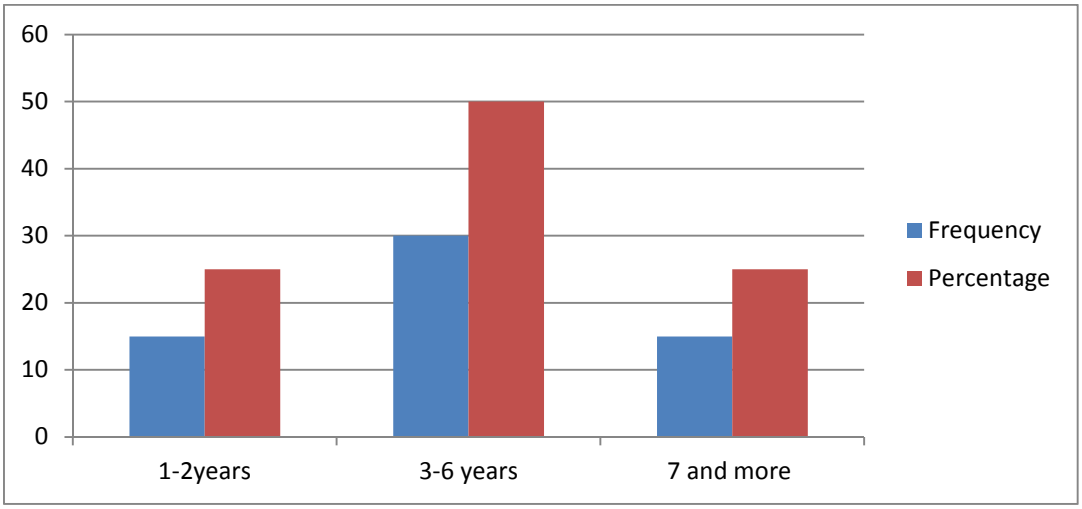
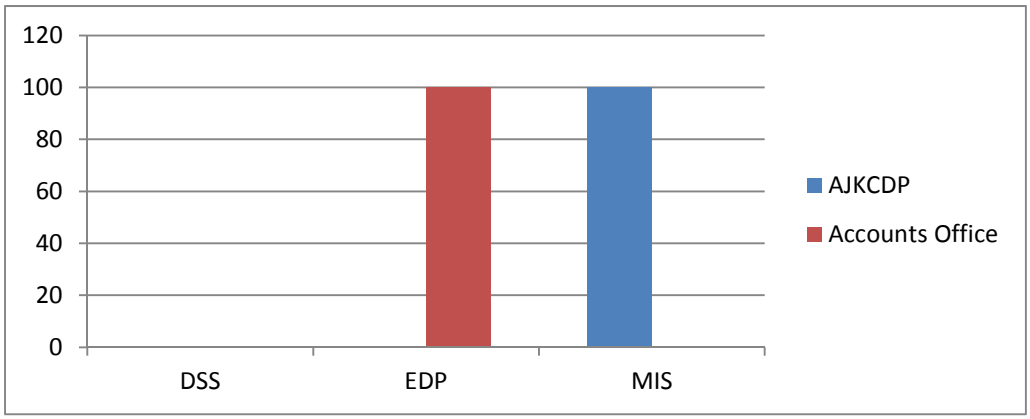


Table-4 What Kind of HRIS implemented

Name of Organization/ Using Systems	DSS	EDP	MIS
AJKCDP	0	0	100
Accounts Office	0	100	0

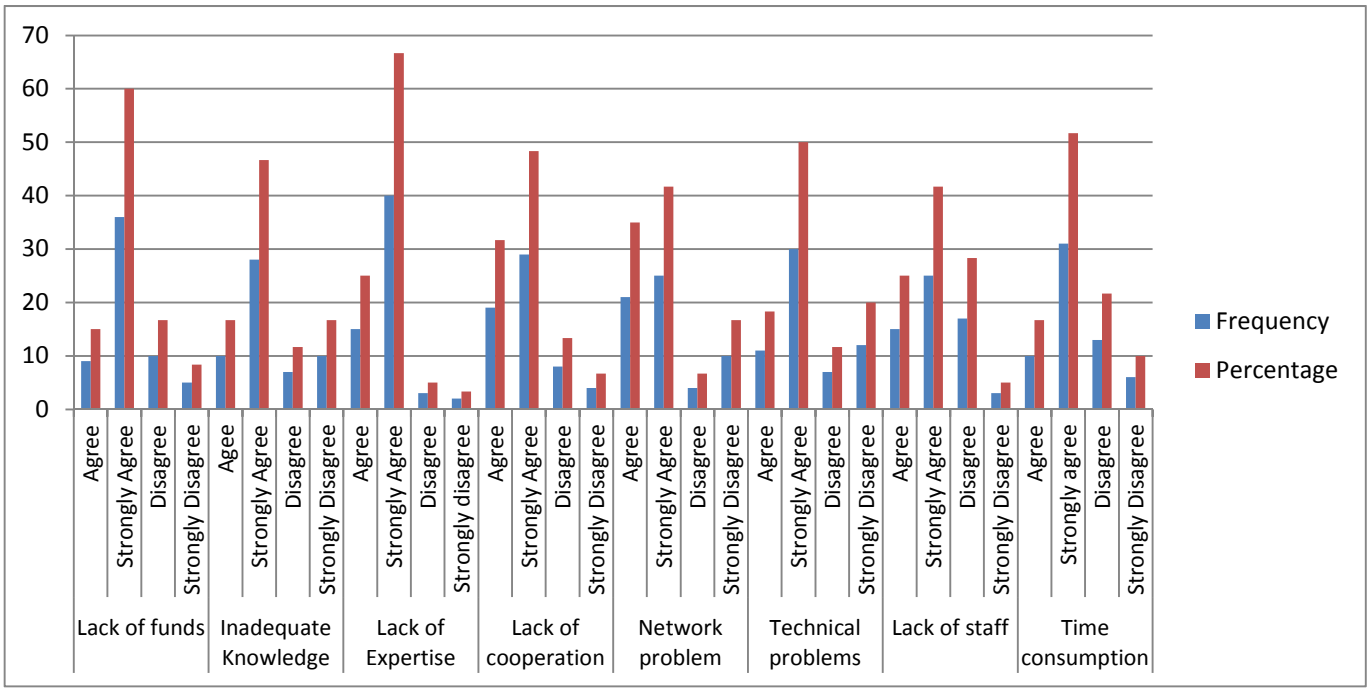


Source: Developed by Authors

AJKCDP has implemented only MIS while Accounts office only implemented EDP(SAP HRIS payroll system) Both organizations have not fully implemented the HRIS. They started these as a trial after that they will fully implemented the HRIS.

Table-5 Problem in adopting HRIS

Factor	Division	Frequency	Percentage
Lack of funds	Agree	9	15.00
	Strongly agree	36	60.00
	Disagree	10	16.67
	Strongly disagree	5	8.33
Inadequate knowledge	Agee	10	16.67
	Strongly agree	28	46.67
	Disagree	7	11.67
	Strongly disagree	10	16.67
Lack of expertise	Agree	15	25.00
	Strongly agree	40	66.67
	Disagree	3	5.00
	Strongly disagree	2	3.33
Lack of cooperation	Agree	19	31.67
	Strongly agree	29	48.33
	Disagree	8	13.33
	Strongly disagree	4	6.67
Network problem	Agree	21	35.00
	Strongly agree	25	41.67
	Disagree	4	6.67
	Strongly disagree	10	16.67
Technical problems	Agree	11	18.33
	Strongly agree	30	50.00
	Disagree	7	11.67
	Strongly disagree	12	20.00
Lack of staff	Agree	15	25.00
	Strongly agree	25	41.67
	Disagree	17	28.33
	Strongly disagree	3	5.00
Time consumption	Agree	10	16.67
	Strongly agree	31	51.67
	Disagree	13	21.67
	Strongly disagree	6	10.00



While asking about the problems about lack of funds 60% of the respondents were stongly agreed,15% agree as well as 16.67% disagree and 8.33 strongly disagreed. The percentage of respondents regarding inadequate knowledge 46.67% were strongly agree, 16.67% agree as well as 16.67% were strongly disagree.

Table-6 Benefits of HRIS

Factors	Division	Frequency	Percentage
Reducing Paper work	Agree	17	28.33
	Strongly Agree	33	55.00
	Disagree	7	11.67
	Strongly Disagree	3	5.00
Improving data control	Agree	12	20.00
	Strongly agree	39	65.00
	Disagree	4	6.67
	Strongly disagree	5	8.33
Quick Response	Agree	17	28.33
	Strongly Agree	31	51.67
	Disagree	8	13.33
	Strongly Disagree	4	6.67
Easy Access to information	Agree	14	23.33
	Strongly Agree	37	61.67
	Disagree	6	10.00
	Strongly	3	5.00
Improving services	Agree	11	18.33
	Strongly Agree	41	68.33
	Disagree	5	8.33
	Strongly Disagree	3	5.00
Reducing manpower	Agree	18	30.00
	Strongly Agree	35	58.33
	Disagree	6	10.00
	Strongly disagree	1	1.67
Less errors	Agree	20	33.33
	Strongly Agree	25	41.67
	Disagree	9	15.00
	Strongly Disagree	6	10.00
Streamlining the process	Agree	23	38.33
	Strongly Agree	29	48.33
	Disagree	7	11.67
	Strongly Disagree	1	1.67
Enhancing the competitiveness	Agree	16	26.67
	Strongly Agree	34	56.67
	Disagree	10	16.67
	Strongly Disagree	0	0.00
Save time	Agree	18	30.00
	Strongly Agree	36	60.00
	Disagree	5	8.33
	Strongly Disagree	1	1.67

2 DISCUSSIONS AND CONCLUSION

The role of HRIS are increasing and become strategic. Availability of timely information, improvement in the services played an important role. Although AJKCD and Accounts office implemented the HRIS partially . The implementation of HRIS reduce the workforce, save time. It enables the organization to improve their data and enhance the competitiveness. But the implementation of HRIS also cause some problems such as lack of expertise, technical problems, lack of funds, time consumption by the untrained staff. Inspite of barriers in implementation, HRIS has more positive effect on the organization performance. Actually this is a newly implemented system and employees and organizations are trying to understand and streamlining the system. HRIS made it possible for the organizations to have employee development. It is easy for both organizations to get the information from line departments and from the communities timely.And most influencing barrier is

the lack of funds. The study examines the trends and latest developments of HRIS and MIS in AJ&K ,AJKCDP and Accounts office were took as a case studies.

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Invention of NFV Technique and Its Relationship with NPV

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ABSTRACT: The capital budgeting techniques have the real life impact in case of decision making process. The available techniques are traditional techniques: Pay Back Period (PBP), Average Rate of Return (ARR) and discounted techniques: Net Present Value (NPV, Internal Rate of Return (IRR), Profitability Index (PI) and Discounted Pay Back Period (DPBP). Here researcher has introduced a new capital budgeting technique: Net Future Value (NFV). The researcher focused NFV basis on borrowing phenomenon and investing or lending phenomenon. The researcher has characterized this technique that if the Net Future Value (NFV) of a borrowing project is negative, the project has the positive worth for the outsider investor(s) and /or the outsider lender(s) and negative worth for the borrower(s) otherwise positive NFV creates negative worth for the investor outsiders and /or the lender outsiders and positive worth for the borrower(s).And if the NFV of an investing or lending project is positive, the project has the positive worth for investor(s) or lenders and negative worth for the borrower(s). The researcher viewed NFV as the compounding technique of capital budgeting. The researcher found the positive relationship between NPV and NFV in case of investing or lending project or investor or lender perspective but negative relationship between NPV and NFV for borrowing project or borrower or debtor perspective.

KEYWORDS: NFV, NPV, technique, borrowing, investing, relationship and project.

1 INTRODUCTION

This paper focuses the determination of NFV and relates the comparative description with other methods of capital budgeting. Many researchers viewed the determination of terminal value or future value of cash flows but they did not determine net future value (NFV) and its relationship with other methods of capital budgeting. Compounding is the process of determining the future value (FV) of a cash flow or a series of cash flows and the future values are equal to the beginning amount plus the interest earned [1]. Short term rates accurately reflect the expectations of future rates of inflation but his methodology and conclusions have been disputed by several rebuttals [2]. Net present value method can be treated as representative method for capital budgeting evaluating, and for all other's it can be sad that they are "inferior with regard to NPV method [3]. The NPV can be attained using the discounted cash flow (DCF) approach. Wee proposed a replenishment policy for deteriorating items with a price-dependent demand [4]. Wee's model was extended to consider DCF with finite planning horizon and known replenishment cycle [5]. DCF approach in base stock inventory system is evaluated by Hill and Pakkala [6]. In capital budgeting, financial manager must consider risk. Risk is measured like combination probability of unwonted occurrence and consequences of realization of that probability. In capital budgeting process there are two sorts of risk systematic and unsystematic risks for more about risk. Also there are many studies that where conducted to check risk management and possible criteria for avoiding risks. It has been shown that manger can and do avoid risks using different techniques. Most of them, one more, emphasized the importance of alternatives, collect more information, check different aspects of the problem, and actively work on the problem to reduce risk [8]. Gul and Ekinci analyze the empirically the relationship between nominal interest rates and inflation by using high frequency data of nominal interest rates and inflation of Turkey. They found that a long run relationship between nominal interest rates and inflation exists [9]. Even though the payback method has some cons associated with it, the simplicity of the method can allow it to be used as a filter for those

projects which should go on to a more in-depth method. If a project is not recommended based on the payback method, the chances are pretty high the project should not even be considered for the other methods [10]. Accounting rate of return also known as Return on Investment (ROI), use accounting information revealed by the financial statement to measure the profitability of an investment and number of period taken in recovering the investment outlay on presented value basis is the discounted pay back period. Discounted payback is computed by adding the present value of each year's cash inflows until they equal the investment and pay back period is defined as the number of the years required to recover the original cash outlay invested in the project [11]. The classic vehicle for analyzing the impact of taxation on investment is Jorgenson's user cost of capital, an expression that incorporates prices, tax provisions, financing costs and depreciation [12]. The real options approach embraces the concept of uncertainty. There must be uncertainty in terms of future cash flows deriving from the investment, and management must have flexibility to assess this uncertainty as it evolves [13]. Despite the emergence of new methods, the traditional ones, NPV and IRR are still the most popular [14]. However, it can be argued that a shift from IRR methods towards the NPV methods has occurred from the 1970s to 1990s. Additionally, it holds no risk of ambiguous roots, as it is in the case of IRR. On the other hand, IRR depends only on the properties of the cash flow stream, having nothing to do with the prevailing discount rate, which is sometimes troublesome to calculate. Considering these factors, it seems that both methods have their place in investment appraisal, but in different situations. If a project shows a positive outcome, it is accepted. However, in the case of several investment alternatives showing positive NPV, the candidates may be ranked according to their profitability index (PI) that PI is the present value of NCF divided by the initial investment [15].

2 MATERIALS AND METHODS

This was fundamentals research in nature. To formulate the NFV that considers the time value of money. The researcher invented the following equations basis on borrowing project or borrower's perspective and investing project or investor's or lender's perspective which were applied for calculating the NFV on both meadows. In this study, the researcher assumed the data of bank. The NFV's equations were applied on these data to find the values of NFVs. In these data, the researcher had applied the other methods of capital budgeting. Researcher compared the value of NFV with the value of NPV and presented the relationship of NPV with NFV. This study focused the effect of inflation on NFV as well of NPV. This study had pointed out decisions for the value of NFV.

2.1 FOR BORROWING PROJECT/ BORROWER'S PERSPECTIVE

Application for both mixed stream cash flows and even cash flows and where cash outflows occur at the end of the period.

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t}-\sum_{t=1}^{mn} CO_t\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 1.1$$

Application for even cash flows only and where cash outflows are ordinary annuity

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t}-CO_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right] \quad 1.2$$

Application for both mixed stream cash flows and even cash flows and where cash outflows occur at the beginning of the period.

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t}-\sum_{t=1}^{mn} CO_t\left(1+\frac{r_d}{m}\right)^{mn+1-t} \quad 1.3$$

Application for even cash flows only and where cash outflows are annuity due.

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t} - CO_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right]\left(1+\frac{r_d}{m}\right) \quad 1.4$$

2.2 FOR INVESTING OR LENDING PROJECT/ INVESTORS OR LENDER'S PERSPECTIVE

Application for both mixed stream cash flows and even cash flows and where cash inflows occur at the end of the period.

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t} - \sum_{t=1}^{mn} CO_t\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 2.1$$

Application for even cash flows only and where cash inflows are ordinary annuity

$$NFV=CI_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right] - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 2.2$$

Application for both mixed stream cash flows and even cash flows and where cash inflows occur at the beginning of the period.

$$NFV=\sum_{t=1}^{mn} CI_t\left(1+\frac{r_d}{m}\right)^{mn+1-t} - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 2.3$$

Application for even cash flows only and where cash inflows are annuity due

$$NFV=CI_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right]\left(1+\frac{r_d}{m}\right) - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 2.4$$

2.3 MEANING OF THE ABOVE EQUATION'S VARIABLES

Cl_e = Equal cash inflow or equal payment

Cl_0 = Cash out flow at time period zero or today

m= Number of frequency

n= Number of year

Cl_t = Cash inflow at time period t

CO_t= Cash outflow at time period t

r_d = Discount and compound rate

mn = Total period

3 RESULTS

3.1 BEHAVIOUR OF NPV

The Researcher found that the NPV declined as to being increased discount rate. In this study, researcher applied the different percentages which are presented in table 1.1 and got different values of NPV. The study showed the negative relationship between discount rate and NPV value.

3.2 BEHAVIOUR OF NFV

For investing and or lending project, the researcher found that the NFV declined as to being increased compound rate but for borrowing perspective, NFV increased or declined negatively as to being increased compound rate.

3.3 RELATIONSHIP

For calculating the NFV both for borrowing perspective and investment or lending perspective, researcher used different compound rates and got different values for both case, that are presented in table 1. NPV has positive relationship with NFV for investing/ lending perspective but negative relationship for borrowing perspective. The results of the table 1 of NPV and NFV were gotten by using equation 3.1 for NPV, 1.4 for NFV in borrowing perspective and 2.4 for NFV in investment and or lending perspective. To get the idea swiftly captivate, these tabulated results of these techniques (NPV and NFVs) were presented in the graphical form.

Table 1. Value of NPV and NFV and Their Relationship.

Percentage	NPV (Taka)	NFV for Investing (Taka)	NFV for Borrowing (Taka)
1%	976084.88	988594.771	-988594.771
2%	895762.38	917748.81	-917748.81
3%	816542.57	844949.508	-844949.508
4%	738407.76	770155.402	-770155.402
5%	661340.55	693324.241	-693324.241
6%	585323.88	614412.974	-614412.974
7%	510340.97	533377.735	-533377.735
8%	436375.35	450173.828	-450173.828
9%	363410.88	364755.713	-364755.713
10%	291431.53	277076.992	-277076.992
11%	220421.81	187090.394	-187090.394
12%	150366.33	94747.7567	-94747.7567
13%	81250.01	0.01598039	-0.01598039
14%	13058.06	-97202.813	97202.813

Source: *Author*

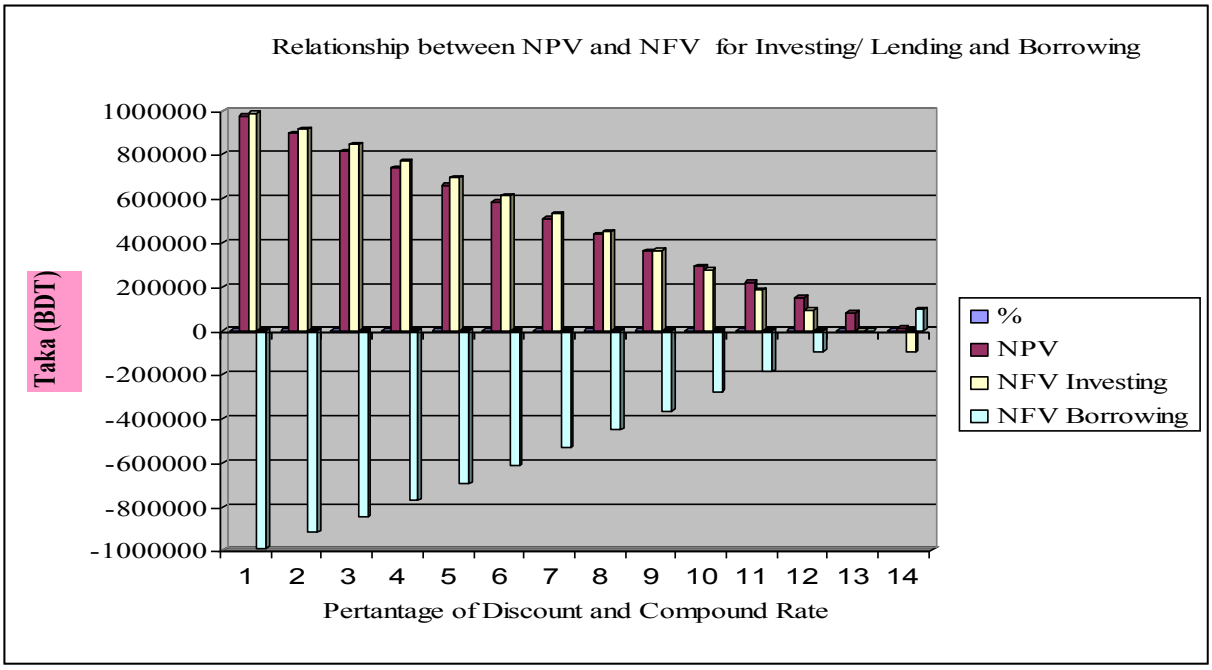

Fig.1. Relationship between NPV and NFV for Investing/ Lending and Borrowing.

Figure 1 represents the results of the table 1 with discount rates and compound rates. These rates were presented in the horizontal axis of graph and findings of NPV and NFVs in the vertical axis. This figure ultimately flourishes the positive relationship between NPV and NFV in case of investing or lending project or investor or lender perspective as both of their values with the given percentages lies above origin point 0 corresponding of horizontal axis but negative relationship between NPV and NFV for borrowing project or borrower or debtor perspective as NFV values with given percentages lie below origin point 0 corresponding of horizontal axis.

4 DISCUSSION

4.1 APPLICATION OF NFV

The researcher applied his invented NFV techniques on the bank loan and its installment. The meaning of letters used in the equation (s) have been provided in materials and methods section. The researcher viewed that the bank's loan or lending amount was cash out flow for the bank and installments provided by the borrower were cash inflows for bank. In this phenomenon, the researcher studied on an account holder's loan provided by the Prime bank limited, Dinajpur branch, Dinajpur, Bangladesh. The researcher applied equation 2.4 as it being investor or lender perspective. M/S Blue Bell Auto Rice Mill, Proprietor, Mr Blue, borrow on Dec.27, 2008, tk7500000 at 13% interest rate on 12 installment paid per year for two year loan period from the Prime Bank Limited. The amount of payment per installment was charged for Tk. 356563.67 and the numbers of installments were 24 due to monthly frequency being considered. Table 2 represents these installment figures.

Table 2. Installment Amount of Loan Supplied

Payment Date	Installment (Taka)	Payment Date	Installment (Taka)	Payment Date	Installment (Taka)
12/27/08	356563.67	8/27/09	356563.67	4/27/10	356563.67
1/27/09	356563.67	9/27/09	356563.67	5/27/10	356563.67
2/27/09	356563.67	10/27/09	356563.67	6/27/10	356563.67
3/27/09	356563.67	11/27/09	356563.67	7/27/10	356563.67
4/27/09	356563.67	12/27/09	356563.67	8/27/10	356563.67
5/27/09	356563.67	1/27/10	356563.67	9/27/10	356563.67
6/27/09	356563.67	2/27/10	356563.67	10/27/10	356563.67
7/27/09	356563.67	3/27/10	356563.67	11/27/10	356563.67

***Source**: Prime Bank Limited, Dinajpur Branch, Dinajpur, Bangladesh.*

4.2 INVESTMENT OR LENDING PERSPECTIVE

Inflation rate in Bangladesh averaged 6.65 percent from 1994 until 2014 [16]. Researcher used this average inflation rate as the compound rate to find the NFV on above lending amount. In this case, researcher can have the future value using the equation 2.4 presented in the materials and methods section. By using that equation, researcher has had the value calculated as follows-

$$NFV = CI_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right]\left(1+\frac{r_d}{m}\right) - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{mn-t}$$

$$= \text{Tk. } 356563.67\left[\frac{\left(1+\frac{.0665}{12}\right)^{12\times 2}-1}{.0665/12}\right]\left(1+\frac{.0665}{12}\right) - \text{Tk. } 75000000\left(1+\frac{.0665}{12}\right)^{12\times 2-0}$$

= Tk. 9125714.56- Tk. 8563730.

= Tk. 561984.45

By applying this equation in same way, considering different compound rates, it is got the NFVs presented in the table 1. NFVs show the decreasing values with increasing compound rates.

4.3 BORROWING PERSPECTIVE

Researcher was so much interested for the application equation 1.4 in borrowing concept. Actually this equation of NFV is the opposite to the equation 2.4 of NFV. Applying the same compound rate, researcher has gotten the NFV negative where in earlier case it was found positive.

$$NFV = \sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t} - CO_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right]\left(1+\frac{r_d}{m}\right)$$

$$= \text{Tk. } 75000000\left(1+\frac{.0665}{12}\right)^{12\text{ x }2-0} - \text{Tk. } 356563.67\left[\frac{\left(1+\frac{.0665}{12}\right)^{12\text{ x }2}-1}{.0665/12}\right]\left(1+\frac{.0665}{12}\right)$$

= Tk. 8563730.11- Tk. 9125714.56

= -Tk. 561984.45

By applying this equation in same way, considering different compound rates, it is gotten the NFVs presented in the table 1. NFVs show the increasing values with increasing compound rates.

4.4 NPV AND NFV FOR INVESTING PROJECT AND BORROWING PROJECT

Researcher applied the average inflation rate as the discount rate to calculate the NPV and found out the relationship between NPV and NFV.

$$NPV = CI_e\left[\frac{1-\left(1+\frac{r_d}{m}\right)^{-mn}}{r_d/m}\right]\left(1+\frac{r_d}{m}\right) - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{-t} \quad 3.1$$

$$NPV = \text{Tk. } 356563.67\left[\frac{1-\left(1+\frac{.0665}{12}\right)^{-12\text{ x }2}}{.0665/12}\right]\left(1+\frac{.0665}{12}\right) - \text{Tk. } 7500000\left(1+\frac{.0665}{12}\right)^{-0}$$

= Tk. 8036468.43 - Tk. 7500000

= Tk. 536468.434

Using this equation in same way, considering different compound rates, it is gotten the NPVs presented in the table 1. NFVs show the decreasing values with increasing discount rates.

5 CONCLUSION

In this study, author has identified the new capital budgeting technique named NFV. To find the NFV, compound rates have been used, that rates compounded cash inflows and cash outflows and then deviations have been found out between compounded cash inflows and compounded cash out flows. The study also shows the relationship between NFV and NPV, where it has gotten that NPV has positive relationship with NFV for the investor/ lender perspective but negative relationship for borrower perspective. The Positive NFV creates positive worth and the negative NFV creates the negative worth. NPV rule produces discounted behavior but NFV principles create compounded behavior. The 0 value which is found when both compounded cash inflows and compounded cash outflows are equal. So, NFV techniques exposes the neutrality due to be had 0 value as NPV technique of capital budgeting shows impartiality due to the discounted cash inflows and discounted cash outflows being equal or having 0 value.

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Availability and Utilization of Electronic Information Resources for Information Works by Library Staff in Kogi State University Library, Anyigba, Nigeria

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ABSTRACT: The paper discusses electronic information resources as library materials use for information works in contemporary information age by library staff. The paper purposely identified the available electronic information resources and their extent of use by library staff. The study employed a descriptive survey design. The instrument of data collection is questionnaire while, population of the study comprises 19 library staff who work in Kogi State University Library, Anyigba. Data gathered by use of questionnaire were analyzed by simple percentage to determine availability of electronic information resources (table,1) and use of available electronic information resources by library staff (table, 2); while mean were used to determine the extent of use of available electronic information resources (table, 3). The findings shows that out of 20 itemized electronic information resources 8(40.0%) were considered available while 12(60.0%) were considered not available. More to this, out of population of 19 library staff 6(31.6%) know how to use available electronic information resources while, 13(68.4%) do not know how to use them. Furthermore, out of 8 available electronic information resources 5 were used to great extent while, 3 to low extent. Hence, data analyzed in (table 1, 2 & 3) are presented in charts. Recommendations were proffered on how to make adequate electronic information resources available, examples/ categories/ types of electronic information resources to be provided (table, 4) as well as uses of them in the library (table, 5) so that library staff would able to use them appropriately to very great extent in support of knowledge to be acquired through trainings.

KEYWORDS: Electronic information resources; Information works; Library staff; University library, Kogi state university, Nigeria.

1 INTRODUCTION

Electronic information resources made available and use for information works in libraries in this contemporary time of information overwhelm was not initially designed for libraries. The need to adopt them became more essential when information that is considered as the holistic product for human survivor; its explosion was great beyond print resources management [1]. Thereby, library was considered as the control center where information seekers can obtained their various information needs.

Electronic information resources can be referred to as tangible or virtue resources upon which information is been acquired, processed, analyzed, stored, disseminated, archived, and weeded. The most unique thing about electronic information resources apart from their maintenance is that, they needs power supply to put information into works or actions. Notably, electronic information resources ease the rigorous activities and stimulate fast information works of library staff. By standard, the professionals' duties of library staff cut across acquisition, process, analysis, store, disseminate, archive, and weed of information in the library. Absolutely, this is synonymous to what electronic information resources were designed for. Therefore, it is imperative for library staff to know how and what to use the electronic information resources for in their library. "Reference [2] noted that all the librarians must know how to use information and communication technology (ICT) resources". However, guides and trainings are required for library staff to enables appropriate and effective

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use of the resources. This is because, the introduction of electronic information resources to buttress manual activities in the offices many professionals find it as a challenge. Hence, orientations and trainings for staff so that they can cope in the contemporary age of information overflows are essential [3].

Despite this, one cannot but agreed that the introduction of electronic information resources into library is an important concept. Precisely, in the university libraries; where library is required to serve students, lecturers or researchers, university management and others in the university community to enable them into effective learning, teaching and research with help of library staff. Consequently, university library has been described by different scholars. "Reference [4] noted that university library is the most important "organ" in the institution; the academic health, intellectual, vitality, and effectiveness of any university depends largely upon the state of health and excellent of its library". In the same vein, university library is the "heart" of the university [5]. To fulfill the purpose of buttressing educational objectives which are: teaching, learning, research and cultural development in this contemporary age; the university library required having good numbers of electronic information resources while, their staff should know how to use all the electronic information resources to a very great extent.

1.1 KOGI STATE UNIVERSITY LIBRARY

Kogi State University Library is established in Kogi State University Anyigba. Kogi State University is a State owned University in North Central of Nigeria. It was opened on April 2000. It is central operational library system, the building complex has a total floor space of 10,000 square meter with capacity to hold stock of not less than 500,000 volumes of information resources (both print and non print) with 2,552 capacity for readers. The sections in the library are administrative, acquisition, technical, serial/ news papers, reserve circulation, enquiries/complaint, visual resources/ electronic, and documentation [6].

2 BRIEF LITERATURE REVIEW

2.1 ELECTRONIC INFORMATION RESOURCES

The use of electronic information resources became necessary when was discovered that the information needs of everyone in a society has grown beyond management of print resources. As a result of this, it becomes imperative for library staff to know how to use them effectively to meet the information needs of seekers. "Reference [7] noted that the librarians of contemporary time should not be regarded as custodian of library materials but exploiter of information and information conduit". This was in assumption that electronic information resources should be made available and use purposefully in the library by library staff.

It is worth noting that electronic information resources can be dedicated/ stand alone or enhancement. It's necessary to be made available in the university library where purpose centered on teaching, learning and research. The electronic information resources to be made available for information works are computer, compact disc and digital versatile disc, digital camera, fax machine, flash drive, internet, intranet, projector, recorder, scanner, software package, printer, photocopy machine, magnetic tape, audio input device, voice output device, digital television, digitizing tablets, radio and plagiarism detective machine [8].

Computer is a programmable, multiuse machine that accepts data and manipulates it into useful information [9]. There are different data computer system can analyze and convert into meaningful and useful information in the library. These include administrative discussion, data collected about library users and staff as well as services rendered within the library and its environs. University library is to serve students, lecturers, researchers, university management/administrators and others within the internal and external environment of the university. There are various activities such as events, exhibition displays, and objects of historical and reference values in the area coverage of university library of which digital camera can be use to capture and display in computer or preserved in external storage device like compact disc and digital versatile disc.

Compact Disc (CD) and Digital Versatile Disc (DVD) are round plate-like plastic object. It contained substance that can store information; and it can be access with the use of computer drive. DVD has the same appearance and can perform the same function with CD, but, just DVD is more sophisticated and has larger memory than CD. DVDs is not widely used yet, mainly because of different standards for writing information or data to it. Once the problem of conflicting standards is resolved, DVDs will probably supplant CD-ROMs as the preferred portable storage medium [10]. Internet is a virtual world wide computer that links different organizations and individuals. Internet embraces computers, server, service providers (ISP) address site and domain names. Many library activities can be carry out with the use of internet. Precisely, in academic environment internet resources regulated in the library can play heavy roles in teaching, learning, research, and recreation.

Close to internet is intranet. It uses internet resources and adopted its resources; just that, it is designed and truncated to be use within specific organization. It is imperative to note that intranet can serve important purpose in university library where there is different units or sections such as cataloguing, reference, serial, circulation, acquisition just among others. There are needs for the units' heads to send and received special information within library concerning their professionals duties which they might not want to expose to the entire world as the case of internet.

Progressively, for the purpose of information literacy which involves enlightening of library users on strategies to source for information based on need make projector as one of essential electronic information resources needed in the university library. The resource can project information magnificently on the screen for viewing. Furthermore, it obvious that, not all the time or at all instances that librarian will able to inscribe history or story or events as information. However, recorders as oral recognitions device can be used. It can magnetize oral information and save it. Conversion of hardcopy information resources such as photography, and print document into softcopy is the activities of scanner. It uses light-sensing substance to translate images of text, drawing, photos, just among others into digital form [11]. It is worth noting that scanners perform similar function like photocopy machine. The most unique different between them is that, photocopy machine reproduces hard copy (print) information resources into copies directly.

"Reference [9] opinion is strong on magnetic tape, audio input devices, video output devices, digital television and digital tablets". Magnetic tape became important for library use because of the substance on the tape that enables it to magnetized information and data presented to it. Magnetic tape as thin plastic tape coasted with a substance that can magnetize. Data is represented by magnetized spots (represented 1s) or non-magnetized spots (representing 0s). Similar to this are audio-input and video output devices. Audio-input devices, convert waves into digital 0s and 1s before further use by any prescribe system. This becomes essential for use in the library. Because some audio sound are important information that need to kept for use by different group of professionals. Notably, analog sound which is a continuous variable waves within a certain frequency range most be converted by into digital form before computer can recognize it; while voice-output device convert digital data into speech-like sound.

Digital television uses digital signal of 0s and 1s rather than the customary analog standard, a system of different signal amplitude and frequency that represents images and audio elements [12]. Display of motion pictures and sounds as information is needed in the library. As a result of this digital television that has sharp and good resolution which cannot be easily affected by climatic condition is essential. Frankly, digital television is far better than analog. Digitalizing tablets as one form of digitizers it has electronic plastic board on which each specific location corresponds to a location on the screen. This resource is significant in the library especially when the user's needs to make drawing and locating a portion digitally.

Radios as electronic information resources involve production, transmission, and reception of programmes. There are different types of radios based on sources of power. These include transistor radio, battery –powered radios, solar powered crank radios [13]. Hence, regardless of its types is essential in the library for information acquisition. To this end, it is imperative to note that; university library is a resources center where all information works can be stored and used for teaching, learning and research. Plagiarism detective machine becomes essential in the library as authors copy and paste others authors works without referencing them. With plagiarism detective machines any portion of work that contain copy and paste without reference the original author(s) will be indicated.

3 STATEMENT OF THE PROBLEM

Adequate availability and effective utilization of electronic information resources in university library is a timely need in this contemporary age. It is worth noting that, when there is adequate and functional electronic information resources and competent library staff use them in the library it will facilitate accurate, complete, and timely information. However, if there is poor availability of electronic information resources and inadequate competent hands of library staff to use them teaching, learning, and research of the university will be affected; and hereby reduce their standard in academic world. This justifies the present study and the problem of the study put in question form is; what is the state of availability and utilization of electronic information resources by library staff in Kogi State University, Anyigba, Nigeria?

4 OBJECTIVES OF THE STUDY

The following objectives guides the study

1. To identify electronic information resources available in Kogi State University, Library
2. To know the number of library staff who can use available electronic information resources in university library understudy

3. To know the extent of use of the available electronic information resources in university library understudy

5 SIGNIFICANCE OF THE STUDY

The outcome of the study will be of important to a group of people such as university library management, university management, library staff, lecturers, researchers and library students. To university library management, it will help them to know the adequacy of availability of electronic information resources in their library; and competent strength of their staff in using them. The outcome of this will help the university management to know where to come in for help. To library staff, lecturers, researchers and library students the study will serve reference purpose.

6 RESEARCH METHODOLOGY

Descriptive survey design was adopted for the study. Questionnaire was used as instrument of data collection. Nineteen (19) copies of questionnaires were administered to library staff at Kogi State University, Library, Anyigba. The questionnaire consist of table 1, 2, & 3. Table 1, were design to know the available electronic information resources. Table 2, were to identify the number of library staff that can use available electronic information resources. Simple percentage were used for the data analysis for (table 1&2) where 50% and above were considered agreed, while below 50% were considered disagreed. Furthermore, to know the extent of use of available electronic information resources which is (table 3) mean were used for data analysis based on Likert response rate. Hence, the acceptable mean is 2.50 and above. Where, ≥ 2.50 is Significant (considerable response) and < 2.50 is not Significant (inconsiderable response). Specifically, for each items in table 3 real limit of numbers was used to determine the decision level as follows: Very Great Extent: 3.50 and above; Great Extent: 2.50 – 3.49; Low Extent: 1.50 – 2.49; No Extent: 0.00- 1.49. More to these, data analyzed in table 1, 2, & 3 were presented with chart.

7 DATA ANALYSIS

7.1 AVAILABILITY OF ELECTRONIC INFORMATION RESOURCES

Table 1. Availability of Electronic Information Resources in University Library Understudy

S/N	Electronic information Resources	Yes	No
1.	Computer	√	
2.	Compact Disc (CD) & Digital Versatile Disc (DVD)	√	
3.	Flash drive	√	
4.	Internet	√	
5.	Scanners	√	
6.	Software packages	√	
7.	Printer	√	
8.	Photocopy machine	√	
9.	Digital camera		√
10.	Fax machine		√
11.	Intranet		√
12.	Projector		√
13.	Audio recorder		√
14.	Magnetic tape		√
15.	Audio-input device		√
16.	Digital television		√
17.	Digitizing table		√
18.	Voice-input device		√
19.	Radio		√
20.	Plagiarism detective machines		√

Source: *Field Survey*

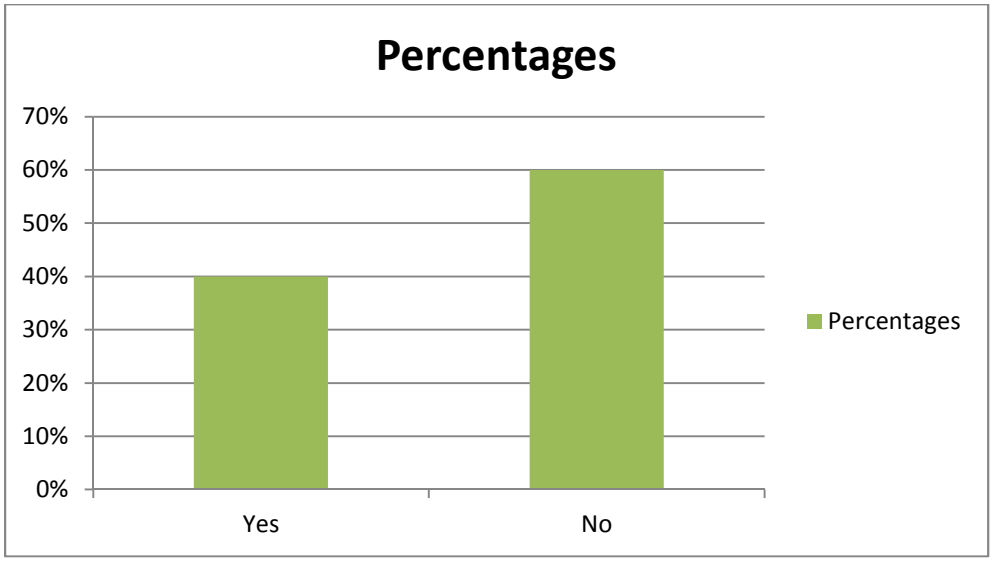

Fig 1: Bar Chart showing Percentage of Availability of Electronic Information Resources in University Library Understudy

From table 1 and its chart above, response with "Yes" option has 8(40.0%) while, those with "No" option has 12 (60.0%). It can be concluded that the library understudy has inadequate electronic information resources. Because "No" option is above 50%.

7.2 USE OF ELECTRONIC INFORMATION RESOURCES BY LIBRARY STAFF

Table 2: Use of Electronic Information Resources by Library Staff

Items	Response	Percentage (%)
Yes	6	31.6
No	13	68.4
Total	19	100

Source: *Field Survey*

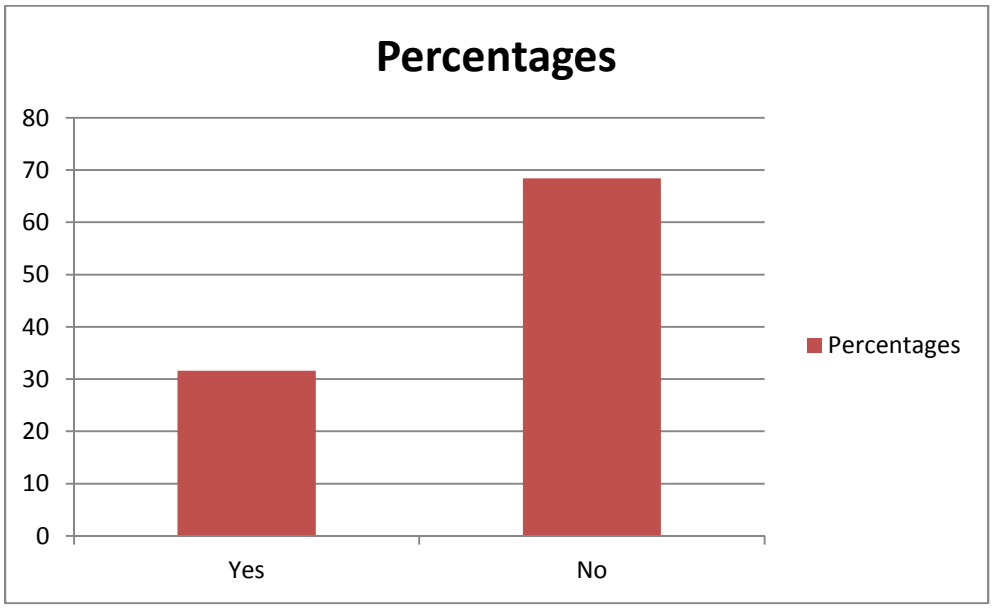

Fig. 2: Bar Chart showing the Percentage of Library Staff on the Use Available Electronic Information Resources in their Library

From table 2 and its chart above, respondents with "Yes" option has 6 (31.6%) while, those with "No" option has 13 (68.4%). It can be deduced that, majority of library staff in the library understudy cannot use the few available electronic information resources. Evidently, their response rate percentage is greater than 50%.

7.3 EXTENT OF USE AVAILABLE ELECTRONIC INFORMATION RESOURCES

Table 3: Extent of Use of Available Electronic Information Resources in the University Library Understudy

S/N	Electronic Information Resources	X	Rank	Dec
1.	Computer	3.21	1st	GE
2.	Compact Disc (CD) & Digital Versatile Disc (DVD)	2.63	3rd	GE
3.	Flash drive	2.70	2nd	GE
4.	Internet	2.50	5th	GE
5.	Scanner	2.35	6th	LE
6.	Software packages	2.07	8th	LE
7.	Printer	2.57	4th	GE
8.	Photocopy machine	2.32	7th	LE

Key: X- Mean, Dec- Decision, GE- Great Extent, LE-Low Extent

Sources: *Field Survey*

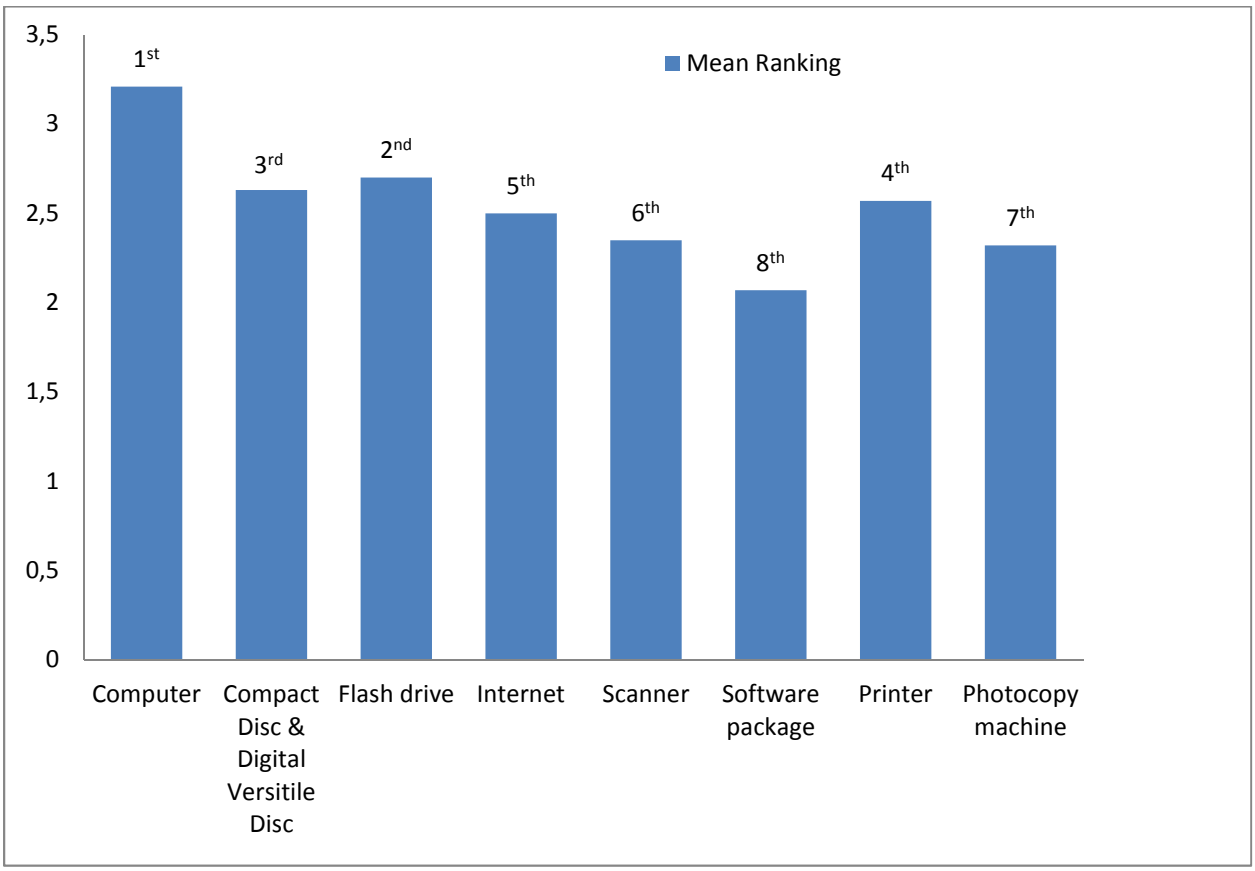

Fig. 3: Bar Chart showing the Extent of Use of Available Electronic Information Resources

From table 3 and its chart above "computer system" ranked highest with mean weight of 3.21. "Flash drive" has mean weight of 2.70, "compact disc and digital versatile disc" has mean weight of 2.63, "printer" has mean weight of 2.57, and "internet" has mean weight of 2.50. Hence, they are considered agreed because their mean weights are greater than 2.50 as criterion mean. While, "scanner", "photocopy machine" and "software package" are considered disagree to an extent because their mean weights are less than 2.50 as considerable criterion mean.

8 DISCUSSION OF THE FINDINGS

The data earlier presented shows that the university library studied do not have many electronic information resources such as digital camera, fax machine, intranet, projector, recorder, magnetic tape, audio-input devices, digital television, voice-output devices, radio and plagiarism detective machine as prescribed [8]. Majority of library staff do not know how to use the few available electronic information resources in their library. This was in line with [3] when he noted that many professionals find adoption of electronic information resources in their activities as a challenge. Hence, for university library which was referred to as most important "organ" and "heart" of the institution [4], and [5] respectively to grow and meet the purpose upon which was established in this contemporary time all the itemized electronic information resources need to be made available in the library and use consciously as recommended in table 4.

9 SUMMARY OF MAJOR FINDINGS

Below is the summary of major findings from data analyzed:

- It was discovered that out of twenty (20) itemized electronic information resources only eight (8) were available. These include computer system, compact disc & digital versatile disc, flash drive, internet, scanner, software package, printer and photocopy machine. While twelve (12) itemized electronic information resources that are not available are digital camera, fax machine, intranet, projector, audio recorder, magnetic tape, audio-input device, digital television, digitalizing tablet, voice-output device, radio, and plagiarism detective machine.
- Out of population of 19 of library staff six (6) know how to use the available electronic information resources in their library; while thirteen (13) library staff does not know how to use them.
- On extent of use of available electronic information resources in the library it was discovered that computer system, flash drive, compact disc, printer, internet has Great Extent (GE) of use. While, scanner, photocopy machine, and software packages has Low Extent (LE) of use.

10 IMPLICATION OF THE STUDY

The findings of the study show that, a lot of electronic information resources are not available in the university library studied. More to this, majority of library staff does not know how to use the few available electronic information resources to very great extent to buttress effective teaching, learning and research as reflected in [5]. All itemized electronic information resources need to be made available and ensure that the library staff can use them to very great extent. Hence, if proffered recommendations are not adherent to the university library will lose their standard as facilitator in this information age.

11 CONCLUSION

For any university library to achieve its objectives- teaching, learning and research in this contemporary age of information overflow it must have adequate electronic information resources; and while all the library staff there-in must know how to utilize them effectively in carrying out their professional duties. It is evidenced from the study that, there is poor availability of electronic information resources. There is high percentage of library staff that do not know how to use electronic information resources; while, the few available of electronic information resources are not used to very great extent. These call for recommendations.

12 RECOMMENDATIONS

The following recommendations are proffered based on the findings:

1. University library management should discuss with university management as to ensure that all not available electronic information resources should be provided in their library. Precisely, examples/categories/types that are good for library information works are provided in below table 4

Table 4: Electronic Information Resources and its Examples/Categories/Types use in the Library

S/N	Items	Examples/Categories/Types
1.	Computer	*Personal computer: Desktop, Laptop, Notebook, Tablets PC, and Smart phones
2.	Compact Disc (CD) & Digital Versatile Disc (DVD)	*CD-ROM *CD-R *CD-R 74/80/90/99 *CD-RW *CD-RW *DVD-ROM *DVD-5 * DVD-R/DVD+R(DVD-5) *DVD-RW and DVD+RW(DVD-5)*DVD-RAM *DVD-DL (DVD-9) *DVD-10, DVD-11, DVD-14, DVD-18 *HD-DVD *BD single layer/ BD Dual layer
3.	Flash drive	*Credit card *Kronos USB watch *Lighter *Memory meter *Food styled *LEGO USB flash drives
4.	Internet access	*Broadband *High speed *Wireless *Satellite internet accesses
5.	Scanners	*Flatbed *Film *Drum scanners
6.	Software packages	*ResourcesMate *L4U *OPALS *Koha ILS *Alexanaria *Concourse *Mandarin Oasis *SoutronGLOBAL *LIBRARIAN *Access-it Library *Adlib Library *ALEPH 500 *Amlib *Apollo *Aura Online *Auto Librarian *Autolyb *AxisBookShopPro *Bibiotheca *Boopsie for Libraries *BrowseCollection.com *Circulation Desk system *CyberTools for Libraries *Destiny Library Manager *e-Library * EBSCONET ERM Essentials *Eprints *Evergreen *First LMS *Flaskscan *Genesis G3 *Impact/VERSO *Infocenter *Inmagic DB/Text Library suite *Insignia Library System *Journal Findex *KLAS *Lexwin and Lexweb *Lib-Portal *LibAnswers *Libdata *Liberty *LibGuru *LIBMAN *LIBRA.NET * Library Gold *Library Man *Library vision *Library.solution *LIBRARYSOFT * LibraryWorld *LIBSOFT *LIBSYS7 *LIMsys *LPT:One *Millennium *MindLibrary *MyLibrary *NOTEbooks *OPALS *OpenText Library Management *Orange Skool *PC Card Catalog *Polaris ILS *Precision One *Progen Lib junior *Readerware *ReQuest manager 2 *ROVAN LMS * Schookee *School Plus *Series-M *Small Library Organizer Pro *SMS *Spectra CRC *STAR/Libraries *SwetsWise Library Edition *SydneyPLUS *Totally IntegratedAutomation *Unicorn *Virtua ILS
7.	Printer	*Laser *Dot-matrix *Ink-jet & bubble jet *Dye diffusion Printers
8.	Photocopy machine	*Analog *Digital *Mono *Colour *Multifunctional *Desktop *Net work Photocopies machines
9.	Digital camera	*Digital sir/ Digital Single Lens Reflex or DSLR cameras *Compact *Bridge compact *Compact System Camera/ Mirror Lens Interchangeable lens Digital cameras
10.	Fax machine	*Inkjet *Laser *Thernal transfer fax machines
11.	Intranet	*Collaborative platform *Internet web site *Distributed intranet
12.	Projector	*Desktop *Home theater *Overhead *Installation and *Slide Projectors
13.	Audio recorder	*Cassette *Minidisc *Digital audio tape (DAT) *Solid-state *Hard-disk *Laptop audio interfaces *Portable Digital Assistance (PDAs) audio recorders
14.	Magnetic tape	*Audio *Video and *Data storage magnetic tapes
15.	Audio-input device	*Analog and *Digital audio – input device
16.	Digital television	*Digital-ready sets *High-Definition Television (HDTV) sets *Integrated High-Definition Television (HDTV) digital televisions
17.	Digitizing table	*Passive *Actives and Hybrid digitizing tablets
18.	Voice-input device	*Digitized and *Text-to-speech voice-input devices
19.	Radio	*Music *Old time *All-news *Sport and *Weather radios
20.	Plagiarism detective machines	*Chimpsky *CitePlag *CopyTracker, eTBLAST *Plagium *SeeSources *The Plagiarism Checker *Attributor *Copyscape *PlagTracker *Iparadigms: ithenticate, Turnitin *Plagiarism Detect *PlagScan *VeriGide *Ephoru*URKUND.

Sources: *Authors' experiences and Literature search*

2. The university management should make effort to sponsor library staff to seminars and conferences so that they can expose to different electronic information resources and use them as prescribe in below table 5.

Table 5: Electronic Information Resources and Their Uses in Library

S/N	Electronic information Resources	Uses
1.	Computer	* Word processing *Calculation * Data base management *Information networking
2.	Compact Disc (CD) & Digital Versatile Disc (DVD)	*Archiving information/ data for long time
3.	Flash drive	*Best to store information / data for short period of time *Transfer of information/ data from one computer to other
4.	Internet	*Virtue medium to send and receive information and data world wide
5.	Scanners	*Conversion of hardcopy information resources to softcopy
6.	Software packages	*For automation activities
7.	Printer	*Produce hardcopy information materials from softcopy
8.	Photocopy machine	*Reproduce hardcopy information resources to more copies
9.	Digital camera	*Capture photographic images in digital form
10.	Fax machine	*Transmission of text and graphic data over television line for information transfer
11.	Intranet	*Uses internet resources and function like internet but restricted within organization
12.	Projector	*Information presentation to large audience
13.	Audio recorder	*Oral information capture
14.	Magnetic tape	*Backup and archiving information /data
15.	Audio-input device	*Translate recorded analog sound into digital storage and processing
16.	Digital television	*Handling computer and internet data
17.	Digitizing table	*Make maps and drawing, and tracing of drawing
18.	Voice-input device	*Converts digital data into speech-like sound
19.	Radio	*Receive audio information from frequency of broadcast station
20.	Plagiarism detective machines	*Detect portion of information or write up which original author is not reference

Sources: *Authors' experience and literature search*

3. The university library management or administrator should monitor to ensure proper use of electronic information resources by library staff to very great extent in carrying out their professional's duties-acquisition, processing, analyzing, storing, disseminating, archiving, and weeding of information.

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ÉTUDE BACTERIOLOGIQUE DES ANALYSES MEDICALES AU SERVICE BACTERIOLOGIE AU C.H.R AL IDRISSI – KENITRA

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ABSTRACT: Bacteriological analysis is very important because it helps to identify the causal agent of infection: bacteria, parasites, fungi.
Our study has as purpose the statistical study of different types of analysis developed in the service for nine months ; the urine cytology examination (urinalysis), stool culture, cytology examination of the pus, the blood culture examination, examination of the cerebrospinal fluid (CSF), the bacteriological examination of secretions and ENT bronchopulmonary and ascites fluid and cytology examination of vaginal swab.
Based on the statistical study established and the results we determine the impact of the most common germs in different types of analyzes namely *E.coli; klebsiellae* and *Staph.Aureus….*

KEYWORDS: Medical analyses; bacterium, bacteriology; infections; infectious diseases.

RESUME: L'identification et le suivi des maladies infectieuses émergentes revêtent une importance capitale. Dans le domaine de la microbiologie, le responsable est le microbe. Ce dernier ne cesse d'emprunter des voies de transformation lui permettant de développer des mécanismes de résistances incompréhensibles.
Le présent travail a vu nécessaire commencer par la réalisation d'une enquête exploratoire. Il s'agit de collecter l'information des statistiques analytiques réalisées au niveau du service de bactériologie. Nous avons examiné les registres de la période 2011-2012. Les rubriques que nous avons arrêtées sont l'examen cytobactériologique des urines (ECBU), la coproculture, l'examen cytobactériologique du pus, l'examen d'hémoculture, l'examen du liquide céphalo-rachidien (LCR), l'examen bactériologique des sécrétions de la sphère ORL et broncho pulmonaires et liquide ascite et l'examen cytobactériologique du prélèvement vaginal.
Nous avons constaté, suite à la lecture des résultats, qu'aucune des parties susmentionnées n'échappent à la contamination microbienne. Cependant, la partie la plus colonisée en nombre et en type de microorganismes est le système urinaire. Il sort aussi de la même lecture que les germes fréquemment rencontrés sont *Escherichia coli* avec un pourcentage de 34,24% ; *klebsiellae* (21,34%) *et Staphylococcus aureus* (20,59%).
L'examen cytobactériologique des urines (ECBU) a montré une contamination anormalement élevée. Pour sa part, la fréquence d'apparition de la contamination durant les deux années était de 55,76%. Il n'en est pas de même pour les autres parties analysées. Le pourcentage d'apparition de la contamination est classé dans l'ordre décroissant suivant : 15,72% pour la coproculture, 10,41% pour l'examen du liquide céphalo-rachidien, 9,96% pour l'examen du liquide pleural et liquide

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d'ascite, 3,67% pour l'examen cytobactériologique du pus, 2,44% pour l'examen cytobactériologique du prélèvement vaginal et 1,99% pour l'examen d'hémoculture.

MOTS-CLEFS: analyses médicales ; bactérie, bactériologie ; infections ; maladies infectieuses.

1 INTRODUCTION

Les maladies infectieuses ne cessent d'augmenter. Les résistances aussi. Toutes les parties du corps humains sont sujets à des infections et par conséquent générer une maladie particulière. A notre niveau, il nous manque les informations sur la prévalence des maladies infectieuses à l'échelle nationale, régionale et même locale.

Une enquête d'exploration ou diagnostic parait évidente pour pouvoir ressortir les enjeux et fixer des objectifs correspondants. Pour se faire, nous avons commencé par l'identification du périmètre d'étude. Nous avons choisi l'hôpital central de la région du Gharb Maroc. Cela nous donnera une information sur l'ensemble des maladies infectieuses rencontrées dans la région, l'importance de chacune des maladies et laquelle d'entre elles la plus fréquente.

Le seul moyen que nous avons jugé fiable à soulever les indicateurs de prise de décision est la réalisation d'une analyse statistique des registres de l'hôpital central. Cela va se faire du janvier 2011 à décembre 2012.

Nous avons consulté tous les registres du service bactériologique de l'hôpital. Nous avons donné plus d'attention aux examens cytobactériologiques des urines (ECBU), de la coproculture, de la cytobactériologique du pus, d'hémoculture, du liquide céphalo-rachidien (LCR), de la bactériologie des sécrétions de la sphère ORL, broncho-pulmonaires et liquide ascite et enfin de la cytobactériologie du prélèvement vaginal.

L'étude statistique établie, nous permettra ultérieurement de mesurer l'incidence des germes sur une ou plusieurs parties du corps humains. Elle nous permettra aussi de centrer nos efforts sur la maladie infectieuse la plus critique dans la région.

2 MATÉRIEL ET MÉTHODES

Les analyses bactériologiques

Examen cytobactériologique des urines (ECBU)

L'urine est un liquide jaune clair, transparent sécrété par les reins et éliminé par les voies urinaires. L'urine se compose principalement d'eau et d'un résidu sec entièrement soluble à l'état normal. L'urine est normalement stérile mais elle est souillée physiologiquement lors de son émission par les germes présents dans la flore cutanéomuqueuse et génito-urinaire.

Cette analyse comporte un examen direct de l'urine au microscope et une mise en culture afin de rechercher et d'identifier la présence de germes. L'ECBU permet de rechercher une infection urinaire (cystite, pyélonéphrite) et d'identifier le(s) germe(s) en cause. Si un germe est trouvé, un antibiogramme est alors réalisé pour guider le médecin dans sa prescription d'antibiotique.

Examen bactériologique des selles (coproculture)

La flore intestinale ou endogène, appelée encore physiologique regroupe l'ensemble des espèces microbiennes présentes de façon constante dans l'écosystème digestif. La fraction dominante de cette flore est essentiellement constituée de bacilles anaérobies Gram négatif non sporulés où le genre bactéroïde est le plus abondant. La flore intestinale normale varie selon les individus, l'âge, le régime alimentaire et l'environnement.

La coproculture à visée bactériologique permet de rechercher et d'identifier des germes pathologiques qui sont normalement absents : Salmonelles, Shigelles, Campylobacter, Escherichia coli et Vibrio cholerae. Ces germes peuvent être responsables de diarrhées et d'infections digestives.

Examen d'Hémoculture (recherche de germes dans le sang)

Le prélèvement est effectué de sorte à vérifier la présence de germes dans le sang du patient. Il est accompli avant la mise en place d'un traitement antibiotique. Il s'agit d'un prélèvement de sang veineux réalisé en général au pli du coude.

L'ensemencement du sang se fait sur milieu appropriés afin d'y mettre en évidence la présence de bactéries. Les deux milieux habituellement utilisés sont : le milieu anaérobie et le milieu aérobie.

L'examen du liquide céphalo-rachidien (LCR)

Le liquide céphalo-rachidien (ou LCR) ou encore liquide cérébro-spinal (ou LSC) est le liquide dans lequel baignant le cerveau et la moelle épinière. Il est contenu dans les méninges, plus précisément entre la pie-mère (qui recouvre le système nerveux central) et l'arachnoïde (qui tapisse le versant interne de la dure-mère, elle-même solidement attachée aux structures osseuses : boite crânienne et rachis).

L'examen du LCR permet le diagnostic de méningite aiguë. Il est réalisé en urgence lorsqu'une méningite est suspectée. Il peut être également nécessaire au diagnostic d'autres infections du système nerveux central : méningo-encéphalites, abcès cérébraux, myélites.

L'examen bactériologique des sécrétions de la sphère ORL et broncho-pulmonaires et ponctions d'ascites :

Le prélèvement est effectué avant le traitement antibiotique. Le prélèvement est effectué à partir du nez, des oreilles ou de la gorge. Il est réalisé au laboratoire par frottement d'un écouvillon stérile (sorte de long coton-tige) sur la zone concernée ou du liquide pulmonaire à l'aide d'une seringue stérile.

L'analyse bactériologique de prélèvements ORL ou broncho-pulmonaires permet de rechercher et d'identifier d'éventuelles bactéries responsables d'infections localisées dans ces sites (une recherche de virus peut également être réalisée mais pas de façon systématique). Une fois les germes sont identifiés, le médecin est automatiquement rendu vers la prescription antibiotique correcte.

L'examen cytobactériologique de Pus

C'est un mélange de leucocytes plus ou moins altérés avec des bactéries (en plus ou moin grand nombre) et des débris cellulaires. Le pus est l'un des risques d'une infection. On a production de pus lors d'une infection de microorganismes pyogènes (souvent des bactéries et quelques parasites), bactéries qui sécrètent des substances attirant des phagocytes. Elles sécrètent souvent en plus des leucocidines qui détruisent les leucocytes.

Le but de cet examen est d'identifier les germes pathogènes lors d'un abcès fermé (panaris, abcès dentaire) ou lors d'un abcès ouvert (pus cutané, superficiel).

Examen cytobactériologique du prélèvement vaginal

Le but de cet examen est l'étude de la flore vaginale pour apprécier un éventuel déséquilibre de la flore ou dépister une infection.

En étudiant l'aspect de la flore vaginale en relation avec le pH et la cytologie et en isolant des germes banaux par culture sur milieux spécifiques et usuels, nous faciliterons l'identification des Streptocoques, Listéria, Entérobactéries et les levures.

3 RÉSULTATS ET DISCUSSIONS

Données statistiques des analyses effectuées au service bactériologie des laboratoires du CHR Kénitra du janvier 2011 au Septembre 2011

a) Analyses effectuées à partir du janvier 2011 au décembre 2012

Les analyses bactériologiques réalisées pendant la période d'étude sont en nombre de 3334. Nous les avons éclatées en mois pour voir la fréquence de la contamination mensuelle au niveau du service bactériologique.

Il sort de les figures n° I et II qu'il n'ya pas de différence significative au point de vu nombre de patients souffrants d'attaque bactériologique. Le nombre varie entre 91 et 152 en 2011 et de 112 et 202 en 2012.

Les valeurs basses obtenus trouvent explication dans la non disponibilité des médecins pendant la période d'été (période des congés) ou prise de conscience de la part de population du danger de la période hivernale. En effet, pendant les périodes de congés, le nombre de visiteur du service de bactériologie se limite à 99 pendant le mois de juillet 2011. Il était aussi faible pendant le même mois de l'année suivante (130).

Pour ce qui est autoprotection, la population kénitrienne ne se rendait pas en masse pendant le mois de novembre. Cela est argumenté par la population et les médecins de l'hôpital par le fait que tout le monde est conscient du danger lié à la période froide. Tout le monde prend ses dispositions pour éviter le mal pendant cette période. Le constat est le même pour les deux mois de novembres des deux années successives. Les valeurs relevées du nombre de patients ayant visité le service bactériologique sont de 91 et 112 respectivement pour les années 2011 et 2012.

Tableau I : nombre d'analyses par mois en 2011/2012

Mois	Nombre d'analyses
Janvier 2011	122
Février	114
Mars	150
Avril	124
Mai	119
Juin	137
Juillet	99
Aout	121
Septembre	131
Octobre	128
Novembre	91
Décembre	152
Janvier 2012	168
Février	128
Mars	162
Avril	151
Mai	194
Juin	150
Juillet	130
Aout	126
Septembre	202
Octobre	150
Novembre	112
Décembre	173
Totale	3334

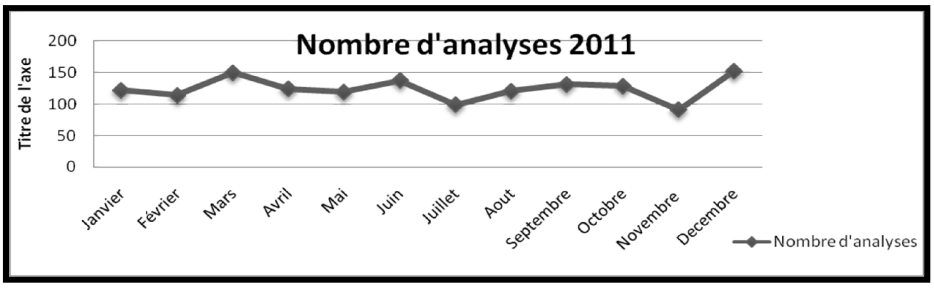


Figure I : nombre d'analyses en 2011

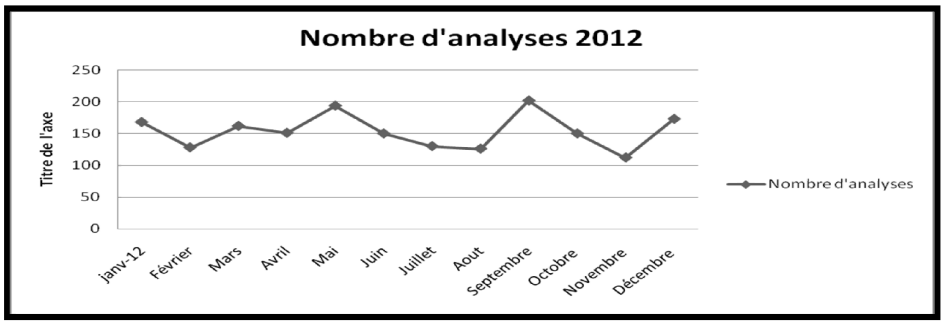


Figure II : nombre d'analyses en 2012

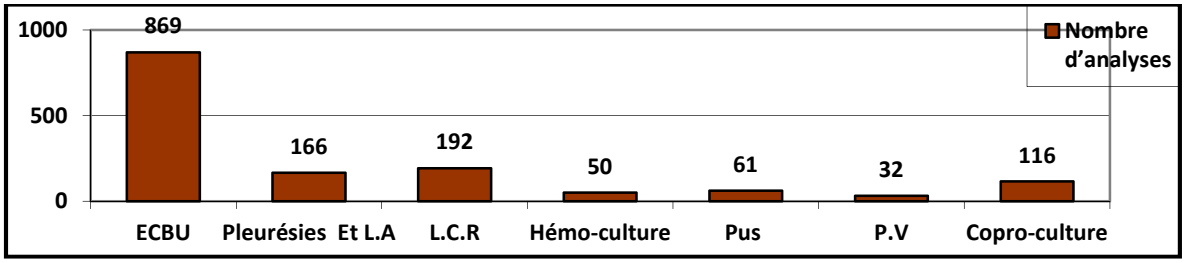
b) Résultat selon types d'analyse

A partir de ces graphiques I et II on a pu déterminée l'examen le plus effectuée au sein de service.

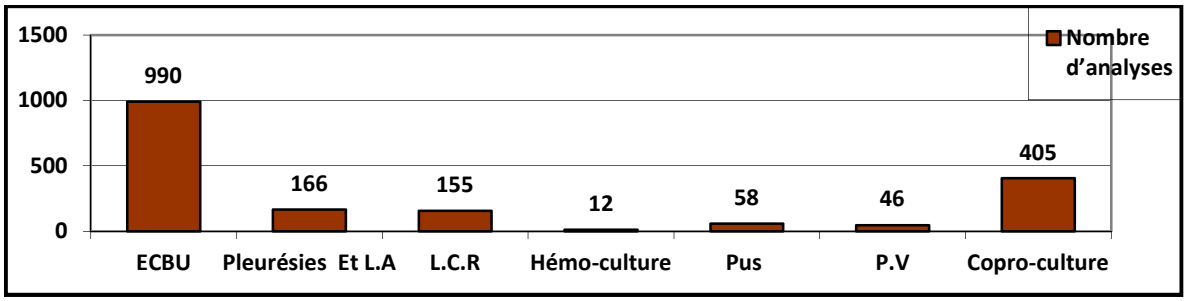
Comme il est représenté graphiquement le nombre maximum réalisés est celui de l'E.C.B.U dans les deux années (869 cas en 2011 et 990 cas en 2012) alors que le nombre minimum est celui de Prélèvement vaginale en 2011 (32 cas) et de l'hémoculture en 2012 (12 cas) d'où on peut ressortir les pourcentages des types d'analyses dans les deux années d'étude.

Durant les deux années on a pu calculer les pourcentage des tests réalisés l'examen cytobactériologique des urines (ECBU) est plus fréquent avec un pourcentage de (55,76%) suivi par la coproculture (15,72%) ; ensuite on trouve l'examen du liquide céphalo-rachidien (10,41%) puis l'examen du liquide pleural et liquide d'ascite (9,96%) suivi par l'examen cytobactériologique du pus (3,67%) et les moins fréquents sont l'examen cytobactériologique du prélèvement vaginal (2,44%) suivi par l'examen d'hémoculture (1,99%).

Le nombre élevé des études cytobactériologiques des urines montre que l'appareil urinaire est la plus attaqué par les infections bactériennes. Cette attaque importante est due généralement au climat de la région (humidité) et aux problèmes d'hygiène intime chez les malades.



Graphique I : Année 2011



Graphique II : Année 2012

c) Résultat des cultures positive/ négative selon le type d'analyse

i. ECBU

L'étude cytobactériologique des urines nous a permet de déterminer et identifier ainsi classer les différentes germes ou agents pathogènes responsables d'infections urinaires dans la Région du Gharb Chrarda Bni Hssen reçue au niveau du service bactériologie des laboratoires du C.H.R El IDRISSI.

Les tableaux II et III présentent les résultats obtenus après traitement des registres d'étude cytobactériologique des urines. Ces résultats nous a aidée à déterminer le pourcentage des cas positives /négatives.

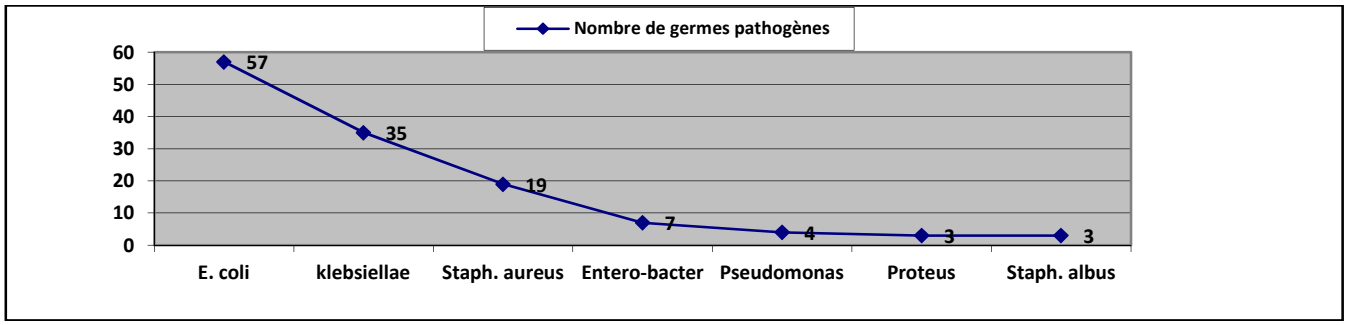
On a trouvée 128 cas positifs dans l'année 2011 avec un pourcentage de 14,73% et 134 cas positifs dans l'année 2012 avec un pourcentage de 13,53%.

Ainsi les graphiques III et IV nous présentent les bactéries présentes dans les urines selon leurs dominances 48.85% d'*Escherichia coli*, 25,9% *Klebsiellae*, 13.36% *Staphylococcus aureus,* 4,2% *Proteus sp*, 3,44% *Enterobacter sp*, 2,29% *Staphylococcus albus*, 1,9% *Psoudomonas* et 0,76% *Candida albicans.*

Tableau II : Année 2011

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	41	18	*9 E. coli* *5 Staphylocoque aureus* *2 Klebsiellae* *1 Enterobacter* *1 Staphylocoque blanc*
	Total = 59		
Février	53	9	*4 E. coli* *3 Staphylocoque aureus* *1 Klebsiellae* *1 Staphylocoque blanc*
	Total = 62		
Mars	66	9	*3 E. coli* *3 Staphylocoque aureus* *1 Klebsiellae* *1 Enterobacter* *1 Proteus*
	Total = 75		
Avril	59	7	*4 E. coli* *1 Staphylocoque aureus* *1 Enterobacter* *1 Proteus*
	Total = 66		
Mai	63	10	*4 Klebsiellae* *3 E. coli* *1 Staphylocoque aureus* *1 Enterobacter*
	Total = 73		
Juin	70	9	*4 E. coli* *3 Klebsiellae* *1 Staphylocoque aureus*
	Total = 79		
Juillet	46	15	*5 E. coli* *5 Klebsiellae* *3 Enterobacter* *1 Staphylocoque aureus* *1 Proteus*
	Total = 61		
Août	63	15	*7 E. coli* *6 Klebsiellae* *1 Staphylocoque aureus* *1 Proteus*
	Total = 78		
Septembre	65	12	*7 Klebsiellae* *3 E. coli* *2 Staphylocoque aureus*
	Total = 77		
Octobre	82	12	*7 E. coli* *3 klebsiellae* *2 pseudomonas*
	Total = 94		
Novembre	56	10	*7 E. coli* *1 klebsiellae* *1 Enterobacter* *1 pseudomonas*
	Total = 66		
Décembre 2011	75	4	*2 klebsiellae* *1 E.coli* *1 Staphylocoque aureus*
	Total = 79		

D'où on peut ressortir l'incidence des microorganismes pathogènes

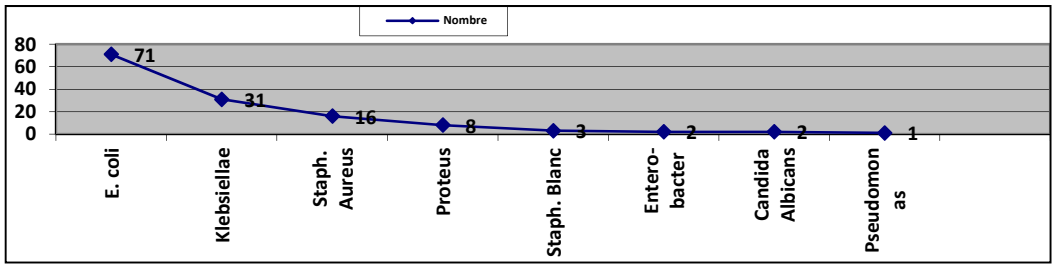


Graphique III : nombre de germes pathogènes

Tableau IV : Année 2012

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	88	12	*8 E. coli* *2 Klebsiellae* *1 Staphylocoque aureus* *1 Proteus*
	Total = 100		
Février	55	18	*8 E. coli* *3 Staphylocoque aureus* *3 Proteus* *2 Klebsiellae* *1 Staphylocoque blanc* *1 Enterobacter*
	Total = 73		
Mars	71	8	*4 Klebsiellae* *3 E. coli* *1 Staphylocoque aureus*
	Total = 79		
Avril	72	13	*6 E. coli* *3 Staphylocoque aureus* *2 klebsiellae* *1Staphylocoque blanc*
	Total = 85		
Mai	95	9	*7 E. coli* *1Klebsiellae* *1 Staphylocoque blanc*
	Total =104		
Juin	54	11	*8 E. coli* *2 Klebsiellae* *1 Staphylocoque aureus*
	Total = 65		
Juillet	68	9	*4 E. coli* *2 Klebsiellae* *1 Enterobacter* *1 Staphylocoque aureus* *1 Candida Albicans*
	Total = 77		
Août	47	11	*4 E. coli* *6 Klebsiellae* *1 Pseudomonas*
	Total = 58		
Septembre	68	14	*5 Klebsiellae* *4 E. coli* *3 Proteus* *1 Staphylocoque aureus* *1 Candida Albicans*
	Total = 82		
Octobre	83	10	*9 E. coli* *1 Staphylocoque aureus*
	Total = 93		
Novembre	56	10	*4 E. coli* *3 klebsiellae* *3 Staphylocoque aureus* *1 proteus*
	Total = 76		
Décembre 2012	85	13	*6 klebsiellae* *6 E.coli* *1 Staphylocoque aureus*
	Total = 98		

D'où on peut ressortir l'incidence des microorganismes pathogènes



Graphique IV : nombre de germes pathogènes pour l'année 2012

ii. Liquide pleurale et liquide d'ascite

Les tableaux suivants nous ont permis de déterminer le nombre de cas positifs dans les deux années d'études et aussi d'identifier les germes pathogènes qui peuvent être présentes dans le liquide pleural et le liquide d'ascite afin de les classer selon leur pathogénicité.

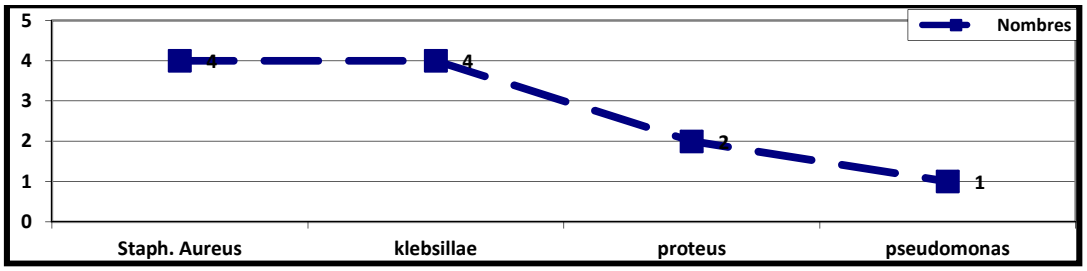
Les agents pathogènes identifiés sont : 6 *Staphylococcus aureus, 5 Klebsiellae sp, 2 Proteus sp, 1 Pseudomonas sp.*

Durant toute la période d'étude, nous avons trouvé 42,85% de *Staphylococcus aureus, 35,71% Klebsiella, 14,28% Proteus* et 7,14% *Psoudomonas.*

Tableau IV : Année 2011

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	11	2	*2 Staphylocoque aureus*
	Total = 13		
Février	16	0	_
	Total = 16		
Mars	22	0	_
	Total = 22		
Avril	13	1	*1 Staphylocoque aureus*
	Total = 14		
Mai	14	0	_
	Total = 14		
Juin	14	2	*2 Klebsiellae*
	Total = 16		
Juillet	9	0	_
	Total = 9		
Août	13	1	*1 Pseudomonas*
	Total = 14		
Septembre	9	1	*1 Proteus*
	Total = 10		
Octobre	13	2	*1 Staphylocoque aureus* *1 Klebsiellae*
	Total = 15		
Novembre	5	0	_
	Total = 5		
Décembre	17	2	*1 klebsiellae* *1 Proteus*
	Total = 19		

D'où on peut ressortir l'incidence des microorganismes pathogènes



Graphique V : nombre de germes pathogènes en 2011

Tableau V : Année 2012

Mois	**Cultures**		**Germes isolés**
	Négatives	**Positives**	
Janvier	17	0	_
	Total = 17		
Février	9	0	_
	Total = 9		
Mars	15	1	*1 Klebsiellae*
	Total =16		
Avril	11	0	_
	Total = 11		
Mai	20	0	_
	Total =20		
Juin	14	0	_
	Total = 14		
Juillet	10	0	_
	Total = 10		
Août	17	0	_
	Total = 17		
Septembre	13	0	_
	Total =13		
Octobre	13	2	_
	Total = 15		
Novembre	8	0	_
	Total = 8		
Décembre 2012	5	2	*2 Staphylocoque aureus*
	Total = 7		

iii. Hémoculture

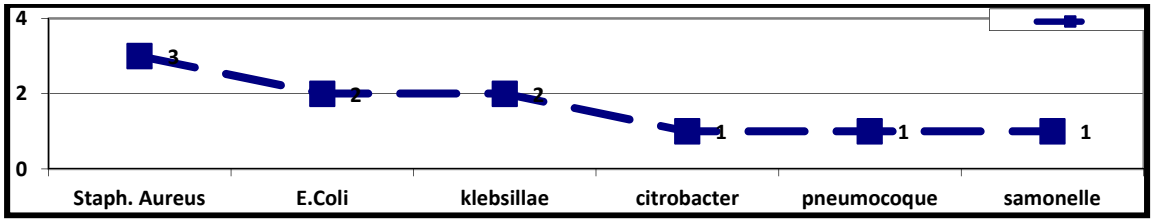
La lecture des valeurs analytiques portées dans les tableaux VI et VII montre 9 cas positifs sur 50 en 2011 avec un pourcentage19.23%. Par contre en 2012, sur les 12 prospects, nous n'avons trouvé que 2 cas positifs avec un pourcentage de 16.66%.

L'incidence des bactéries en hémoculture durant les deux années (2011-2012) peut être présentée comme suit : (*41,66*%) *Staphilococcus aureus, (16,66 %*) *Escherichia coli, (16,66%) Klebsiella sp, (8,33%) Citrobacter sp; (8,33%) Salmonella sp et (8,33%) Pneumococcus sp*. Il est à noter que nous avons trouvé aussi des *Méningocoque.*

Tableau VI : Année 2011

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	0	0	–
	Total = 0		
Février	3	1	*1 Staphylocoque aureus*
	Total = 4		*1 Klebsiellae*
Mars	4	2	*1 Citrobacter*
	Total = 6		*1 Salmonelle*
Avril	1	1	*Diplocoque Gram (-) grain de café*
	Total = 2		
Mai	0	0	–
	Total = 0		
Juin	4	2	*1 E. coli*
	Total = 6		*1 Staphylocoque aureus*
Juillet	3	1	*1 Staphylocoque aureus*
	Total = 4		
Août	5	0	–
	Total = 5		
Septembre	13	2	*1 Klebsiellae*
	Total = 15		*1 E. coli*
Octobre	3	0	–
	Total = 3		
Novembre	5	0	–
	Total = 5		
Décembre	0	0	–
	Total = 0		

D'où on peut ressortir l'incidence des microorganismes pathogènes



Graphique VI : nombre de germes pathogènes en 2011

Tableau VII : Année 2012

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	3	1	*1 Staphylocoque aureus*
	Total =4		
Février	0	0	_
	Total =0		
Mars	0	0	_
	Total = 0		
Avril	0	0	_
	Total =0		
Mai	0	0	_
	Total = 0		
Juin	0	0	_
	Total = 0		
Juillet	0	0	_
	Total = 0		
Août	0	0	_
	Total = 0		
Septembre	4	0	_
	Total = 4		
Octobre	0	1	*1 Staphylocoque aureus*
	Total = 1		
Novembre	2	0	_
	Total = 2		
Décembre	1	0	_
	Total =1		

iv. Prélèvement de pus

Les tableaux VIII et IX présentent le nombre de cas positifs c'est-à-dire portant les germes pathogènes dans le pus. Il en sort qu'il y avait 33 cas positifs sur 61 pour l'année 2011 soit un pourcentage de 54% et 25 cas positifs sur 58 en 2012 soit un pourcentage de 43,10%.

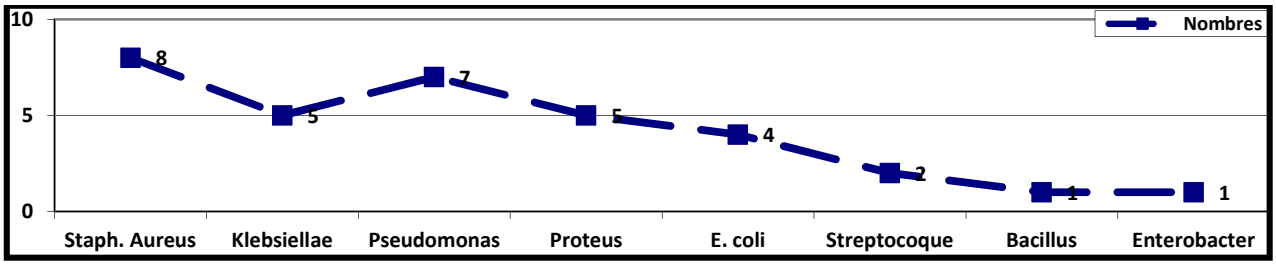
Les bactéries qui sont présent dans les pus analysés sont : *Staphylococcus aureus, Pseudomonas sp, Klebsiellae sp, Proteus sp, Escherichia coli, Streptococus sp, Bacillus sp, Enterobacter sp, Enterococcus sp,* S*taphylococcus albus.*

Le classement de l'ensemble des souches obtenues peut être présenté comme suit : *Staphylococcus aureus* avec 27,59%*, Psoudomonas sp avec* 22,41%, *Proteus* avec 18,96%, *Klebsiella* sp avec 13,79%, *Escherichia coli* avec 6,90%, Streptococcus avec 3,45%, S*taphylococcus albus avec* 1,72%*, Bacillus sp avec* 1,72%*, Enterococcus sp avec* 1,72% *et Enterobacter avec* 1,72%.

Tableau VIII : Année 2011

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	1	1	*1 Bacillus*
	Total = 2		
Février	2	5	*2 Staphylocoque aureus* *2 Klebsiellae* *1 Proteus*
	Total = 7		
Mars	4	9	*3 Klebsiellae* *2 E. coli* *1 Staphylocoque aureus* *1 Pseudomonas* *1 Streptocoque* *1 Proteus*
	Total = 13		
Avril	0	3	*2 Staphylocoque aureus* *1 Enterobacter*
	Total = 3		
Mai	0	1	*1 E. coli*
	Total = 1		
Juin	3	1	*1 Proteus*
	Total = 4		
Juillet	0	0	–
	Total = 0		
Août	5	3	*1 Pseudomonas* *1 Proteus* *1 Streptocoque*
	Total = 8		
Septembre	2	5	*3 Pseudomonas* *2 Staphylocoque aureus*
	Total = 7		
Octobre	5	2	*1 Pseudomonas* *1Staphylocoque aureus*
	Total = 7		
Novembre	3	1	*1 Proteus*
	Total = 4		
Décembre	3	2	*1 Pseudomonas* *1 E. Coli*
	Total = 5		

D'où on peut ressortir l'incidence des microorganismes pathogènes :

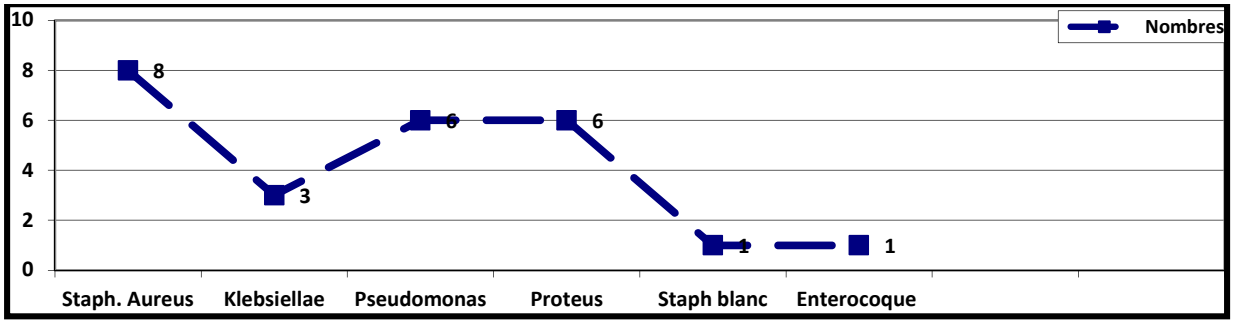


Graphique VII : nombre de germes pathogènes en 2011

Tableau IX : Année 2012

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	2	3	*1 Enterocoque* *1 Staphylocoque aureus* *1 Proteus*
	Total = 5		
Février	2	2	*1 Staphylocoque aureus* *1 Proteus*
	Total = 4		
Mars	5	2	*1 Pseudomonas* *1 Proteus*
	Total = 7		
Avril	3	2	*1 Pseudomonas* *1 Klebsiellae*
	Total = 5		
Mai	1	2	*1 Proteus* *1 Staphylocoque albus*
	Total = 3		
Juin	3	2	*1 Pseudomonas* *1 Klebsiellae*
	Total = 5		
Juillet	1	2	*1 Proteus* *1 Staphylocoque aureus*
	Total = 3		
Août	1	1	*1 Staphylocoque aureus*
	Total = 2		
Septembre	5	4	*2 Pseudomonas* *1Staphylocoque aureus* *1 Proteus*
	Total = 9		
Octobre	2	2	*1 Klebsiellae* *1 Staphylocoque aureus*
	Total = 4		
Novembre	3	1	*1 Proteus*
	Total = 4		
Décembre	5	2	*2 Staphylocoque aureus* *1 Pseudomonas*
	Total =7		

D'où on peut ressortir l'incidence des microorganismes pathogènes :



Graphique VIII : nombre de germes pathogènes en 2011

v. Etude cytobactériologique de prélèvement vaginal

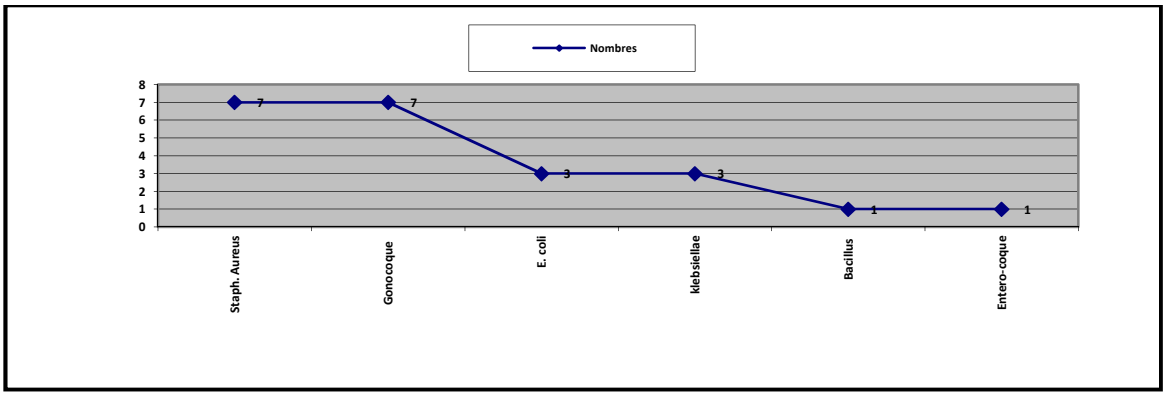
Le diagnostic des tableaux X et XI, nous a permis de sortir le pourcentage des cas positifs dans cette partie du corps humain. En 2011, nous avons trouvé 20 cas sur 32. Cela correspond à un pourcentage de 62.5%. Par contre, en 2012, le nombre de cas positif était de 23 soit un pourcentage de 50%. Le total des malades était de 46.

L'incidence des germes dans la partie vaginal selon les analyses des années 2011/2012, est la suivante: *Staphylococcus aureus* avec 38,46%*, Neisseria gonorrhoeae avec 19,23%*, *Klebsiellae avec* 9,61%, *Enterococcus sp avec* 9,61%*, Escherichia coli avec 7,69%, Staphylococcus albus avec 3,84%, Bacillus sp 1,92% et Candida albicans 1,92%.*

Tableau X : Année 2011

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	2	3	*3 Staphylocoque aureus*
	Total = 5		
Février	0	0	_
	Total = 0		
Mars	0	1	*1 Gonocoque*
	Total = 1		
Avril	0	2	*1 Bacillus* *1 Gonocoque*
	Total = 2		
Mai	1	3	*1 E. coli* *1 Gonocoque* *1 Staphylocoque Aureus*
	Total = 4		
Juin	0	4	*2 Staphylocoque Aureus* *2 Klebsiellae* *1 Gonocoque*
	Total = 4		
Juillet	0	3	*2 E. coli* *1 Gonocoque* *1 Klebsiellae*
	Total = 3		
Août	0	0	_
	Total = 0		
Septembre	0	0	_
	Total = 0		
Octobre	4	1	*1 Gonocoque*
	Total = 5		
Novembre	1	0	_
	Total = 1		
Décembre	4	3	*1 Enterocoque* *1 Gonocoque* *1 Staph Aureus*
	Total = 7		

L'incidence à extraire de tableau sus mentionné est inscrite dans les données suivantes :

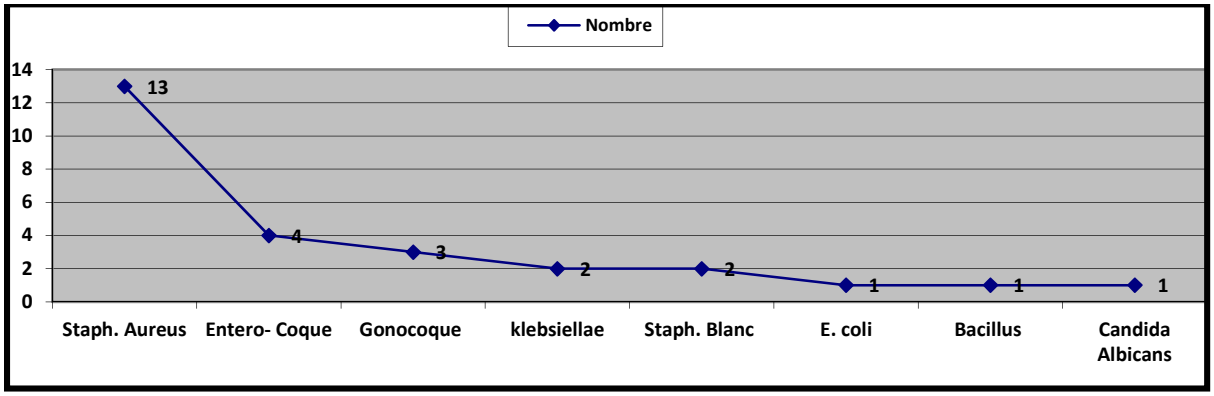


Graphique VIII : nombre de germes pathogènes en 2011

Tableau XI : Année 2012

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	6	2	*2 Staphylocoque aureus* *1 Gonocoque*
	Total = 8		
Février	4	2	*2 Staphylocoque aureus*
	Total = 6		
Mars	4	2	*1 Staphylocoque blanc* *1 Enterocoque*
	Total = 6		
Avril	3	5	*2 Staphylocoque Aureus* *2 Enterocoque* *1 Gonocoque*
	Total = 8		
Mai	1	4	*3 Staphylocoque Aureus* *1 Enterocoque*
	Total =5		
Juin	0	2	*1 Staphylocoque Aureus* *1Candida Albicans*
	Total = 2		
Juillet	0	1	*1 Klebsiellae*
	Total = 1		
Août	2	2	*1 Staphylocoque Aureus* *1Bacillus*
	Total = 4		
Septembre	0	0	_
	Total = 0		
Octobre	4	1	*1 (Klebsiellae+ Staphylocoque Aureus)*
	Total = 1		
Novembre	2	1	*1 (E. coli+ Staphylocoque blanc)*
	Total = 3		
Décembre	1	1	*1 Gonocoque*
	Total = 2		

L'incidence à extraire de tableau sus mentionné est inscrite dans les données suivantes :



Graphique IX : nombre de germes pathogènes en 2012

vi. Etude cytobactériologique de liquide céphalo-rachidien

L'analyse du liquide céphalo-rachidien s'avère très importante. Elle va nous orienter vers la ou les bactérie(s) responsable(s) de l'infection de cette partie de l'organisme humain. L'incidence des cas positifs est d'un pourcentage de 1.05% en 2011 soit 2 cas positifs sur 190 et d'un pourcentage de 3.87% en 2012 soit 6 cas positifs sur 155.

A partir de l'étude bactériologique du liquide céphalo-rachidien, nous avons extrait le pourcentage des germes pathogènes. Ces derniers se répartissent comme suit : *55,55% Pneumococcus sp, 22,22% Méningocoque, 11,11% Streptococcus sp et 11,11% Staphylococcus aureus.*

Tableau XII : Année 2011

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	16	2	*1 Pneumocoque* *1 Méningocoque*
	Total = 18		
Février	12	0	_
	Total = 12		
Mars	18	0	_
	Total = 18		
Avril	28	0	_
	Total = 28		
Mai	15	0	_
	Total = 15		
Juin	20	1	*1 Staphylocoque aureus*
	Total = 21		
Juillet	10	0	_
	Total = 10		
Août	19	0	_
	Total = 19		
Septembre	15	0	_
	Total = 15		
Octobre	11	0	_
	Total = 11		
Novembre	12	0	_
	Total = 12		
Décembre	11	0	_
	Total = 11		

Tableau XIII : Année 2012

Mois	Cultures		Germes isolés
	Négatives	Positives	
Janvier	4	1	*1Streptocoque*
	Total = 5		
Février	12	0	_
	Total = 12		
Mars	11	0	_
	Total = 11		
Avril	14	0	_
	Total = 14		
Mai	11	0	_
	Total = 11		
Juin	12	1	*1 Pneumocoque*
	Total = 13		
Juillet	12	2	*2 Pneumocoque*
	Total = 14		
Août	13	0	_
	Total = 13		
Septembre	16	1	*1 Méningocoque*
	Total = 17		
Octobre	14	0	_
	Total = 14		
Novembre	11	1	*1 Pneumocoque*
	Total = 12		
Décembre	19	0	_
	Total = 19		

4 CONCLUSION

Les maladies infectieuses sont en augmentation inquiétante. L'infection ne fait pas abstraction d'une partie du corps humain pour abonder l'autres. Aucun territoire n'échappe à la contamination.

Afin de valider ce qui précède, nous avons réalisé une enquête au niveau C.H.R El IDRISSI de Kénitra Maroc. Et ce par la lecture des informations portées sur les registres du service de bactériologie. Les six examens les plus pratiqués dans le service sont l'examen cytobactériologique des urines (ECBU), la coproculture, l'examen cytobactériologique du pus, l'examen d'hémoculture, l'examen du liquide céphalo-rachidien (LCR), l'examen bactériologique des sécrétions de la sphère ORL et broncho-pulmonaires et liquide ascite et l'examen cytobactériologique du prélèvement vaginal.

Nous avons arrêté 2 ans (2011-2012) comme période de contrôler et d'identification de problèmes liés à la contamination microbienne. Ainsi, nous avons trouvé que l'infection microbienne existe dans les six examens réalisés dans le service. La différence réside au niveau nombre de germes et d'espèces.

Pour ce qui est nombre, nous avons trouvé 262 cas positives de E.C.B.U, 58 au niveau des prélèvements de pus, 52 dans les prélèvements vaginales, 14 dans le liquide pleural, 12 dans l'hémoculture et 9 dans le liquide céphalorachidien.

Parallèlement, nous avons trouvé 48.85% d'*Escherichia coli*, 25,9% *Klebsiellae sp*, 13.36% *Staphylococcus aureus,* 4,2% *Proteus sp*, 3,44% *Enterobacter sp*, 2,29% *Staphylococcus albus*, 1,9% *Psoudomonas sp* et 0,76% *candida albicans* dans le prélèvement d'E.C.B.U.

Ainsi 27,59% *Staphylococcus aureus,* 22,41% *Psoudomonas sp*, 13,79% *Klebsiellae sp*, 18,96% *Proteus sp*, 6,90% *Escherichia coli*, 3,45% *Streptococcus sp* et 1,72% (S*taphylococcus albus, Bacillus sp, Enterococcus sp et Enterobacter sp)* dans l'examen de pus.

38,46% *Staphylococcus aureus, 19,23% Gonococcus*, 9,61% (*Klebsiellae sp*, *Enterococcus sp). 7,69% Escherichia coli, 3,84%* S*taphylococcus albus, 1,92% (Bacillus sp,Candida albicans)* dans l'examen de prélèvement vaginal. 42,85% *Staphylococcus aureus, 35,71% Klebsiellae sp, 14,28% Proteus sp*, 7,14% *Psoudomonas sp dans les pleurésies.*

41,66% Staphylococcus aureus, 16,66 % Escherichia coli, 16,66 % Klebsiellae sp, 8,33% (Citrobacter sp ; Salmonelle sp et pneumococcus sp) dans les Hémocultures.

55,55% Pneumococcus sp, 22,22% Méningocoque, 11,11% (Streptococcus sp et Staphylococcus aureus) dans les prélèvements du L.C.R.

Cette étude nous a aidée à regrouper les différentes agents pathogènes rencontrés dans différents types d'analyse ainsi nous a orienter à réaliser une étude suivante en se basent sur la prévalence des infections rencontrées.

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Using Path Analysis to evaluate Breeding Progress in Grain Yield and Related Characters of Durum Wheat in Morocco

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ABSTRACT: This study evaluates yield formation and breeding efforts in durum wheat grown in Morocco by the mean of path coefficient techniques based on plant ontogeny. A field experiment was conducted during 2008-2009 growing season with six Moroccan durum wheat varieties released between 1984 and 2007. Results obtained showed an increased grain yield from old to moderns varieties that was mainly due to longer vegetative period and heavy grains. Path coefficient analysis elucidates the correlation studies, and showed that grain yield was dependent on their three main components from old to modern varieties. Absolute and relative genetic gains in grain yield was 23 kg ha^{-1} $year^{-1}$ and 0.5% $year^{-1}$ indicating an important breeding progress in durum wheat made in Morocco since last two decades as compared to other countries with more pronounced breeding programs.

KEYWORDS: Path analysis, breeding, genetic gain, durum wheat, Morocco.

1 INTRODUCTION

Cereals are of paramount importance in Morocco and their consumption is one of the highest in the world, and cereal demand is almost synonymous with demand for food. The area planted annually with cereals in Morocco is about 5 million hectares. The national production contributes 43% of total consumption [1]. Among cereals, durum wheat, *Triticum turgidum* var. L. *durum* is sown annually over 1.2 million hectares, with an average consumption of around 65 kg/person/year [2]. Morocco is ranked third in the Mediterranean region and first in the North Africa and Middle East region in term of durum wheat acreage. Arid and semi arid regions (60% of the cropped Moroccan lands) are characterized mainly by drought and poor rainfall distribution within seasons [3]. Due to these reasons, the average yield is low and variable ranging from 0.5 to 1.2 t ha^{-1} [4]. The new durum wheat varieties released since 1972 in Morocco have allowed a grain yield gain of at least 25% over the landraces, but their productivity and grain quality are highly affected by the environmental factors [5]. The improvement of grain yield of durum wheat and its quality are the major objectives of the research conducted by the National Agricultural Research Institute (INRA) and the collaborating International Centers, CIMMYT and ICARDA [6].

Morocco and all countries belonging to the Mediterranean basin suffer from low and erratic distribution of rainfall, which has explained as much as 75% of the variation in wheat yield [7]. Under these conditions, most rain falls during autumn and winter and water deficit emerges in the spring, resulting in a moderate stress for rainfed wheat around anthesis, which increases in severity throughout grain filling [8]. Grain yield of wheat can be analyzed in terms of three yield components (number of spikes m^{-2}, number of grains $spike^{-1}$, and grain weight) that appear sequentially with later-developing

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components under control of earlier-developing ones [9], [10]. Understanding the effect of water stress and temperature regimes on yield formation becomes an essential step in the development of higher-yielding and more stable varieties [11].

Numerous studies on cereals include correlations between grain yield and its components. Although these are helpful in determining which components is influencing final grain yield, they may not provide a clear picture of the importance of each component in determining grain yield. Path coefficient analysis divides the correlation coefficients into direct and indirect effects. It allows, then, the separation of the direct influence of each yield component on grain yield from the indirect effects caused by the mutual relationships among yield components themselves [11].

Evaluation of breeding advances was undertaken in several works on bread wheat (*T. aestivum* L.) and other cereals [12], [13], [14], [15], but durum wheat has been analyzed in only a few studies. In fact, , McCaig and Clarke [16] reported yield increases in Canada of 0.81% year^{-1} over the period 1947-1992, while the genetic gain in durum wheat yield among CIMMYT germplasm between 1960 and 1984 was 3% year^{-1} [17]. Recently, Royo et al. [18] showed a relative genetic gain of 0.61% year^{-1} in grain yield across Spain and Italy from 1945 to 2000.

This study aims: (i) to evaluate yield formation in six durum wheat varieties released between 1984 and 2006 by using the path coefficient analysis; and (ii) to estimate the genetic gain in grain yield among these varieties over 20 years of breeding efforts in Morocco.

2 MATERIAL AND METHODS

A field trial was conducted during 2008-2009 growing season under rainfed conditions at the INRA Experimental Station of Jemâa Shaim (110 km west of Marrakech). The experiment consisted of a randomized complete block design with three replications and plots of 3 m^2 (six rows 0.15 m apart and 3 m length). Experimental details are given in Table 1. The seeding rate was adjusted for a density of 200 viable seeds m^{-2} according to the standard practices in the zone.

Table 1. Site localization, agronomical details, and climatic data

Site	Jemâa Shaim (rainfed)
Coordinates	
Latitude	32°24’09’’
Longitude	08°46’55’’
Altitude, m	176
Soil characteristics	
Classification	*Vertisol*.
Texture	*Tirs (calcareous clay)*
pH:	6.8 to 7
P	not available
K	abundant
Organic matter, %	1.1 to 2.8
Climatic data	
Seasonal rainfall, mm	171
Average temperatures,°C	
Tmax	23
Tmean	16.5
Tmin	10
Agronomic practices	
Fertilizers, kg ha^{-1}	
N	204
P_2O_5	404
K_2O	0
Sowing date	13 Nov. 2008

Six durum wheat varieties were selected to represent the germplasm grown in Morocco during the second half of the 20th century. Based on the year of release (Table 2), varieties were assigned to three periods, namely old (released before 1990), intermediate (released between 1990 and 2000), and modern (released after 2000).

Table 2. Description of the six durum wheat varieties used in this study

Varieties	Origin	Registration date	Adaptation zone
Olds			
Marzak	INRA Morocco	1984	Large, high yield potential
Karim	INRA Morocco	1985	Large, Irrigated, High yield potential
Intermediates			
Yasmine	INRA Morocco	1993	Large
Ourgh	INRA Morocco	1995	Large
Moderns			
Nassira	INRA Morocco	2003	Semi arid, drought tolerant
Faraj	INRA Morocco	2007	Semi arid, drought tolerant

The length of vegetative period was calculated as days from sowing to anthesis (growth stage 65 according to [19]. Duration of grain filling was considered to be the days from anthesis to physiological maturity (growth stage 87). The number of spikes m^{-2} was calculated by counting the spikes contained in 1 m of one of the central rows in each plot. The number of grains $spike^{-1}$ was determined by counting grains on every spike from a subsample of 10 plants selected from 1 m of row taken completely at random in each plot before harvest. Thousand grain weight (TGW) was calculated from the weight of three sets of 100 grain per plot. Grain yield was determined on the basis of the harvested plot and corrected to 120 g kg^{-1} moisture level.

Combined ANOVA over periods and varieties were performed with the Statgraphics package [20]. Means were compared by Duncan's test at $P < 0.05$. Correlation coefficients among all characters were computed from the mean values of the three replications. Genetic gain was calculated for grain yield as the slope of the linear regression between the mean value of grain yield of each variety and its corresponding year of release.

Path coefficient analysis was performed to partition the correlation coefficient, r_{ij}, into direct and indirect effects. The following four sets of simultaneous equations were solved to determine the path coefficient, P_{ij}, with subscripts indicating the six characters: vegetative period (1), number of spikes m^{-2} (2), grain filling duration (3), number of grains $spike^{-1}$ (4), TGW (5), and grain yield (6).

$$\begin{cases} r_{26} = P_{26} + r_{24}P_{46} + r_{25}P_{56} \\ r_{46} = r_{24}P_{26} + P_{46} + r_{45}P_{56} \\ r_{56} = r_{25}P_{26} + r_{45}P_{46} + P_{56} \end{cases} \qquad \begin{cases} r_{25} = P_{25} + r_{23}P_{35} + r_{24}P_{45} \\ r_{35} = r_{23}P_{25} + P_{35} + r_{34}P_{45} \\ r_{45} = r_{24}P_{25} + r_{34}P_{35} + P_{45} \end{cases}$$

$$\begin{cases} r_{14} = P_{14} + r_{12}P_{24} + r_{13}P_{34} \\ r_{24} = r_{12}P_{14} + P_{24} + r_{23}P_{34} \\ r_{34} = r_{13}P_{14} + r_{23}P_{24} + P_{34} \end{cases} \qquad \begin{cases} r_{13} = P_{13} + r_{12}P_{23} \\ r_{23} = r_{12}P_{13} + P_{23} \end{cases}$$

In the equation $r_{13} = P_{13} + r_{12}P_{23}$, P_{13} is the direct effect of character 1 on 3 (the path coefficient) while $r_{12}P_{23}$ is the indirect effect of character 1 on 3 via 2. Similar definitions apply to the other equations. The causal system assumed (as described in [10], [11]) was based on the ontogeny of the cereal plant, and it is shown in Fig. 1.

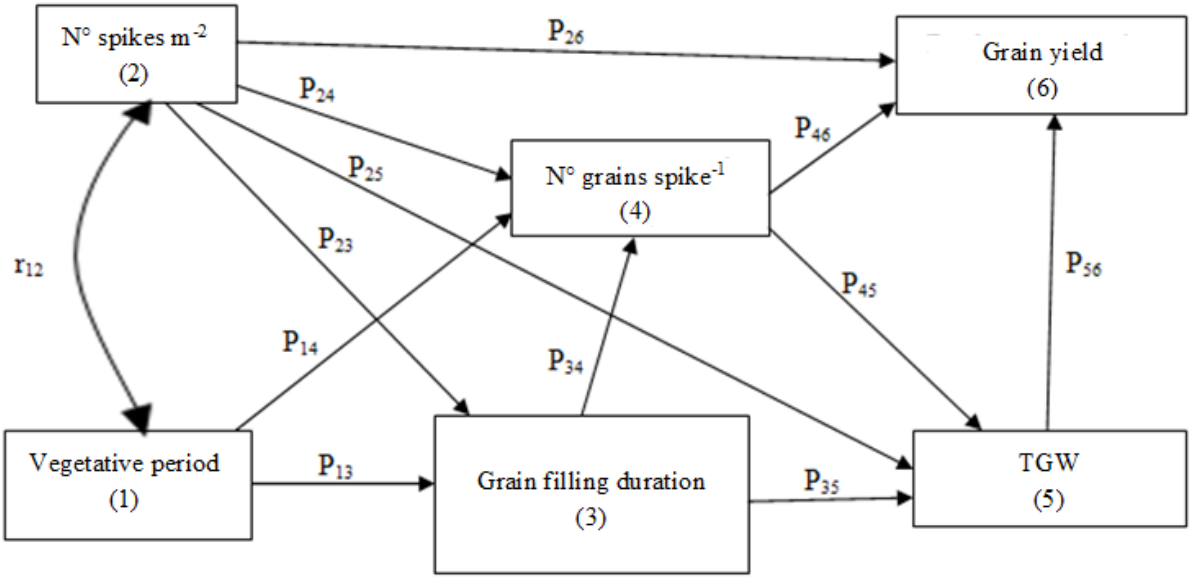

Fig. 1. Path coefficient diagram showing the interrelationships among the six characters studied. The single-headed arrows indicate path coefficients, and the double-headed arrows indicate simple correlation coefficients.

3 RESULTS

3.1 CHANGES IN GRAIN YIELD AND RELATED CHARACTERS OVER PERIODS OF RELEASE

Results presented in Table 3 indicate that modern varieties showed the highest grain yield with an increased number of spikes m^{-2} but mainly because of their high grain weight. Old and intermediate varieties revealed low grain yields in spite of high number of grains $spike^{-1}$. This was caused by their lower grain weight that negatively influenced final grain yield. In relation to plant cycle duration, modern varieties had flowered later in comparison to old and intermediate ones while grain filling duration was relatively the same for the three groups of varieties.

Table 3. Mean values of grain yield and related characters for the three categories of varieties

Period of release	Grain yield (kg ha^{-91})	Spikes m^{-2}	Grains $spike^{-1}$	TGW (g)	Vegetative period (days)	Grain filling duration (days)
Olds	880b†	228b	42.1a	34.0b	120b	36a
Intermediates	650b	269a	44.0a	31.4b	119b	37a
Moderns	1320a	279a	31.9b	41.1a	132a	36a

† Values followed by the same letter in a column are not significantly different according to Duncan's test ($p < 0.05$).

3.2 CORRELATION STUDIES

Correlation analyses (Table 4) revealed that yield components (number of spikes m^{-2}, number of grain $spike^{-1}$, and TGW) had low but; in general, positive associations with grain yield in old varieties. In this group, the length of vegetative period was significantly and negatively related to grain yield (r = –0.947**). For intermediates varieties, grain yield was moderately but no significantly dependent on number of spikes m^{-2} (r = 0.742). Among yield components, grain weight was positively associated to number of spikes m^{-2} but negatively and significantly affected by number of grains $spike^{-1}$ (r = –0.830*). Regarding modern varieties, grain yield was highly dependent on its three main components with particular significant and positive correlation to number of spikes m^{-2} (r = 0.817*) and grain weight (r = 0.854*). This latter component was highly and significantly affected by number of spikes m^{-2} (r = 0.920**) and number of grains $spike^{-1}$ (r = 0.833*). In addition, grain filling duration was negatively and significantly affected by the length of vegetative period (r = –0.965**).

Table 4. Correlation coefficients among the characters studied for the three categories of varieties

	Spikes m^{-2}	Grains $spike^{-1}$	TGW	Vegetative period	Grain filling duration
Olds					
Grain yield.	0.379	0.581	0.471	–0.947**	0.099
Spikes m^{-2}		0.221	–0.339	–0.297	0.522
Grains $spike^{-1}$			0.182	–0.386	–0.307
TGW				–0.521	–0.531
Vegetative period					–0.262
Intermediates					
Grain yield.	0.742	–0.122	0.566	0.094	0.064
Spikes m^{-2}		–0.363	0.780	0.212	0.449
Grains $spike^{-1}$			–0.830*	0.216	–0.285
TGW				–0.079	0.522
Vegetative period					0.042
Moderns					
Grain yield.	0.817*	0.786	0.854*	0.657	–0.518
Spikes m^{-2}		0.665	0.920**	0.462	–0.358
Grains $spike^{-1}$			0.833*	0.530	–0.319
TGW				0.492	–0.306
Vegetative period					–0.965**

3.3 PATH COEFFICIENT ANALYSIS

Path coefficient analysis was performed to obtain further information on the interrelationships among traits and their effects on grain yield. For this purpose, a cause–effect system (as shown in Fig. 1) was constructed and based on the ontogeny of the durum wheat plant. Hence, the number of spikes m^{-2} and length of vegetative period are shown to have a mutual relationship (double-headed arrow). Both traits could have a reciprocal influence at early stages of wheat growth. Duration of vegetative period was believed to affect both number of grains $spike^{-1}$ and the duration of GFP. Tiller production (which determines the number of spikes m^{-2}) is known to be the first developmental process in cereals, and then it may exercise a direct influence on all other traits that are developed later. The duration of GFP could modify number of grains $spike^{-1}$ by reducing abortion of pollinated florets after anthesis [10], [11].

Path coefficients presented in Fig. 2 revealed a direct and positive effect of the three main components on grain yield for all groups of varieties. In fact and for old varieties (Diagram a, Fig. 2), a non-significant direct effect of number of spikes m^{-2}, number of grain $spike^{-1}$ and grain weight was observed on grain yield. Number of spikes m^{-2} had a direct positive effect on number of grains $spike^{-1}$ but a direct negative effect on grain weight; it had also a positive direct effect on grain filling duration. The length of vegetative period had a direct negative effect on number of grains $spike^{-1}$ while grain filling duration affected negatively grain weight. Direct effects calculated for intermediate varieties (Diagram b, Fig. 2) showed that main yield components were non-significantly but positively associated to grain yield. Number of spikes m^{-2} had a direct negative effect on number of grains $spike^{-1}$ but a direct positive effect on both grain weight and grain filling duration. In addition, number of grains $spike^{-1}$ had a direct negative effect on grain weight. Finally, path analyses for modern varieties (Diagram c, Fig. 2) revealed that number of spikes m^{-2} and grain weight had a significant direct and positive effect on grain yield. Number of grains $spike^{-1}$ had a positive although non-significant direct effect on grain yield. Number of spikes m^{-2} had a positive direct effect on the two remaining yield components. Grain weight was positively affected by number of grains $spike^{-1}$ but negatively influenced by grain filling duration. The length of vegetative period had a marked but non-significant positive effect on number of grains $spike^{-1}$.

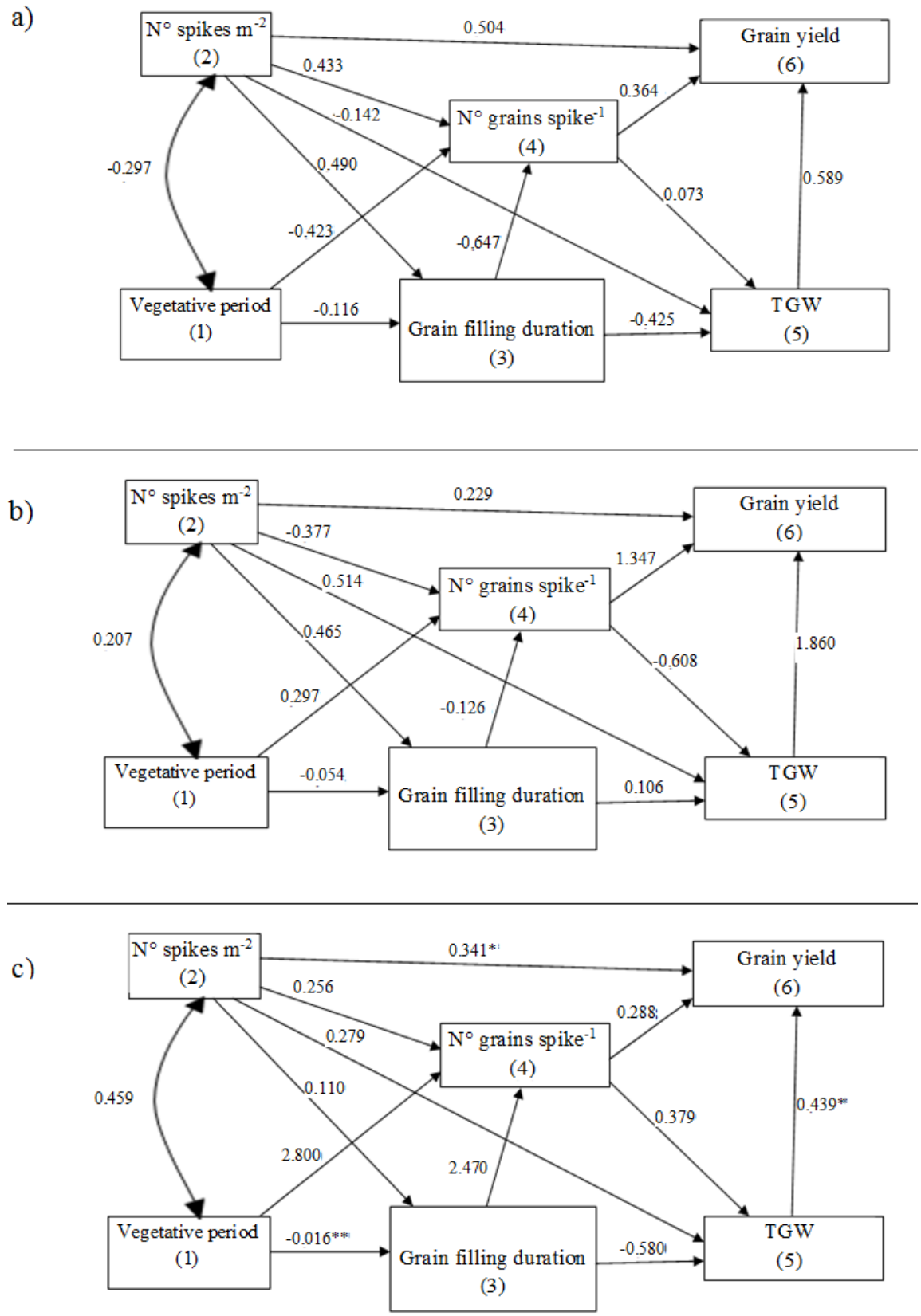

Fig 2. Path coefficient diagrams showing direct effects among the six studied characters for the three categories of varieties: olds (a), intermediates (b), and moderns (c). The single-headed arrows indicate path coefficients, and the double-headed arrows indicate simple correlation coefficients.

GENETIC GAIN IN GRAIN YIELD

Regression of mean grain yield of the six studied varieties over its year of release are displayed in Fig. 3. A marked evolution in grain yield could be observed from 1984 to 2007. Absolute changes in grain yield from old to modern varieties used in the present work had leaded to an absolute genetic gain (regression slope) of 23 kg ha^{-1} $year^{-1}$ that correspond to a relative genetic gain of 0.5% $year^{-}1$.

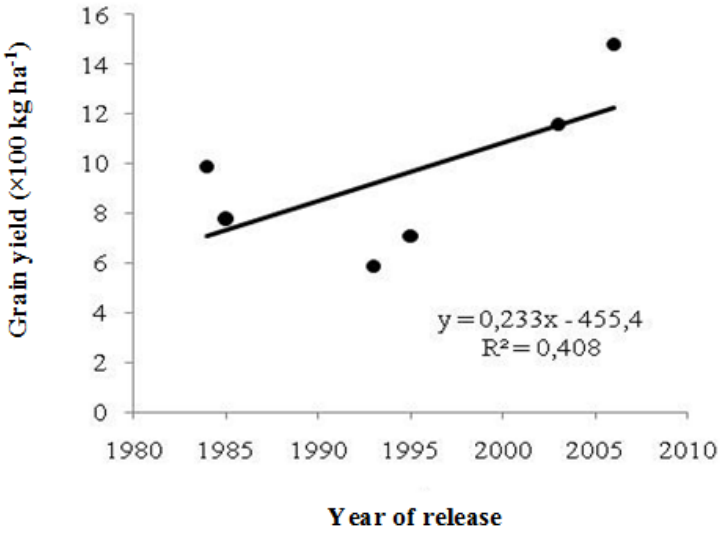

Fig. 3. Absolute changes in grain yield of six durum wheat varieties released between 1984 and 2007 in Morocco.

4 DISCUSSION

Results of the present work showed that grain yield increased in Moroccan durum wheat by about 50% from 1984 to 2007. This was mainly due to a long vegetative period allowing more accumulation of assimilates which resulted in heavier grains and higher grain yield. The positive effect of lengthening vegetative period on grain yield had been previously reported [11], [21], [22]. Evans and Wardlaw [23] indicated that variation in the duration of vegetative period accounted for 5 to 10% of the variation in grain yield.

The interrelationships among the studied characters revealed a high dependency of grain yield on its three main components particularly number of spike m^{-2} and grain weight. This was true specifically in modern varieties. Importance of number of spike m^{-2} in determining grain yield was previously reported in barley [10], [24], [25] and wheat [11], [26], [27], [28], [29], [30]. Path coefficient analysis elucidates some associations obtained by correlation coefficients. In fact, grain weight was weakly related to grain yield in intermediate varieties. This was a misleading because the direct positive effect on grain yield was masked partially by the direct negative influence that exercised number of grain $spike^{-1}$ on grain weight. This agrees with results of [26] in durum wheat and may indicate a compensatory effect between apical development, and grain growth in wheat, presumably deriving from the negative allometry between these traits during plant development [9]. Moreover, yield component compensation in cereals, arising from the fact that these components develop sequentially with later-developing components under control of earlier-developing ones [10]. One interesting point from the results is the evolution of the relationship between the length of vegetative period and grain $spike^{-1}$ and grain weight (influencing consenquently grain yield) from old to modern varieties as demonstrated by correlations and path analyses. While length of vegetative period influenced negatively number of grain $spike^{-1}$ and grain weight resulting in lower grain yield in old varieties, it was positively associated with number of grain $spike^{-1}$ and grain weight in modern varieties. The negative effect of lengthening vegetative period on number of grain $spike^{-1}$ was reported in several works under water-limited conditions [10], [26], [31]. Moreover, Giunta et al. [32] also indicated that severe water deficit around anthesis produces serious effects on wheat yield, reducing the number of spikes and spikelets and therefore causing a decrease in plant fertility.

Total absolute genetic gain in grain yield found in our study was 23 kg ha^{-1} $year^{-1}$ (50% of increase), which amounts to a relative genetic gain of 0.5% $year^{-1}$. These values are similar to the genetic yield gain of 20 kg ha^{-1} $year^{-1}$ recently reported for durum wheat in Spain [18] and 19.9 kg ha^{-1} $year^{-1}$ in Italy [33], and values of 0.4 to 0.6% $year^{-1}$ reported for bread wheat [34], [35], [36]. However, evaluations of genetic gains by the durum wheat breeding program of International Maize and

Wheat Improvement Center (CIMMYT) reached much higher values due to experiments conducted under optimal conditions [37]. In fact, Pfeiffer et al. [38] found that the gain in yield increase in durum wheat between 1967 and 1994 was 1.7% year^{-1}.

5 CONCLUSION

It could be concluded that grain yield increases in Moroccan durum wheat varieties was mainly due to lengthening the period from sowing to anthesis and a high remobilization of assimilates during grain filling that increased grain weight. Grain yield was positively affected mainly by number of spikes m^{-2} and grain weight as was showed by correlation studies, and elucidated by path analysis particularly in modern varieties. Compensatory effects among yield components was also observed in the three group of varieties. Genetic gain in grain yield within durum wheat varieties released between 1984 and 2007 in Morocco was similar to what is reported in other countries with pronounced breeding programs like Spain and Italy.

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Industrial Relation and Dispute Settlement Procedure in RMG Sector of Bangladesh: A Critical Review

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ABSTRACT: This paper aims to improve our understanding the gap between existing law and real scenario relating to Industrial relations and the procedure of settlement of industrial dispute in Ready Made Garment (RMG) Sector of Bangladesh. The very object of this writing is to find out the reason behind the labour movements and the role of the employer in this situation. Though garment sector is a rising sector in Bangladesh. Most of the time it faces labour movements due to various inner and outer kind of reasons. The main object is to give a pen picture of present status of industrial relation and to put some general suggestions that can help to reduce the dispute in the readymade garment sectors of Bangladesh.

KEYWORDS: Industrial relation, RMG, trade union, CBA, strike, dispute settlement procedure.

1 INTRODUCTION

In the economic development of any country a process is followed in recent time by shifting from Agro based Economy to Industrial Economy. Although in the least developed countries (LDCs) policymakers have, at various times, approached to make agriculture the primary concern of economic growth and employment generation, this attempt has not worked due to the contributions of the Green Revolution, which has had the dual effect of increasing agricultural productivity in the LDCs and displacing the rural labor force at the same time. Bangladesh is one of the representatives of LDCs, has also been following the same direction for the last more than two decades. New rules had come to govern the international trade in textiles and apparel, allowing low-cost suppliers to gain a grasp in American and European markets. Assisted by foreign partners, and largely unaided by the government, entrepreneurs seized the opportunity and exploited it to the fullest. Over a period of 25 years, the garments export sector has grown into a $6 billion industry that employs over a million people. In the process, it has boosted the overall economic growth of the country and raised the viability of other export-oriented sectors. The importance of RMG sector can hardly be over emphasized. There has been a steady growth in the field of RMG during last two decades. The RMG industry enjoyed a meteoric rise from 30 enterprises in 1980 increased to about 5700 in 2011-12 fiscal years.

In this particular study we will be focusing on the Industrial relation, dispute settlement procedure and its contribution in RMG sector of Bangladesh. We will also try to highlight the ways to improve the efficiency of the dispute settlement procedure. In the last part, we will have some recommendation as well as concluding remarks.

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2 THE CONTRIBUTION AND GROWTH OF RMG INDUSTRY IN BANGLADESH: [1]

2.1 CONTRIBUTION OF RMG INDUSTRY TO THE ECONOMY

Garments Industry occupies a unique position in the Bangladesh economy. It is the largest exporting industry in Bangladesh, which experienced phenomenal growth during last two decades. The industry plays a key role in employment generation and in the provision of income to the poor. Nearly two million workers one directly and more than ten million inhabitants are indirectly associated with the industry. The sector has also played a significant role in the socio-economic development of the country. In such a context, the trend and growth of garments export and its contribution to total exports and GDP has been examined the following table shows the position.

Table 1: Growth and trend of garments exports, and contribution to GDP

(Amounts in Million USD)

Year	Garment Export (Min USD)	Total Export (Min USD)	Share to Total Export in %	Share to GDP in %
1984-85	116 -	934 -	12.42 -	-
1989-90	624 (40)	1924 (16)	32.43 (21)	-
1994-95	2228 (29)	3473 (13)	64.15 (15)	5.87 -
1999-00	4349 (14)	5752 (11)	75.61 (3)	9.23 (9)
2004-05	6418 (8)	8655 (9)	74.15 (-1)	10.63 (3)
2005-06	7901 (23)	10526 (22)	75.06 (1)	12.64 (2)

Source: Economic Review of Bangladesh, BGMEA

2.2 GROWTH OF RMG INDUSTRY IN BANGLADESH

The growth of the industry in terms of number of units and employment generation is shown in table below:

Table 2: Growth of the industry and Employment

Year	Number of Garment Factories	Employment in Million Workers
2000-2001	3480	1.800
2001-2002	3618	1.800
2002-2003	3760	2.000
2003-2004	3957	2.000
2004-2005	4107	2.000
2005-2006	4220	2.200
2006-2007	4490	2.400
2007-2008	4743	2.800
2008-2009	4925	3.500
2009-2010	5063	3.600
2010-2011	5150	3.600
2011-2012	5700	4.000

Out of 4.0 million manpower employed in garment sectors, 3.20 million are women (80%), majorities of them are disadvantaged and economically poverty stricken women folk. The country's RMG sector, to a creditable level has relieved Bangladesh from over populous unemployment burden through providing the largest employment next to the sector of agriculture, transport, trade and industry. This sector has uplifted the neglected section of the population, thus radically transforming the socio-economic condition of the country.1The employers always want to suppress the workers and to realize the highest labour form the workers. Most of the employers do not follow the rules & regulations like the formation of trade union to regulate industrial relations lawfully which is provided in the labour and industrial laws of Bangladesh. The workers cannot go to the employer to raise their demand, which always turns into illegal strike. To create stability in the garment sectors the employers should fulfill the right of the workers like formation of trade union and to follow the industrial dispute settlement procedure.

3 METHODOLOGY

This study is based on both secondary and primary sources. The secondary sources which have been reviewed are: books, journals, reports, news paper and data from various official and unofficial sources. For primary sources, data from official sources have been collected from Bangladesh institute of labour studies (BILS), a focus group discussion with a number of workers from the RMG sectors. We have also used internet sources to collect information on industrial relation and the industrial dispute settlement procedure.

4 INDUSTRIAL RELATIONS

Industrial relation means the relation between the employer and worker, worker and worker. It is based on the provisions of the industrial relations ordinance, 1969 which had been the industrial relations law in Bangladesh since 1969. It is promulgated to amend and consolidate the law relating to formation of trade union, regulation of the relations between employer and workmen and the avoidance and settlement of any difference or dispute arising between them or matters connected therewith and ancillary thereto.

An industrial relation system consists of the whole gamut of relationship between employees and employees and employers which are managed by the means of conflict and cooperation.

A sound industrial relations system is one in which relationships between management and employees (and their representatives) on the one hand, and between them and the state on the other, are more harmonious and cooperative than controversial and creates an environment conducive to economic efficiency and the motivation, productivity and development of the employee and generates employee loyalty and mutual trust.

5 ACTORS IN THE INDUSTRIAL RELATION SYSTEM

Main parties who are directly involved in the industrial relations are employer and the employee. To regulate industrial relations satisfactorily there must be trade union of the workers in every garments factory. Among the trade unions of an establishment a collective bargaining agent (CBA) should be elected, whose validity shall be for two years and in this time it shall seek to improve the terms and conditions of the employment of the workers. Its duty is to exchange views with management and voice the grievance of the workers. It is the right of the workers to form trade union for regulating a good relationship between the worker and workers, workers and employer. In reality trade union is need in an establishment, because the workers can raise their voice against the management and get support from these unions.

6 RULES REGARDING FORMATION OF TRADE UNION

Trade union means any combination of workmen or employers formed primarily for the purpose of regulating the relations between workmen and employers or workmen and workmen or employers and employers, or for imposing restrictive conditions on the conduct of any trade or business and includes a federation of two or more trade unions.

7 RIGHTS OF THE WORKER TO FORM TRADE UNION

According to the section176 of The Bangladesh Labour Code, 2006 workers shall have the right to form trade union primarily for the purpose of regulating the relations between works and employers or workers and workers. Again employers shall have the right to form trade union primarily for the purpose of regulating the relations between employers and workers or employers and employers. Trade union of workers and employers shall have the right to form and join federation and any such union and federation shall have the right to affiliate with any international organization and confederation of worker's or employers organizations. The right to form associations or unions includes the right of workmen to form trade unions for a lawful purpose. The word "form" has been held to refer not only to the initial commencement of the association but also to the continuance of that association. If, however, the state tries to circumvent the right by placing restrictions on the objects or purposes or the normal functioning of an association, this would amount to an indirect restriction on the right itself. The state cannot do indirectly what it is prohibited to do directly. [2]

7.1 REGISTRATION OF A TRADE UNION

A trade union shall be registered by the director of labour. A trade Union of workers shall not be entitled to registration unless it has a minimum membership of thirty percent of the total number of workers employed in the establishment in which it is formed. [3] This director of labour shall have the power to cancel the registration of a trade union, if it satisfies on enquiry that the registration of a trade union should be cancelled. In this case the director of labour shall submit an application to the labour court praying for permission to cancel such registration. The director of labour shall cancel the registration of trade union within thirty days from the date of receipt of permission from the labour court. [4]

7.2 WORKERS RIGHT TO JOIN IN A TRADE UNION: [5]

Every worker shall have the right to join in any trade union. No employer or trade union of employers or no person acting on their behalf shall—

- Impose any condition in a contract of employment seeking to restrain the right of a person who is a party to such contract to join a trade union or continue his membership of a trade union; or
- Refuse to employ or refuse to continue to employ any person on the ground that such person is, or is not, a member or officer of a trade union; or
- Discriminate against any person in regard to any employment, promotion, condition of employment working condition on the ground that such person is, or is not, a member or officer of a trade union; or
- Dismiss, discharge, Remove from employment or threaten to dismiss, discharge, or remove from employment a worker or injure or threaten to injure him in respect of his employment by reason that the worker is or proposes to become, or seeks to persuade any other person to become a member or officer of a trade union, or participates in the promotion, formation or activities of a trade union; or
- Induce any person to refrain from becoming, or to cease to be a member or officer of a trade union, by conferring or offering to confer any advantage on, or by procuring or offering to procure any advantage for such person or any other person; or
- Compel or attempt to compel any officer of the collective bargaining agent to sign a memorandum of settlement or arrive at a settlement, by using intimidation, coercion, pressure, threat, confinement to a place, physical injury, disconnection of water, power and telephone facilities and such other methods; or
- Interfere with, or in any way influence the election procedure of a collective bargaining agent. [5]

If the employer compels the trade union to do so, it shall be treated as unfair labour practices on the part of employer and in this case the employer shall be punished with imprisonment for a term which may extend to two years, or with fine which may extend to ten thousand taka or with both. [6]

8 COLLECTIVE BARGAINING AGENT AND ITS FUNCTION

In an establishment there shall be registered not more than three trade unions. If an employer has more than one establishment and all the establishments carry out the same manufacturing process, the same type of industries shall be treated as one establishment of that employer. [7]

Collective Bargaining Agent is nothing but a trade union. If in an establishment there is more than one trade union than CBA determine through election. The period of CBA shall be for two years. If there is one registered trade union in an establishment, it shall be treated as a CBA if it has at least 1/3 of total workers as its members. . In this case it is not necessary to hold election to elect collective bargaining agent. The functions of the CBA are to:

- undertake collective bargaining with the employer or matters connected with the employment, non-employment, the term of employment or the conditions of work;
- represent all or any of the workers in any proceedings;
- give notice of and declare, a strike;
- nominate representatives of workers on the board of trustees of any welfare institutions or provident funds and of the workers participation fund;
- to conduct cases on behalf of any individual worker or group of workers.

According to section 209 and 210 of the Labor Code, 2006 collective bargaining is the first step in the industrial dispute settlement procedure.

8.1 IMPORTANCE OF COLLECTIVE BARGAINING:

Collective bargaining includes not only negotiations between the employer and unions but also includes the process of resolving labour-management conflicts. Thus, collective bargaining is, essentially, a recognized way of creating a system of industrial jurisprudence. It acts as a method of introducing civil rights in the industry, that is, the management should be conducted by rules rather than arbitrary decision making. It establishes rules which define and restrict the traditional authority exercised by the management.

8.1.1 IMPORTANCE TO EMPLOYEES

- Collective bargaining develops a sense of self respect and responsibility among the employees.
- It increases the strength of the workforce, thereby, increasing their bargaining capacity as a group.
- Collective bargaining increases the morale and productivity of employees.
- It restricts management's freedom for arbitrary action against the employees. Moreover, unilateral actions by the employer are also discouraged.
- Effective collective bargaining machinery strengthens the trade unions movement.
- The workers feel motivated as they can approach the management on various matters and bargain for higher benefits.

It helps in securing a prompt and fair settlement of grievances. It provides a flexible means for the adjustment of wages and employment conditions to economic and technological changes in the industry, as a result of which the chances are reduced.

8.1.2 IMPORTANCE TO EMPLOYERS

- It becomes easier for the management to resolve issues at the bargaining level rather than taking up complaints of individual workers.
- Collective bargaining tends to promote a sense of job security among employees and thereby tends to reduce the cost of labour turnover to management.
- Collective bargaining opens up the channel of communication between the workers and the management and increases worker participation in decision making.
- Collective bargaining plays a vital role in setting and preventing industrial dispute.[8]

9 REAL SCENARIO OF TRADE UNION OF WORKERS AND THE ASSOCIATION OF EMPLOYERS IN THE GARMENT SECTORS IN BANGLADESH

Visiting in a garment sector "Fashion Jeans Ltd." at Azampur, Uttara,Dhaka, it is to be understood that, employers always want to suppress the worker. Employers thinking are that if workers join in a trade union, they do not work properly. They will create movement at any time. It shall hamper the normal production of the industry. And sometimes it shall be the result of closure of the establishment. For this they do not allow trade union in the establishment. Moreover talking with some workers it makes me confirm that, they do not know what are trade union and the functions of the trade union. One of the production managers says that, there is no trade union. There is a leader of the worker and if any dispute arises it is informed to this leader. This leader shall inform the matter to the employer or other concerned authority and shall settle the dispute according tp the direction of the authority. The employers association BGMEA does not create any pressure to form trade union. If at any time BGMEA creates any pressure to form trade union, the employer of the establishment manages it.

Data of registered trade union on sector basis (from 01/01/2009-16/02/2014) [9]

Sl. no.	Name of the department	No of unions	No of members	comments
01	Main office, Dhaka	279	406479	
02	Divisional labour department, Dhaka	2942	700283	Among 2942 trade unions of Dhaka divisional labour department 210 is from garments sector.
03	Divisional labour department, Chittagong	1252	507568	Among 1252 trade unions of Chittagong divisional labour department 31 is from garments sector.
04	Divisional labour department, Khulna	791	268088	Among 791 trade unions of Khulna divisional labour department 8 is from prawn sector.
05	Divisional labour department, Rajshahi	1682	364437	
06	Sylhet division	119	45201	
07	Barisal division	214	32624	
	Total=	7279	23,24680	In whole Bangladesh there are 241 trade unions at garment sectors.

List of federation of trade union

Type of federation	No of federation	No of unions in the federation	No of members
National federation	32	1352	1076367
Industrial federation (different category)	84	355	2789021
Road transport federation(mechanical)	10	63	56893
Road transport federation(rickshaw)	05	27	52747
Garments federation: Main office-18 Dhaka division-17 Total-35	38	133	65982
Total=	166	1930	4041010

Source: BILS

The role of trade union is should meet the demand of a changing society and labour well-being. Apart from their traditional role of intervention through collective bargaining, the trade unions of Bangladesh are also being organized to introduce social dialogue and framework agreement system; address social issues in the workforce such as gender inequality, HIV/AIDS, child labour and environmental and occupational hazards in the community. [10] In the context of economic globalization, the trade unions should be given greater leverage to ensure well being of workers and to prevent their exploitation. But the real picture in whole Bangladesh in garment sectors is, there are only 241 registered trade unions. And it is a matter of great regret that, the employers do not allow trade union in the establishment. It is the policy of the employer that, if the workers want to form a trade union than the workers shall be terminated from the service. Though there is the rule that in an establishment there shall be not more than 3 trade unions, most of the cases it is to be seen that there is no trade union or sometimes there is more than 3 trade unions in an establishment. Talking with one of the research officer it is to be known that it is the result of politicization in the establishment.

10 PROBLEMS OF TRADE UNION IN BANGLADESHI GARMENT SECTORS

Problems to continue a trade union in Bangladesh garment sectors are given bellow:

a) Politicization of the trade union: Politicization or political affiliation of trade unions prevents them from becoming strong partners in collective bargaining. Politicization of a trade union also causes the loss of its distinct identity; [11]

b) Lack of awareness: most of the workers do not know what are trade union and their right to form trade union. They do not know what collective bargaining agent is and what its function is. Lack of awareness of the worker helps the employer to deprive form their right;

c) Division of trade union: Bangladesh is a country where every organization has more trade unions in name only, [12] which increases conflict between the workers,

d) Lack of solidarity: Lack of solidarity among trade unions, provincialism, patronage of vested interest groups and internal conflict are some of the reasons that have led to the fragmentation of trade unions. The trade unions must be free from influences from political groups, government and owners.

11 ROLE OF EMPLOYERS ASSOCIATION

Bangladesh Employers Federation (BEF) is the main federation of employer's association. The main members of BEF in the garment sectors are:

- Bangladesh Garments Manufacturing and Exporters Association (BGMEA)

- Bangladesh Textile Mills Association (BTMA)

- Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA)

The objectives of the federation are to promote, encourage and protect the interest of the employers in industrial relations, and through such efforts, to establish good relations amongst employers and workers. It also represents them both at national and international levels. Being the apex body of the employers, it has been involved in the task of promoting and protecting the interests of employers.

Although BEF was established to deal with labour relations, its activities have gradually diversified. It now has a stake in socio-economic policies of the government, labour legislation and labour relations with kindred national and international bodies. [13]

12 PROCEDURE OF SETTLEMENT OF INDUSTRIAL DISPUTE

12.1 CONCEPT OF INDUSTRIAL DISPUTE

An industrial dispute may be defined as a conflict or difference of opinion between management and workers on the terms of employment. It is a disagreement between an employer and employees' representative; usually a trade union, over pay and other working conditions and can result in industrial actions. When an industrial dispute occurs, both the parties, that is the management and the workmen, try to pressurize each other. The management may resort to lockouts while the workers may resort to strikes, picketing or gherao.

According to the Section 2(62) of The Bangladesh Labour Code, 2006 - "The **industrial dispute"** means any dispute or difference between employers and employers or between employers and worker or between worker and worker which is connected with the employment or non-employment or the terms of employment or the conditions of work of any person;

12.2 CAUSES OF INDUSTRIAL DISPUTE

The causes of industrial disputes can be broadly classified into two categories: economic and non-economic causes. The economic causes will include issues relating to compensation like wages, bonus, allowances, and conditions for work, working hours, leave and holidays without pay, unjust layoffs and retrenchments. The non economic factors will include victimization of workers, ill treatment by staff members, sympathetic strikes, political factors, indiscipline etc.

An industrial dispute can be raised only by a collective bargaining agent or an employer. Section 209 of The Bangladesh Labour Code, 2006 provides the provisions for raising an industrial dispute which lays down "no industrial dispute shall be deemed to exist unless it has been raised in the prescribed manner by a collective bargaining agent or an employer".

12.3 INDUSTRIAL DISPUTE SETTLEMENT PROCEDURE [14]

Industrial dispute settlement procedure can be divided into three steps: negotiation, conciliation, arbitration.

***Negotiation*:**

If, at any time, an employer or a collective bargaining agent finds that an industrial dispute is likely to arise between the employer and the workers or any of the workers and the employer, the collective bargaining agent shall communicate its view in writing to the other party. The party receiving the communication shall arrange a meeting for collective bargaining agent on the issue raised in the communication with a view to reaching an agreement within fifteen days from the date on which it was received. If the parties reach a settlement, it shall be recorded in writing and signed by both the parties and a copy shall be forwarded by the employer to the government, the director of labour and the conciliator.

Conciliation:

If the party receiving communication fails to arrange a meeting within fifteen days or if the parties fail to do a settlement through negotiation within one month from the date of the first meeting for negotiation, any of the parties can apply to the conciliator within fifteen days from the expiry of the said fifteen days. The conciliator shall proceed to conciliate the dispute within ten days from the receipt of such dispute. The conciliator shall be such a person who is appointed by the Government by notification in the official Gazette for a specific area or any industrial establishment. The conciliator shall call a meeting of the parties to the dispute for the purpose of bringing about a settlement. If the parties reach a settlement, it shall be recorded in writing and signed by both the parties and a copy shall be forwarded by the conciliator to the government. If the conciliator fails to settle the matter within thirty days from the date of receipt of the dispute, it shall be deemed that the conciliation proceeding fails. If the conciliation proceeding fails, the conciliator shall try to persuade the parties to refer the dispute to the arbitrator. If the parties do not agree to refer the dispute to the arbitrator, the conciliator shall issue a certificate to the parties within three days that the proceedings have failed.

Arbitration:

Arbitrator may be a person borne on a panel to be maintained by the government or any other person agreed upon by the parties. If the parties refer the dispute to the arbitrator than the arbitrator shall give Award within a period of thirty days from the date on which it was referred to him. After giving an award, the arbitrator shall forward a copy to the parties and the Government. This award shall be valid for two years and this award of the arbitration shall be final and no appeal shall lie against it.

The difference between conciliation and arbitration proceedings is the conciliator shall not give any decision to the parties to arrive a settlement. The conciliator shall only help the parties to reach in a settlement. The conciliator shall help the parties by making them understand the pros and cons of the settlement. He shall make the parties understand that if the parties reach in a settlement than what will be their gain and if the parties fail to reach in a settlement than what will be their loss. Decision of settlement is depend on the parties and not on the conciliator. But in arbitration proceedings the arbitrator shall give a binding decision to the parties and the parties are bound to obey the decision of the arbitrator.

12.4 RIGHT TO STRIKE AND LOCK-OUT

If the parties don't agree to refer the dispute to the arbitrator, in that case within three days the conciliator shall issue a certificate to the parties that the proceedings have failed. According to section 211 of the labour and industrial laws of Bangladesh, the party which raised the dispute may, within fifteen days of the issue to it a certificate of failure, shall give to the other party a notice to commence strike or lockout not earlier than seven days and not later than fourteen days of the date of such notice or make an application to the labour court for adjudication of the dispute. There is a condition that collective bargaining agent shall not serve any notice of strike, if three-fourths of its members give their consent to it through a secret ballot specially held for this purpose, under the supervision of the conciliator. If a strike or lockout is commenced, either of the parties to the dispute may make an application to the labour court for adjudication of the dispute. A strike or lockout may last for thirty days. After thirty days the government may prohibit the strike or lockout and refer the dispute to the labour court. The labour court, after hearing of both the parties, shall give an award within sixty days from the date on which the dispute was referred to it. This award shall be valid for not more than two years. There is also a provision that, no strike shall be permissible in an establishment for a period of three years from the date of commencement of production, if such establishment is a new one or is owned by foreigners or is established in collaboration with foreigners. This is the legal way to call strike or lockout.

12.5 ILLEGAL STRIKE AND LOCK-OUT

(1) A strike or lock-out shall be illegal,

a) If It is declared, commenced or continued without giving to the other party of the dispute in the prescribed manner a notice of strike or lock-out, before or after the date of strike or lock-out specified in such notice, or

b) According to section 225, when any conciliation proceeding or proceedings is pending before an arbitrator or a labour court or an appeal to the appellate tribunal no party to an industrial dispute shall serve any notice of strike or lock-out. Strike or lock-out commences in contravention of section 225 shall be illegal.

c) If it is declared, commenced or continued in consequence of an industrial dispute raised by anyone other than a collective bargaining agent or an employer.

d) If it is continued in contravention of an order made by the labour court under section 211.

e) According to section 227 when strike or lock-out in pursuance of an industrial dispute has already commenced and is in existence at the time when in respect of such industrial dispute, is pending before the labour court or labour appellate tribunal, the labour court or tribunal may, by an order in writing, prohibit the continuance of the strike or lock-out. If the parties contravene an order made under this section.

f) If it is declared, commenced or continued during the period in which a settlement or award is on operation in respect of the matter covered by a settlement or award.

(2) A lock-out declared in consequence of an illegal strike and a strike declared in consequence of an illegal lock-out shall not be deemed to be illegal.[15]

Penalty for illegal strike and lock-out shall be imprisonment for a term which may extent to one year or with fine which may extent to five thousand taka or with both.

12.6 REASON BEHIND THE ILLEGAL STRIKE IN THE GARMENT SECTOR AND ITS EFFECT:

In the event of an illegal strike by any section or department of any establishment, the employer may close down either wholly or partly such section or department and the workers participated in the illegal strike shall not be paid any wages for such closure. [16] In this case the employer shall notify the fact of such closure and the fact of resumption of work, following such closure on the notice board in the section or department concerned or at a conspicuous place in the establishment.

Most of the cases it is to be observed that employers do not allow the workers to form trade union and where there is trade union in a garment sector, the collective bargaining agent is not strong there. If CBA leaders raise their voice on behalf of the worker, they are threatened by the employer. There is a risk of lost of job; sometimes it is likely to cause death. Aminul Islam, a CBA leader has to leave this earth, only for raising voice on behalf of the workers. So, there is no one, on behalf of the worker to reach their demands to the employers. For this if any dispute arises regarding wages, bonus, allowances, and conditions for work, working hours, leave and holidays without pay, unjust layoffs and retrenchments, they cannot negotiate with the employer or the employer don't want to negotiate with the worker. As a result, the workers become aggrieved and most of the times it causes strike. The workers thinking are that strike is the way to fulfill their demand. This strike is illegal strike. Because to be a legal strike under Section 211 of The Bangladesh Labour Code, 2006 it is to be followed the dispute settlement procedure. In case of illegal strike the employer can close the establishment. They not only fulfill the demand of the striking workers but also close down the establishment. So, the ultimate losers are the workers. On the creation of a movement by the workers of a readymade garment factory named Goldtex in Ashulia for overtime and increasing the allowance for lunch, the authority close down the factory. [17]

To protest the movement of the worker eight readymade garments industry in Gazipur has closed down sine die. [18] So, most of the cases it is to be seen that workers took the way to go on a movement to fulfill their demand, because there is no strong CBA on behalf of the worker and employers always ignore the demands of the worker. As a result illegal strike taka places which are defined in labour law and the employer get the scope lawfully to closure of the establishment.

13 PARTICIPATION COMMITTEE TO REDUCE INDUSTRIAL DISPUTE

There is a special mechanism which is provided in The Bangladesh Labour Code,2006 to reduce industrial dispute at the primary stage. Section 205 of this act suggests the employers to form participation committee, where there are fifty or more workers in an establishment. There shall be equal number of representative of the employer and the worker. The

representatives of the workers in the committee shall be appointed on basis of the nomination made by the trade unions of the establishment. Where there is no trade union, representatives of the workers shall be nominated in the manner prescribed by rules from amongst the workers engaged in the establishment. According to section 206 the functions of the participation committee shall be to inculcate and develop a sense of belonging and workers' commitment and, in particular—

a) To endeavor to promote mutual trust, understanding and cooperation between the employer and the workers;

b) To ensure application of labour laws;

c) To foster a sense of discipline and to improve and maintain safety, occupational, health and working condition;

d) To encourage vocational training, workers' education and family welfare training;

e) To adopt measures for improvement of welfare services for the workers and their families;

f) To fulfill production target, reduce production cost and wastes and raise quality of products.[19]

According to section 208(1) of Bangladesh labour Code- 2006 the employer and the trade union of the establishment shall take necessary measures to implement the specific recommendations made by the Participation Committee within the time prescribed by it. Section 208(2) provides that if by any reason the employer or trade union faces any problem in implementing the recommendations of the committee within prescribed time, the Participation Committee shall be informed of it and all possible endeavors shall have to be taken to implement the recommendations.

But reality is that there is hardly any participation committee in RMG sectors. There are some industries, where the participation committee has been formed without maintaining the laws relating to the formation the committee and somewhere they do not observe the functions of the committee.

According to one author:

"It is true that the formulation of the law in respect of Participation Committee is far from effective. It is difficult to carry the commitment of the workers to fulfill production target when they are not discussed when the target is fixed. It is also too much to expect that the workers' representatives will sit in the meeting of the committee every two months only to discuss, exchange views and recommend measures on paramount issues of their interest which the employer may just ignore and reject without, even mentioning any reason."[20]

14 MEASURES FOR IMPROVING INDUSTRIAL RELATIONS IN THE GARMENT SECTORS [21]

The following measures should be taken to achieve good industrial relations:

14.1 STRONG AND STABLE UNION

A strong and stable union in each industrial enterprise is essential for good industrial relations. The employers can easily ignore a weak union on the plea that it hardly represents the workers. The agreement with such a union will hardly be honored by a large section of workforce. Therefore, there must be strong and stable unions in every enterprise to represent the majority of workers and negotiate with the management about the terms and conditions of service.

14.2 MUTUAL TRUST

Both management and labor should help in the development of an atmosphere of mutual cooperation, confidence and respect. Management should adopt a progressive outlook and should recognize the rights of workers. Similarly, labor unions should persuade their members to work for the common objectives of the organization. Both the management and the unions should have faith in collective bargaining and other peaceful methods of settling disputes.

14.3 WORKERS' PARTICIPATION IN MANAGEMENT

The participation of workers in the management of the industrial unit should be encouraged by making effective use of works committees, joint consultation and other methods. This will improve communication between managers and workers, increase productivity and lead to greater effectiveness.

14.4 MUTUAL ACCOMMODATION

The employers must recognize the right of collective bargaining of the trade unions. In any organization, there must be a great emphasis on mutual accommodation rather than conflict or uncompromising attitude. One must clearly understand that conflicting attitude does not lead to amicable labor relations; it may foster union militancy as the union reacts by engaging in pressure tactics. The approach must be of mutual "give and take rather than "take or leave." The management should be willing to co-operate rather than blackmail the workers.

14.5 SINCERE IMPLEMENTATION OF AGREEMENTS

The management should sincerely implement the settlements reached with the trade unions. The agreements between the management and the unions should be enforced both in letter and spirit. If the agreements are not implemented then both the union and management stop trusting each other. An environment of uncertainty is created. To avoid this, efforts should be made at both ends to ensure the follow up of the agreements.

14.6 SOUND PERSONNEL POLICIES

The following points should be noted regarding the personnel policies. The policies should be:

a) Formulated in consultation with the workers and their representatives if they are to be implemented effectively.

b) Clearly stated so that there is no confusion in the mind of anybody.

c) Implementation of the policies should be uniform throughout the organization to ensure fair treatment to each worker.

14.7 GOVERNMENT'S ROLE

The Government should play an active role for promoting industrial peace. It should make law for the compulsory recognition of a representative union in each industrial unit. It should intervene to settle disputes if the management and the workers are unable to settle their disputes. This will restore industrial harmony.

14.8 PROGRESSIVE OUTLOOK

There should be progressive outlook of the management of each industrial enterprise. It should be conscious of its obligations and responsibilities to the owners of the business, the employees, the consumers and the nation. The management must recognize the rights of workers to organize unions to protect their economic and social interests.

15 CONCLUSION

RMG industry of Bangladesh now accounts for over 76% of the country's total export earning which is 13% of the total GDP. the RMG industry started developing in Bangladesh primarily as an export-oriented industry although; the domestic market for RMG has been increasing fast due to increase in personal disposable income, increase in per capital income and change in life style. The sector rapidly attained high importance in terms of employment, foreign exchange earnings and its contribution to Real GDP. After above discussion of the laws relating to the industrial relation and industrial dispute settlement procedure, it is seen that there is a chain of procedure to mitigate the industrial dispute, which should be followed by the employers. Employers should come out from their own interest. They should give their attention to the worker's interest, because industrial reputation mostly depends upon the workers and keeping a large number of workers in dissatisfaction industrial development is not possible.

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What can nonlinear Taylor rule say about the Egyptian monetary policy conduct?

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ABSTRACT: Using monthly data of Egypt over the period from 2008:M6 to 2013:M1, we extend the linear Taylor rule to a regime-switching framework, where the transition from one regime to another occurs in a smooth way, using a logistic smooth transition regression (LSTR) approach. We find that the nonlinear Taylor rule improves its performance with the advent of special events, such as the global financial crisis in 2008 and the general political instability defined by outbreaks of revolution.

In particular, our results show that the adoption of a nonlinear specification instead of a linear one leads to a reduction in errors of 90 basis points in 2008 and 20 basis points in 2012.

KEYWORDS: Policy rule, Central bank, Taylor rule, Nonlinearity.

1 INTRODUCTION

The traditional approach to analyzing optimal monetary policy is derived from the minimization of a symmetric quadratic central bank's loss function and assuming that the aggregate supply function is linear.

Under these assumptions, the optimal policy is certainty equivalent. This policy can be characterized by a linear time-invariant response to each shock. In such context and under fairly normal circumstances, optimal monetary policy does not focus on risk management.

Recently, a growing number of studies have questioned the two assumptions underpinning linearity. For example, Schaling (1998) and Dolado, Maria-Dolores and Noveria (2005) show that the Phillips curve may reflect more complex price-setting mechanisms than those subsumed in a linear specification and it is also possible that the preference of the policymaker might not be quadratic (Nobay and Peel, 2003; Surico, 2007).

Given the intrinsic complexity of economic relations. i.e; the interconnection among the relevant variables, the structural institution changes, financial disruptions and the interpretation of different phenomena by the economic agents, forces monetary policy to be developed in a highly uncertain world, adopting a more flexible framework for analyzing the behaviour of a central bank is crucial in formulating the appropriate response of monetary policy. This paper designing a set out a comprehensive methodology for optimal monetary policy rules under uncertainty where certainty equivalence does not hold, motivated by the regime switching models where the strength of the response of monetary policy to macroeconomic conditions depends on the level of risk facing the economy.

Recent empirical evidence points to important that nonlinearities in interest rate setting are neglected in the standard specification of estimated Taylor rule. Then, a nonlinear framework seems to be more adequate to explain the behaviour of monetary policy.

Almost all of recent studies focused on nonlinear Taylor rule are limited to industrialized countries, especially US (Lee and Son, 2013; Olsen and al, 2012, Conrad and Eife, 2012), UK (Bruggemann and Riedel, 2010), ECB (Castro, 2008), Japan (Kempa and Wilde, 2011) and Canada (Kolmam, 2013) to name a few.

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Thus, the purpose of this paper is to evaluate the behaviour of monetary authorities in MENA countries and in particular Egypt in response to changes in macroeconomic variables over time using the LSTR model in order to investigate a possible deviation from the simple instrument rules and identify the specific rules that characterize the special regime.

The reminder of the paper is organised as follows: section 2 presents reasons justifying Nonlinear Taylor rule. Section 3 describes the methodology applied. The data and preliminary analysis are presented in section 4. We then report the estimations results where the strength of the response of monetary policy to macroeconomic conditions depends on the transition variable. Section 5 concludes.

2 REASONS JUSTIFYING NONLINEAR TAYLOR RULE

While linear models dominate empirical econometric research, there are a number of reasons for expecting changes in the parameters of the models estimated on temporal data.

Recently, there has been a great deal of research activity on monetary policy with time-varying parameter (TVP) because of an ever-growing body of evidence that the usual regression assumption of stable parameters often appears invalid.

There are a host of reasons for expecting changes in the parameters of the models estimated on temporal data.

First, monetary policy reaction functions reflect the importance attached to conflicting objectives and the policy maker's view on the structure of the economy. As such, they may display instability and parameter variation.

Second, central banks utilize broader range of information set while building policy decisions. Thus, for example, if the policy rule is a Taylor type interest rate rules. Then the same levels of output gap and inflation may not produce the same level of interest rate in different periods since the information set used by central banks will be different in those periods.

Besides, unstable nature of the coefficients of a policy rule can be explained by the change in the transmission mechanism of monetary policy.

Moreover, traditional constant parameter reaction functions are likely to blur the impact of institutional reforms. Like the adoption of the inflation targets or the move to a different monetary policy framework, like a fixed exchange rate or managed float regime.

Due to shift in the coefficient of policy rules, interest rate rule should considered as dynamic rule and not statistic because models for policy analysis that do not allow for shift in behavioural relationships may be misleading or inefficient in formulating policy advices.

3 EMPIRICAL METHODOLOGY

3.1 AUGMENTED LINEAR TAYLOR RULE

Our starting point is the estimation of linear Taylor rule. The original Taylor rule has been modified in various ways because central banks seem to look on the broader set of factors.

In order to improve the performance of the rule it became almost standard to add lagged values of interest rate because central banks dislike jumps and tends to take into account the inertia of monetary policy that reflects the smoothness of the typical adjustment pattern.

We also augment the conventional Taylor rule by the REER. Indeed, the work of Svensson (2003) proposes an extension of the Taylor rule by incorporating the exchange rate in a rule designed for small open economies. His conclusion is in line with that of Batini et al (2001) which showed that the descriptive power of the Taylor rule augmented by the exchange rate variable is higher than the standard Taylor rule for small open economies (i.e: UK).

There are several reasons to include the REER in Egyptian reaction function. The constant real effective exchange rate rule provides a buffer against shocks and helps to reduce volatility in interest rate. This policy is partly out of concerns for the international competitiveness of Egypt's manufacturing exports and in particularly aims to prevent excessive appreciation of the real exchange rate when the nominal exchange rate was tending to appreciate.

When dealing with capital flows the authorities confront a trade-off between currency appreciation and depreciation. The former has a negative impact of the competitiveness of exports while the Egyptian pound depreciation induces loses to Egyptian Central Bank by increasing the country massive debt burden.

Thus, the concept of REER goes beyond the weighted average of currencies to greater significance to Egyptian policy makers where sectors are expected to contribute more to the growth of the economy.

Given the importance of exchange rate especially in the context of an open economy, it is widely agreed to introduce it as an explanatory variable in the Taylor rule. To sum up, the inclusion of the REER is consistent with the objectives of the Egyptian Central Bank in terms of maintaining price stability.

The model thus becomes:

$$i_t = \alpha + \rho\, i_{t-1} + b_\pi \pi_t + b_y y_t + b_q q_t + u_{1.t} \qquad (1)$$

Where,

$\alpha = r - \phi\pi^*$ and $b_\pi = 1 + \phi$

i_t : stands for the nominal short term interest rate, r for equilibrium real interest rate. π_t : is the inflation rate at time t, calculated from the consumer price index (CPI), reflecting cost of acquiring a fixed basket of goods and services by an average consumer. y_t : refers to the output gap, defined as the difference between actual output and potential output, which is measured using the Hodrick-Prescott filter (1997). q_t : refers to the REER.

ϕ : indicates the sensitivity of interest rate policy to deviations of inflation from its target. b_y : represents the coefficient of the reaction of the central bank in response to the output gap. b_q : is the coefficient of the reaction of the Central Bank in response to a change in REER. ρ : measures the degree of interest rate smoothing.

3.2 NONLINEAR TAYLOR RULE

As noted in the introduction, the linear Taylor rule even augmented used by many authors are based on two keys namely a linear aggregate supply function and a quadratic loss function for the preferences of the Central Bank.

A number of theoretical and empirical studies in the very recent literature have questioned the two assumptions underpinning linearity.

Thus, the purpose of this paper is to employ an extension of the linear Taylor rule to a regime-switching framework where the transition from one regime to the other occurs in a smooth way.

This class is particularly attractive here since it allows monetary policy to evolve over time. Following the work of Teräsvirta (1998), the standard two-regime STR for a nonlinear Taylor rule could be derived as follows:

$$i_t = \varphi Z_t + \theta Z_t G(\gamma, c, S_t) + u_{2t} \qquad t=1,\ldots, T. \qquad (2)$$

Where $G(\gamma, c, S_t) = (1 + \exp\left\{-\frac{\gamma}{\sigma_{S_t}^k}\prod_{k=1}^{k}(S_t - c)\right\})^{-1}$; $\gamma > 0$.

$Z_t = (w_t^{'}, x_t^{'})$ is a vector of regressors including the exogenous variables, $x_t(1, x_{1t}, \ldots, x_{kt})$ and lagged dependent variable, $w_t(y_{t-1}, \ldots, y_{t-p})$.

The vectors $\varphi = (\varphi_0, \varphi_1, \ldots, \varphi_n)$, $\theta = (\theta_0, \theta_1, \ldots, \theta_m)$ represent $((n+1)*1)$ and $((m+1)*1)$ parameter vectors in the linear and nonlinear parts of the model, respectively.

The disturbance term is iid with zero mean and constant variables, $u_{2t} \approx iid(\theta, \sigma^2)$.

$G(\gamma, c, S_t)$ is the transition function bounded by 0 and 1, and depends upon the transition variable S_t, the slope parameters γ and the location parameter c.

In terms of above equation, the transition variable increases in tandem with the logistic function. Van Dijk D., Teräsvirta T. and Franses P.H. (2002) demonstrate that as $S_t \to zero\ or \infty$, the transition function becomes abrupt, such the model becomes indistinguishable from the linear (AR) model.

Teräsvirta (1994) proposes procedures in building an STR model; these include linearity test, estimation and evaluation of the model. A linearity test is performed for the purpose of choosing the appropriate S_t and the most suitable form of the transition function among LSTR1 (with a single transition variable) and LSTR2 (with two transition variables).

The LSTR model has several advantages over other nonlinear models. First, the LSTR model is theoretically more interesting than the threshold model, which requires an abrupt change in the coefficients. Instantaneous changes in regimes are possible if all agents act simultaneously and in the same direction. However, in reality, the market is composed of many traders acting at slightly different times, making the smooth transition regression model the best structural framework. Second, the LSTR model allows the modeling of different types of nonlinear dynamics and asymmetries based on a transition function (Teräsvirta and Anderson, 1992).

Third, the Markov-switching model assumes that regime changes are driven by exogenous and unobservable processes and therefore does not support economic intuition. However, the LSTR model allows the choice of both the appropriate transition variable and the type of transition function and allows the regression coefficients to change smoothly from one regime to another, unlike the regime changes in other models.

4 DATA

We use monthly data over the period from 2008:M6 to 2013:M1. The data series, which includes the interest rate, inflation rate, outputgap and REER, is collected from the International Financial Statistics (IFS) and Bloomberg databases.

Fig. 1 shows that the time paths of all variables introduced in our model for Egypt.

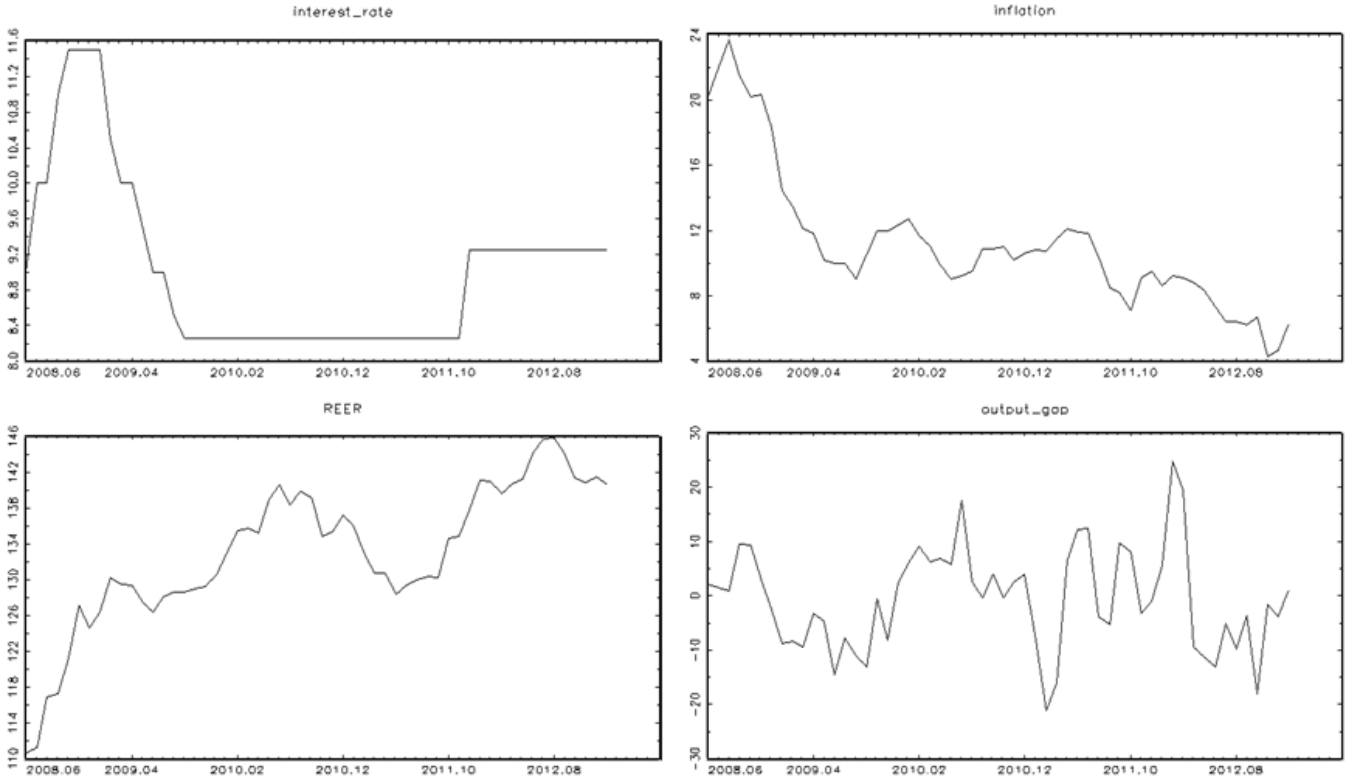


Fig. 1. Time series dynamics

Historically, domestic inflation varied over time with international shocks and domestic pressures.

In 2008, the Egyptian economy suffered from the repercussions of the crisis that exerted significant pressure on the inflation rate, which reached a peak of 23.7% in August 2008.

With the onset of the revolution, inflation displayed a volatile trend, reflecting the conflicting factors affecting inflation.

On one side, depreciation of the domestic currency, the temporary supply shortages that followed the upheaval, coupled with rising global food and oil prices resulted into heightened inflationary pressures during the first half of 2011.

After reaching its peak during the year 2011 in May and June respectively recording the same (11.8%). The inflation started easing as it recorded 7.1% in October: it might be partially due to the slowing growth of the economy and the tightening of monetary policy by the monetary authorities.

The year 2012 witnessed remarkable improvements on the political arena due to the shaping of successful completion of elections of the first president after revolution; Mohamed Morsi and the end of the transitional period.

These improvements cast it shadow over inflation that recorded 4.6% in December 2012.

Moreover, the central bank of Egypt maintained its interest rate unchanged reflecting a neutral monetary stance. However, the CBE decided to tighten monetary policy in November 2011 for the first time since 2008 by almost 0.75 percent.

The CBE attributed such move to tackle rising inflation pressure but also in a bid to prop up the country's swindling reserve and then fight the dollarization process that was triggered since February and March of the year.

Before estimating Eq. (1), it is essential to check for the stationarity of the considered time series. The results of the ADF and KPSS tests are presented in Table 1.

Table 1: Stationarity results

	i_t	π_t	y_t	q_t
ADF	-1.1408	-0.811	-3.7856**	1.764*
KPSS	0.781	1.224	0.0856***	0.608*

Note: This table reports the results of ADF and KPSS stationarity tests. it, πt, yt and qt stand for interest rate, inflation rate, output gap and exchange rate, respectively. 1%, 5% and 10% critical values for the ADF test are -2.56, -1.94 and -1.62 whereas those of the KPSS test are 0.347, 0.463 and 0.739. Respectively ***, ** and * indicate significance at the 1%, 5% and 10% significance levels respectively.

The ADF test results show that output gap and the REER is stationary at the 1% significance level, whereas the interest rate and inflation are not stationary.

Likewise, the KPSS test fails to reject the null hypothesis of stationarity for the output gap and REER. Moreover, according to the same test, the interest rate and the inflation are not stationary.

To remedy this problem, first differencing must be used to make these series stationarity. Consequently, inflation and interest rate are integrated of order one. Yet, output gap and REER are I (0).

5 RESULTS AND DISCUSSION

5.1 LINEAR SPECIFICATION RESULTS

The estimation results of the linear Taylor rule augmented simultaneously by the lagged monetary policy and REER are presented in table 2.

Table 2: Estimation results of linear augmented Taylor rule.

	Estimate	St. error
α	1.056***	0.73
b_π	0.031**	0.034
b_y	0.08***	0.004
ρ	0.173***	0.134
b_q	-0.08***	0.005
AIC	-2.354	
R^2	0.1654	
ARCH(8)	1.3038 [0.9955]	

Note: *This table reports the estimates of the linear Taylor rule augmented jointly by the lagged policy rate and the exchange rate considered in this paper. P-values are between [ ]. ***, ** and * indicate significance at the respective significance levels 1%, 5% and 10%.*

Results shows that all estimates have the expected signs and are significant. However, these coefficients are less than one, which violates the stability condition for the Taylor rule. Additionally, according to the AIC and R2 criteria, we notice a bad overall fit of the model.

The residuals of the estimated linear Taylor rule are Gaussian and not heteroscedastic, which indicates the absence of an ARCH effect in the residuals.

Moving to the graphical analysis, we plot the residuals series form of the regression of equation 1.

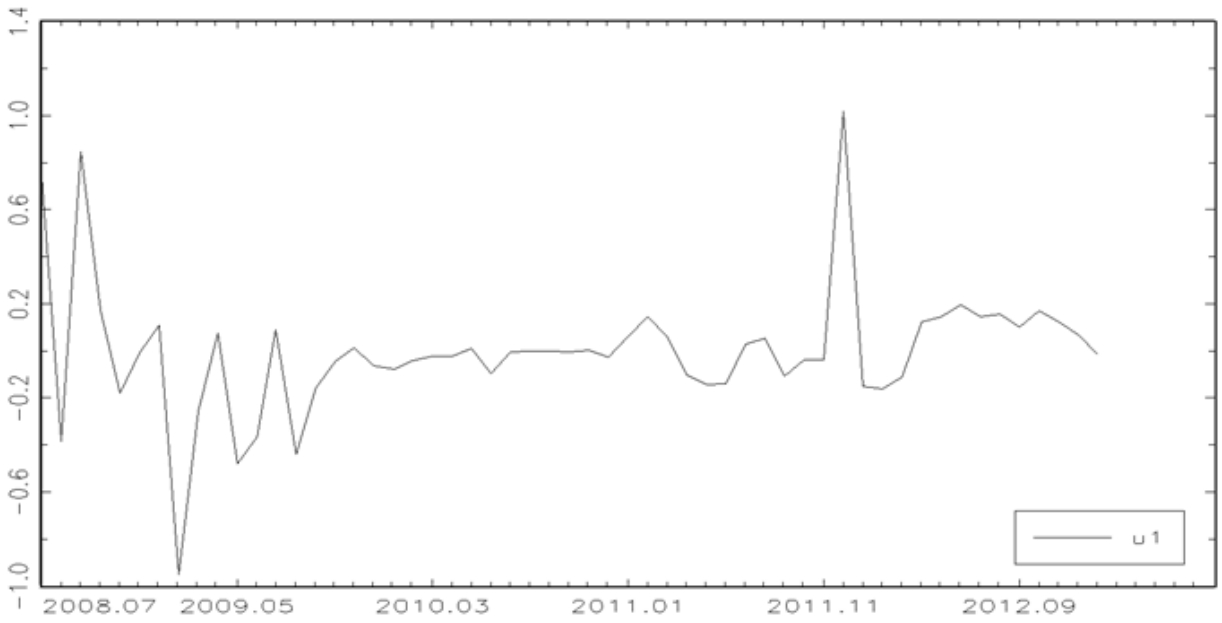


Fig.2. Residual plot from Eq. (1).

At first sight, the rule seems to capture well the behavior of the Egyptian decision makers. However, it is noteworthy those consecutively large residual volatilities for more than one period, notably in the 2008-2009 and 2011:M12. The fitted interest rate is, over these time intervals correlated and remarkably different from the actual value.

Negative (positive) residuals correspond to periods in which the estimated rule leads to a higher (lower) interest rate (repo rate) than the actual rule. In such periods, monetary policy appears to have been tightened (relaxed) beyond that suggested by the inflation, output gap, lagged interest rate and the REER deviations. This phenomenon may be observed

because a simple Taylor rule is not able to perfectly describe the conduct of economic policy in the presence of unusual contingencies (Alcidi et al., 2011).

In summary, we can deduce that although the linear Taylor rule describes well the board contours of Egypt's behavior, it fails to detect significant changes in policy direction in response to the unusual contingencies which affected the Egyptian economy. Thus, the actual presence of finer monetary regimes corrupts the descriptive power of linear rules even augmented by the lagged policy rate and REER.

The theoretical basis of the linear rule comes from the assumption that policymakers have a quadratic and symmetric loss function and that the aggregate supply or Phillips curve is linear. However, in reality, this assumption is unrealistic; monetary authorities may have asymmetric preferences [Surico, 2007] and the underlying aggregate supply schedule might be nonlinear leading to a nonlinear adjustment of the policy rate [Dolado et al, 2005].

Therefore, a nonlinear Taylor rule may be the most appropriate rule to explain the behavior of monetary policy, and therefore the adoption of nonlinear specification instead of the linear one leads to fewer errors.

To get a deeper understanding of this phenomenon and to investigate to what extent concerns of monetary policy makers are related to unexpected events, we adopt the LSTR model to test the hypothesis that the strength of the response of monetary policy to macroeconomic conditions depends on the level of risk facing the economy.

5.2 NONLINEAR SPECIFICATION RESULTS

The results of the tests for the selection of transition variables candidates are reported in table 3

Table 3: Testing Linearity against STR results

	F	F2	F3	F4	Selected Model
i_t	Nan	$1.161*10^{-1}$	7.096^{-1}	Nan	***Linear***
y_t	$7.1008*10^{-2}$	$2.038*10^{-2}$	$8.119*10^{-1}$	$2.082*10^{-1}$	***Linear***
π_t	$2.009*10^{-3}$	$2.36*10^{-1}$	$1.275*10^{-4}$	$6.436*10^{-1}$	***LSTR 2***
q_t	$8.858*10^{-4}$	$2.36*10^{-4}$	$1.905*10^{-2}$	$7.943*10^{-1}$	***LSTR 1***

Note: *This table reports the results of the test of linearity against the STR nonlinearity. All numbers in this table are p-values associated with the test. F refers to the test of linearity against LSTR while, F2, F3 and F4 allow to select the adequate LSTR model among LSTR with one threshold (LSTR1) and LSTR with two variables (LSTR2). i, y, π and q refer to the interest rate, output gap, inflation and the REER, respectively.*

Considering that the p-values reported in column 3 and4 of Table 3 are small (<0.001), we conclude that there is strong evidence against the linear specification of the Taylor rule and that the behavior of the inflation and the REER are likely to be responsive for nonlinear behavior of ECB. Thus, the nonlinear specification can be defined using these variables as possible transition variables in the reaction function, implying that the response of interest rates to inflation, the output gap, the lagged interest rate and REER depends on the regime of inflation and the REER regime.

With regard to the choice of the adequate transition variable, the selected variable is the REER because it provides the lowest p-value of the computed F-statistics for the rejection of the null hypothesis of linearity. Therefore, switching between regimes is controlled by REER.

We attribute this finding to the sequence of adverse, supply shocks that hit the Egyptian economy. During, the time spam that we consider in this paper, Egypt underwent several shocks: the global financial crisis in 2008 and the effect of political instability with the onset of the revolution.

When the world financial crisis began, central bankers had expectations regarding its extent. Unfortunately, a series of consequential shocks to the world economy, such as the Lehman Brothers bankruptcy, the AIG flop and the crush of the Reserve Primary Fund (a large money market mutual fund in the US), spoiled these expectations, leading to the demolition of the financial system and the economy (Mishkin, 2011).

Indeed, after the revolution the political instability in the country had increased uncertainty and led to a systematic capital outflow the tourism sector, which prior the revolution had represented 11% of the country's GDP has been severely

affected as tourism income plunged by 9 percent after January, 25 revolution which took their toll on the Egyptian foreign exchange reserve.

Our results are consistent with those of Mora and Carvalho (2010), whose findings support evidence of nonlinear Taylor rule for Mexico.

The authors consider several specifications of the Taylor rule to examine how monetary policy is conducted in the seven largest economies in Latin America. They show that the exchange rate is relevant variable for the interest rate in Mexico, establishing the monetary policy rate in Chile, Columbia and Venezuela.

Furthermore, the results relative to the output gap as a transition variable in table 3 show that the F2 statistic has the lowest p-value compared with F3 and F4, suggesting that the LSTR model with one threshold is preferred to the LSTR model with two thresholds.

According to the results in Table 3, the resulting nonlinear LSTR model to be estimated is reported in Eq. (3) below:

$$i_t = \alpha_1 + \rho_1 i_{t-1} + b_{\pi.1}\pi_t + b_{y.1}y_t + b_{q.1}q_t + (\alpha_2 + \rho_2 i_{t-1} + b_{\pi.2}\pi_t + b_{y.2}y_t + b_{q.2}q_t)G(\gamma, c, q_t) \quad (3)$$

LSTR model estimates are reported in table 4.

Table 4: Estimation results of LSTR model

	Linear Part	Nonlinear Part
Intercept	10.918***	-9.818***
i_{t-1}	-0.262**	0.374**
y_t	0.0429***	-0.04459***
π_t	0.0975**	0.1572***
q_t	-0.0889***	0.08143***
γ	3.21**	
c	127.937***	
AIC	-2.776	
R^2	0.583	
Jarque-Bera	280.135	[0.000]
ARCH(8)	0.4087	[0.999]

Note: *This table reports the estimates of the nonlinear Taylor rule. Standard errors are between ( ) and p-values are between [ ]. ***, ** and * indicate significance at the respective significance levels 1%, 5% and 10%.*

Table 4 confirms our conjectures; the estimates clearly reveal the existence of two regimes. One regime is very close to the linear augmented rule reported in table 2 while the other (that we call a finer regime) is at odds with the classical Taylor rule.

The REER is chosen to be the threshold variable because of the important weight that the central bank places on this variable and because this variable provides the lowest p-value for the rejection of the linear model.

This means that the reaction of ECB to shocks depending on whether the level of REER is above or below the threshold value of 127.937.

The transition speed parameter is statistically significant and has an estimated value equal to 3.21, indicating an abrupt change from one regime to another. Indeed, from the estimated STR model, report that $b_{\pi.2} < b_{\pi.1}$. The result indicates a strong reaction of ECB to inflation when the REER is above 127.937 and we also notice that the Taylor principle is not satisfied in both regimes, the estimated coefficient on inflation is always lower than one, which indicates an accommodative behavior of interest rate to inflation.

We also note $b_{y.2} < b_{y.1}$, indicating an asymmetric response from the ECB to the output gap. The result also reveals that $\rho_2 > \rho_1$, that is, there is a stronger response to the inertia of monetary policy during the depreciation regime than during the appreciation regime.

Additionally, $b_{q.2} > b_{q.1}$, suggesting that the ECB pays close attention to the REER when setting interest rate. The response to this variable depends on whether the level of the REER is above or below the threshold value of 127.937.

To consider the graphical analysis and to better appreciate the gain in terms of the fit obtained by leaving the linear rule for the nonlinear specification, in Fig. 3, we plot both the residuals from the augmented linear Taylor rule and the nonlinear specification. We note that the nonlinear estimation works better in periods of structural breaks and reveals less autocorrelation of the residuals compared with the linear Taylor rule.

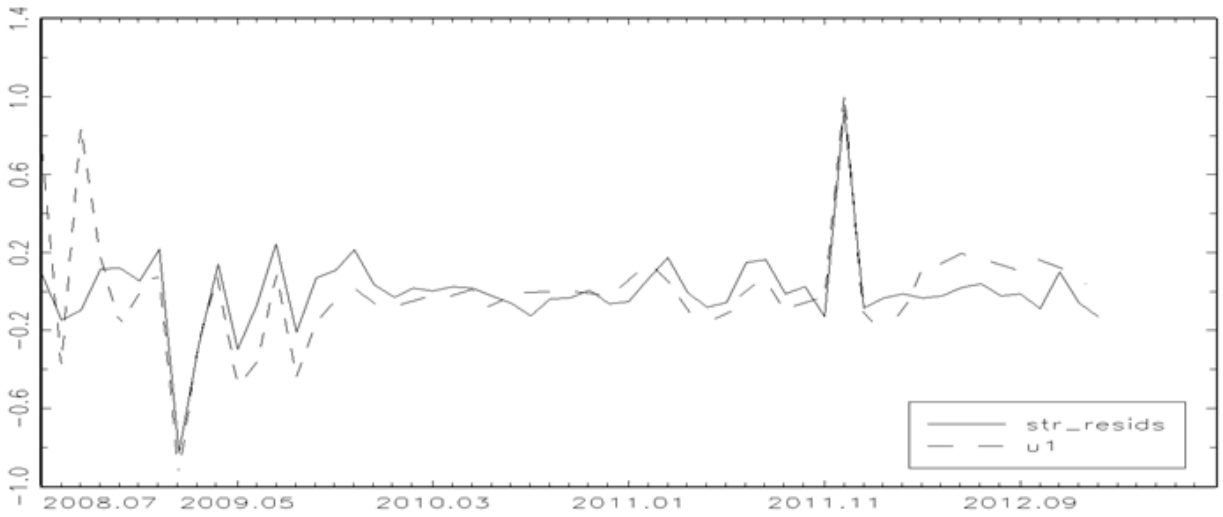


Fig.3. Residual plot from the linear and STR models.

These results indicate that even if a linear Taylor rule describes the broad contours of monetary policy conduct of ECB, the rule fails to detect significant changes in policy direction following the effects of global financial crisis and the general political instability defined by outbreaks of revolution.

These findings suggest that adopting a nonlinear specification instead of a linear one leads to a reduction in errors of 90 basis points in 2008 and 20 basis points in 2012.

Finally, this paper contributes to the recent literature on MENA country, particularly in Egypt, by supporting (i) the idea that the monetary policy followed by the ECB exhibits some nonlinearity and (ii) the existence of changes in the conduct of monetary policy that are determined by special regimes, which may contain relevant information and apply only to unusual economic conditions (appreciation regime).

Indeed, such special regimes refer to some special circumstances in which policy makers extensively use their judgment to make decision.

We perform misspecification tests to check for the robustness of our results and to determine whether there is evidence of parameter instability, non-normality or any remaining nonlinearity. The tests have been proposed by Eitrhem and Teräsvirta (1996). The results of these tests presented in table 5.

Table 5: Diagnostic Tests

Parameter Constancy Test:				
Transition Variable	F-statistic		p-value	
H1	1.4458		0.2149	
H2	1.6721		0.121	
H3	1.7069		0.1295	
No Remaining Linearity				
Transition Variable	F	F2	F3	F4
$TAO(t-1)$	$9.54*10^{-1}$	$9.31*10^{-1}$	$8.929*10^{-1}$	$9.31*10^{-1}$

Note: *This table reports the diagnostic tests of parameter constancy and no remaining linearity. ***, ** and * indicate significance at the respective significance levels 1%, 5% and 10%.*

Moreover, the remaining nonlinearity test shows that the nonlinearity was completely absorbed by a LSTR model with two regimes. Therefore, we find solid evidence of the validity of our empirical nonlinear model. In addition, the parameter constancy test shows that the parameters do not vary over time. Therefore, the results confirm the occurrence of nonlinearity in the Taylor rule.

6 CONCLUDING REMARKS

The purpose of this study is to investigate how the Egyptian Central Bank sets interest rates in the context of both linear and nonlinear policy reaction functions.

Using monthly data from 2008 to 2013 to analyze the movement of the nominal short term interest rate for Egyptian Central Bank, we confirm the occurrence of nonlinearity in the Taylor rule. The contribution of this paper is twofold. First, it support the idea that the nonlinear Taylor rule improves its performance with the advent of global financial crisis in 2008 and the political events that unfolded in Egypt since the 25th January revolution, providing the best description of ECB's interest rate setting behavior.

Second, it provides evidence that the Egyptian policy-makers pay close attention to the REER when establishing interest rate.

We conclude that for the analysis of historical monetary policy, the LSTR approach is a viable alternative to track actual interest rate movements to linear reaction function.

Overall, the evolution of coefficients portraits a richer picture of Central Bank's conduct and it is consistent with historical macroeconomic events, which requires disconnection from the automatic pilot rule of the Central Bank and involving a range of judgmental factors that cannot be condensed into a parametric approach when setting monetary policy decision.

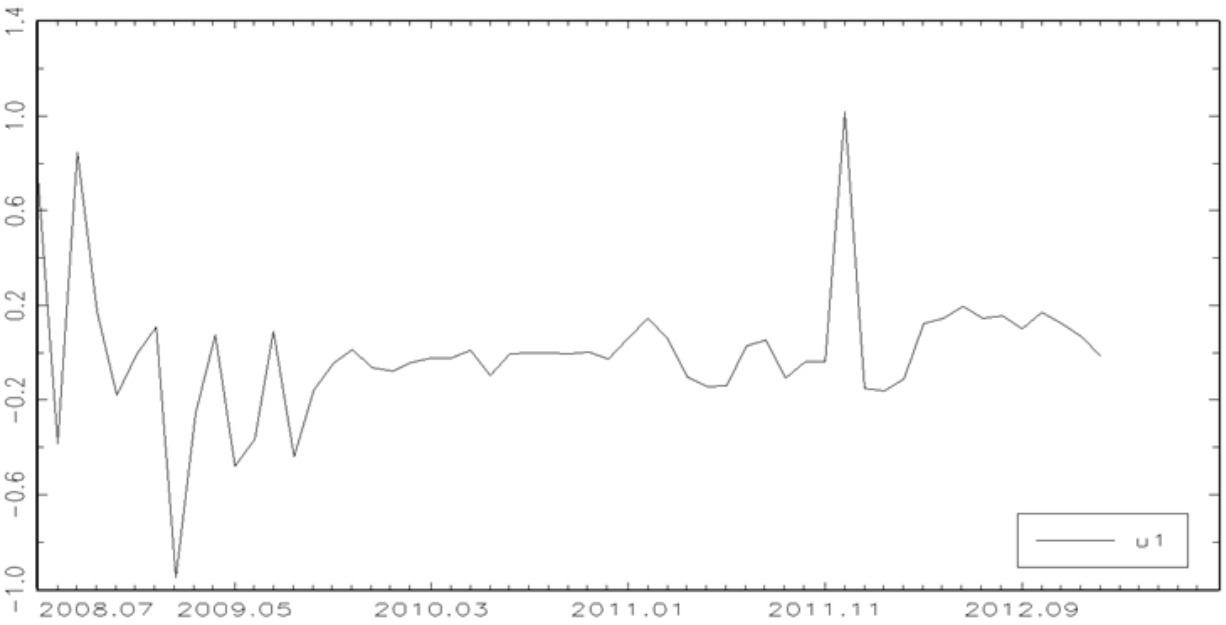
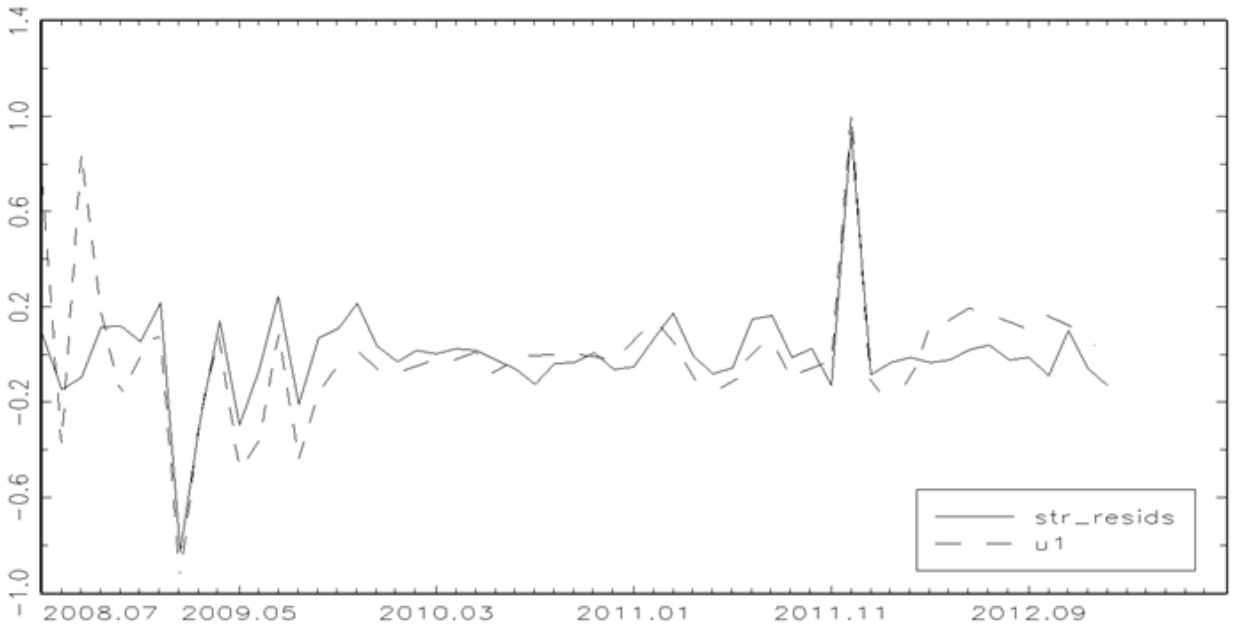


Fig.2. Residual plot from Eq. (1).



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GRAPH MEASUREMENT OF ROAD NETWORK CONNECTIVITY & ACCESSIBILITY ON FARMING ACTIVITIES IN AKOKO SOUTH-WEST LOCAL GOVERNMENT AREA OF ONDO- STATE, NIGERIA

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ABSTRACT: This paper examined the impact of rural road connectivity and accessibility on farming activities in Akoko South-West Local Government Area of Ondo State. Using graph measurement analysis to determine the relationship between structure of transport network, flow of traffic to and from the hinterlands as well as to measure the accessibility of the routes within the study area. A grids of 20km by 20km were first superimposed on a larger-scale route map of the study area of scale 1cm to represent 20km.Thereafter, the length of the routes in each grid was measured and summed up and the answer was placed in the centre of each grid as the accessibility index for the concerned grids which was later subjected to the Beta index network analysis of Kansky (1964). The result obtained was B = 0.98, this shows that road network is not well connected to support highly integrated farming activities in the study area. This does not only, has negative impact on food crop production but has seriously reduced the economic status of 'the rural farmers. The paper recommends that both state and local governments should attach much importance to the improvement of rural road network accessibility such that farm sites in different locations can be well connected for easy means of food passage and raw materials to the people and industries in urban centres as well as its overall positive effect on the rural famers in the study area.

KEYWORDS: Graph-measurement, Road Network, Connectivity, accessibility and Farming Activities.

1 INTRODUCTION

Rural transportation network in most developing countries are still in poor state and under developed. It is noted that rural area households' farmers and their women spend much time and efforts on transport activities to fulfill their basic needs, for example, rural communities in Nigeria still do not have reliable access to main road networks and or easily connected to motorized routes within their locality. The rural transport network system is, therefore, an essential requirement for rural development: although, it is by itself not sufficient to guarantee form of success in farming activity in the rural environment.

However, improvement on the access and well connected routes from farms-to-farms, farmstead to villages as well as access to the local markets and the provision of all season basic motorized access, if affordable and appropriate, are essential conditions for rural development [1 and 2] . Scholars from their various studies sees rural road accessibility and connectivity as a set of policies which seeks to promote the well being of the rural and non-rural inhabitants by the means of supplying agricultural products both to the local markets as well as secondary industries in the sub-urban and in the urban centers. They also pointed out that, improved accessibility as well as highly connected road will create market for agricultural produce, opens up new land for economic opportunities and at the same time encourages farmers to improved on their various farming in other to increase agricultural productivity and as well reduces spoilage and wastage of agricultural produce at various collection centers in the study area [2and 3].

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However, an efficient, accessible and well connected transportation system is a tool for high productivity, improvement in the income of the local farmers, employment generation and reduction in poverty level of the rural dwellers; since it will be easier to move both farm inputs, farm workers and farm outputs among others to the market and agro-allied industries [4 and 2].

Rural transport contributes to improving rural well-being and increase rural businesses as well as farming activities, which have overriding objectives of poverty reduction and in improving economic growth. Several authors have attempted to relate transport provision to the well-being of the people in various settlements [5 and 6]. These studies only addressed the issue of rural road development. Similar studies were carried out on evolution of rural transport network in the South-Western Nigeria [7[. All these studies failed to address issues on rural road transport network improvement on farming activities, hence, this study focussed on the effect of rural transport network on farming activities as well as agricultural food crop production in the study area. In the study, the objective is to examine the level of road accessibility and connectivity on farming activities as well as food crop production in Akoko South-West Local Government Area of Ondo State.

Despite the significance of roads on development, most rural roads in Nigeria are poorly managed and not well maintained. As pointed out by the World Bank report [Ref 8 and 9], the rural inhabitants live far from development, pay a very high cost for transport services, spent longer periods of time travelling and waiting for infrequent and unreliable bus services, due to inadequate and poor transport infrastructure and services. The aforementioned problems are often compounded by the inaccessible and unconnected feeder roads network, which usually causes delay that reduces productivity and inefficiency of vehicles.[10, 8 and 9].

2 CONCEPTUAL ISSUES AND LITERATURE REVIEW

The concept of Accessibility

The concept of accessibility is used in the explanation of growth of both urban and rural areas in relation to the location, functions as well as the juxtaposition of various facilities and land use patterns [11, 12 and 13] . However, several scholars from their individual works have put different definition in relation to the goal of their study. According to Ref 12 and Ref 11].Accessibility is the inherent characteristics of overcoming some form of spatially operating sources of friction in terms of time and distance. In addition, it is an extent to which the land-use transport systems enable groups of people or an individuals and goods to reach points of activities and or destination by means of a combined transport mode [14].

However, accessibility determines the systematic relationship between the spatial distribution and intensity of development as well as the quantity and quality of travel within and between an urban or rural area. In other words, accessibility can therefore be conceptualized in different aspects.In many cases, the objective of transport infrastructure investment is to improve the accessibility of a given region by reducing travel time or increasing the potential to travel. Accessibility can be measured as the quantity of economic or social activities that can be reached using the transport system. Improvement in accessibility will increase the market size for manufacturing, tourism and/or labour, leading to increased competition and/or centralisation. On the other hand, the impact for the region concerned could be both positive and negative, depending on its initial level of competitiveness.

Concept of Connectivity

The concept of connectivity according to [Ref 15] is the degree to which all pairs of lines or routes are connected or the degree of completeness between riders. *Connectivity* refers to the density of connections in path or road network and the directness of links. A well-connected road or path of network has many short links, numerous intersections, and minimal dead-ends. As connectivity increases, travel distances decrease and route options increase, allowing more direct travel between destinations, creating a more accessible and resilient system. Connectivity can be applied both internally (streets within that area) and externally (connections with arterials and other neighborhoods).

A well-connected road or path network has many short links, numerous intersections, and minimal dead-ends. As connectivity increases, travel distances decrease and route options increase, as this allowing more direct link between the rural settlement and farm sites creating a more accessible and connectivity in terms of easy movement of both farm inputs and farm

outputs to the market and other places of demand within the neighborhoods Natural barriers such as big rivers, roads that are seriously eroded and its major arterials sometimes create barriers to direct local movement, particularly for non-motorized movement, called the *barrier effect*.[16]. Various design strategies can help to improve road connectivity and accessibility across such barriers such design, including construction of bridges, surface dressing of arterial roadways, among others, which are walking networks within major rural centers that connect farm sites and transportation terminals.

Efforts to increase roadway connectivity also helps to improve community livability, encourage non-motorized transportation and increase traffic safety as well as increasing in time and cost savings .It also allow productivity gains to be achieved by improving their farm production as well as improving distribution of farm outputs [17]. Wider access to the market will also create both new business opportunities and increased competition, leading to further increases in profitability. Thus, improve in rural road connectivity and accessibility could be said to have an impact on high productivity, and hence on overall economic growth of the rural settlement.

Definition of 'Rural' and Dimensions of Rurality

'The term 'rural' is a concept that is easily understood at a common-sense level, yet difficult if not impossible to define [18]. What is immediately apparent from the literature is the variation in how areas are classified as rural and urban from one Study to the other. What is considered rural in one country may not correspond to what is considered rural in another. For example, in America, classifications of rural go as far as classifying rural 'states and some have even compared rural and urban centres. The two areas differ significantly, with one area having a high number of inhabitants, while the other with little number of people. There is also Considerable variation between rural areas.[Ref 19] argues that "the experience of living on a remote Scottish island may be as different from living in a large suburban village in Oxfordshire as living in a city such as Durham is from living another such as Birmingham". Over generalising rural areas into just 'rural' will miss these qualitative differences. Thus, just as aggregating results across a variety of different areas can be problematic. Failing to recognize that risks way vary considerably even between 'similar' areas can also result in a misleading picture of crime risk. The problem lies in capturing the many types of rural areas that exist. These range from common farmsteads settlements on the fringe of large towns to remote farms many miles from the nearest urban settlement. In much of the literature, rural areas have been defined in terms of the population size and/or density of a settlement. However, it has been suggested that the demography of an area represents just one of four dimensions of the meaning of rurality. The other three being economical, social, structural and cultural

3 STUDY AREA

Akoko South West Local Government Area is the study area and it is located in the northern part of Ondo State, with an area of 796 sq km. Its lies between latitude 5° 31 and 6° 01 North of the equator and between longitude 7° 21^{1} and7^{0} 31^{1} East of the Green which meridian. It is bounded in the west by Emure Local Government Area in Ekiti State, to the East by Akoko South East Local Government Area of Ondo State, to the North and South by Akoko North East and Owo Local Government Area of Ondo State respectively. The study area has a total population of 121,764 people [20]. In general, the hilly nature of the relief in areas like Akungba, Supare, and Oba allows construction of access route through the available pass to promote easy evaluation of food crops to the market. The main mode of transport in the study area is basically road transport. The Local Government has about 569kms of road both intra-rural and inter-rural roads network. Most of these inter rural roads are tarred but poorly maintained while the villages and the farmsteads are mostly connected by untarred.

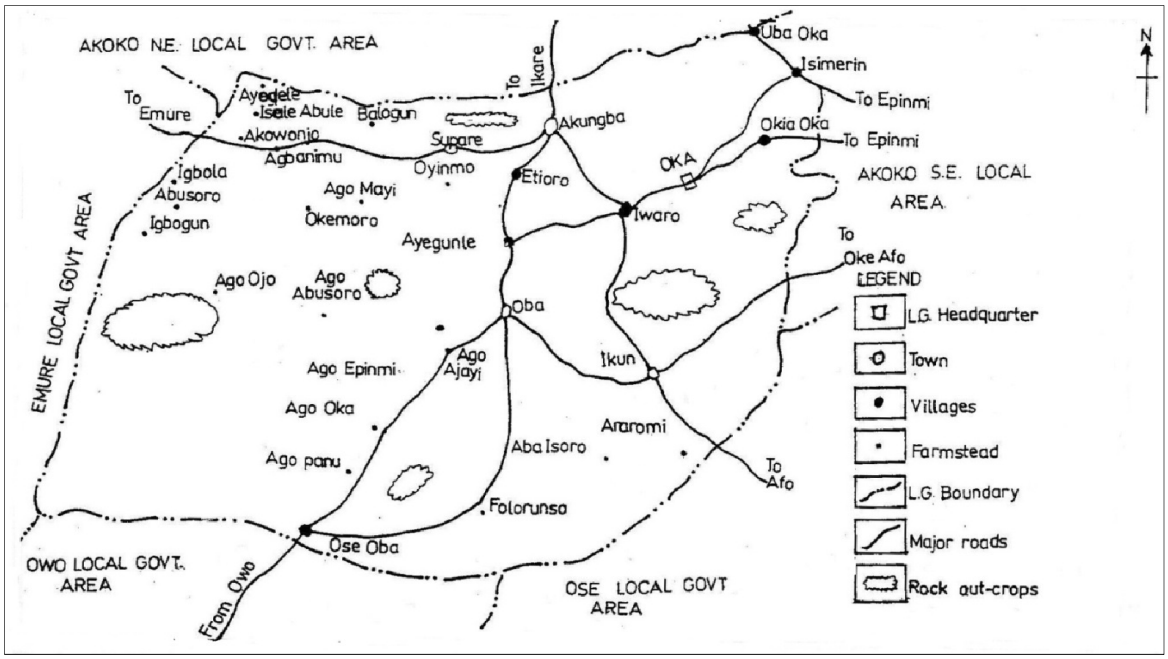

Fig. 1 map of the study area showing towns and villages

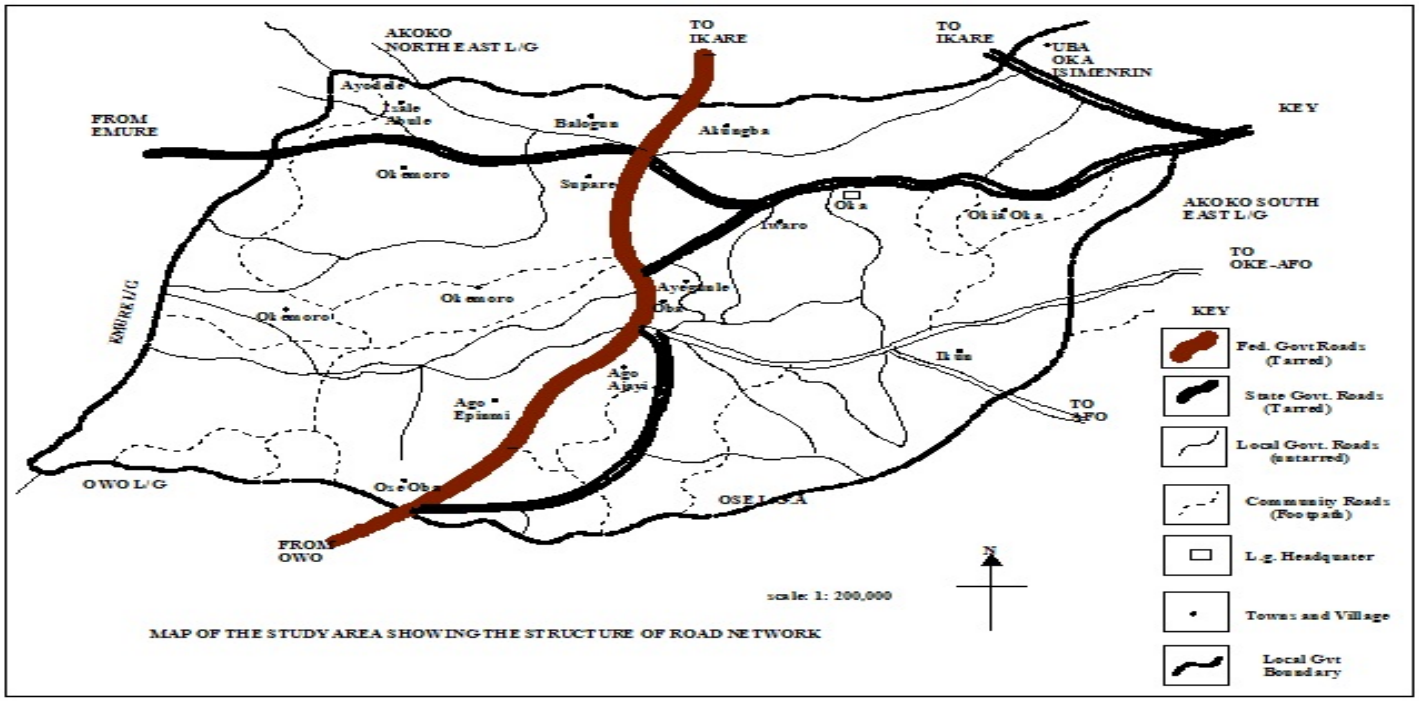

Fig.2 Route Map of the study area

4 METHODS AND MATERIALS

Purposive sampling method was used to select 15 rural communities in the study area the data required for this study was gathered using secondary source. Aided by route survey, the road accessibility of the study area was determined by using a scale of 1cm to represent 20km to superimposed 20 km x 20km grids on a larger-scale route map of the study area. Thereafter, the lengths of routes in each grid were measured, summed up, and the answer got was regarded as the accessibility index of the concern grid [17]. Following the method adopted by [21], points with equal accessibility indices in

the study area were joined together to indicate categories of accessibility within the study area.(see table 2) Similarly, the route connectivity of the study area was determined by counting the numbers of links (arcs) and nodes (vertices) using the map of the study area. Thereafter, the level of route connectivity in the sampled settlements was determined using Beta index graph measurement [22] other secondary data were sources from test-books, journal and magazines.

5 FINDINGS AND DISCUSSION

Rural Accessibility Measurement

Table 1.0: Frequency table of Routes Per grid of 2 by 2 km^2

Length of rouad per grid in km		Frequency (no of grids)	percentage
01	0	17	31.4
02	0.1 – 2	28	51.9
03	2.1 - 4	09	16.7
04	4.1 - 6	0	0
	Total	= 54	100%

Source: Author Field Survey,2014

From the table 1.0, it could be observed that a total of 31.4% of the grid squares contain no road at all. In the same vein, 51.9% of the farm locations in the area are located in an inaccessible rout that is not easily link with vehicles for easy evacuation of farm outputs. As against 16,7% of the farms that are linked with more access routes. In line with [Ref 17 and 23], three different categories of route accessibility were identified in the study area and these are; very low (inaccessible zones) low or (fairly accessible zones) and areas that are averagely accessible (Figure 2). The foregoing observation shows that 83.3% of roads in the study area are inaccessible signifying that easy evacuation of farm outputs is a big problem in the study area.

LENGTH OF ACCESSIBILITY ROUTE PER GRID

	A	**B**	**C**	**D**	**E**	**F**
1	$a_1 = 0$	$b_1 = 0$	$c_1 = 0.25$	$d_1 = 0.25$	$e_1 = 0$	$f_1 = 0$
2	$a_2 = 0$	$b_2 = 1.75$	$c_2 = 1.50$	$d_2 = 2.0$	$e_2 = 0$	$f_2 = 0$
3	$a_3 = 1.75$	$b_3 = 1.0$	$c_3 = 2.75$	$d_3 = 2.75$	$e_3 = 0.5$	$f_3 = 0.5$
4	$a_4 = 1.75$	$b_4 = 1.78$	$c_4 = 0.9$	$d_4 = 1.0$	$e_4 = 1.25$	$f_4 = 1.2$
5	$a_5 = 1.25$	$b_5 = 1.75$	$c_5 = 2.7$	$d_5 = 1.1$	$e_5 = 1.1$	$f_5 = 0.25$
6	a6 = 1.50	$b_6 = 2.0$	$c_6 = 1.00$	$d_6 = 2.75$	$e_6 = 1.0$	$f_6 = 0$
7	$a_7 = 1.75$	$b_7 = 2.15$	$c_7 = 2.00$	$d_7 = 2.20$	$e_8 = 0$	$f_8 = 0$
8	$a_8 = 1.50$	$b_8 = 2.50$	$c_8 = 3.5$	$d_8 = 2.20$	$e_8 = 0$	$f_8 = 0$
9	$a_9 = 0$	$b_9 = 0.7$	$c_9 = 0$	$d_9 = 0$	$e_9 = 0$	$f_9 = 0$

I. a_1, a_2, a_3 ---------- a_n
II. b_1, b_2, b_3 ---------- b_n
III. c_1, c_2, c_3 ---------- c_n
IV. d_1, d_2, d_3 ---------- d_n
V. e_1, e_2, e_3 ---------- e_n
VI. f_1, f_2, f_3 ---------- f_n

Number of grids per box

Source; Field survey, 2014

This observation collaborate the findings of[Ref1 and Ref 2] that well improved access road is a catalyst of achieving optimal rural benefits as well as necessitate agricultural development.

Rural Road Connectivity Measurement

The connectivity of roods network is determined by the extent to which nodes in a network are directly connected to one another. in this study beta index graph measurement of kansky were employed to determine or measure the degree of connectivity of routes within the study area. This was done by dividing the total number of links (arc/edges) in the network by the total number of nodes (vertices /settlements) found at the junction of any two or more arcs as well as at end of an arc. (See figure below).

Beta index is given as: *Beta = e/v*

Where ; e = the total number of edges =42

V = the total number of vertices =43

B = 0.98

From the analysis, it shows that on the average, there is 0.98 links for each vertex of the rout in the study area. However, any route with Beta index value less than 1.0 such route network is considered to have low level of connected and such route is not viable for sustainable agricultural development. From the foregoing, it shows that the road network in the study area is poorly connected that could makes movement or flow of both farm inputs and outputs from the interior to the market for sale difficult. Hence from figure 3 the road network in the study area display very simple network connectivity. This is because there is no fundamental circuit in the network of the study area. In the final analysis, such network is considered not viable economically for proper harnessing of rural resources and or for motorist to maximize profit as well as for effective farming activities. This observation corroborates the findings of [Ref 24], that roads which are highly connected is a pivotal for social and economic development of a nation's economy.

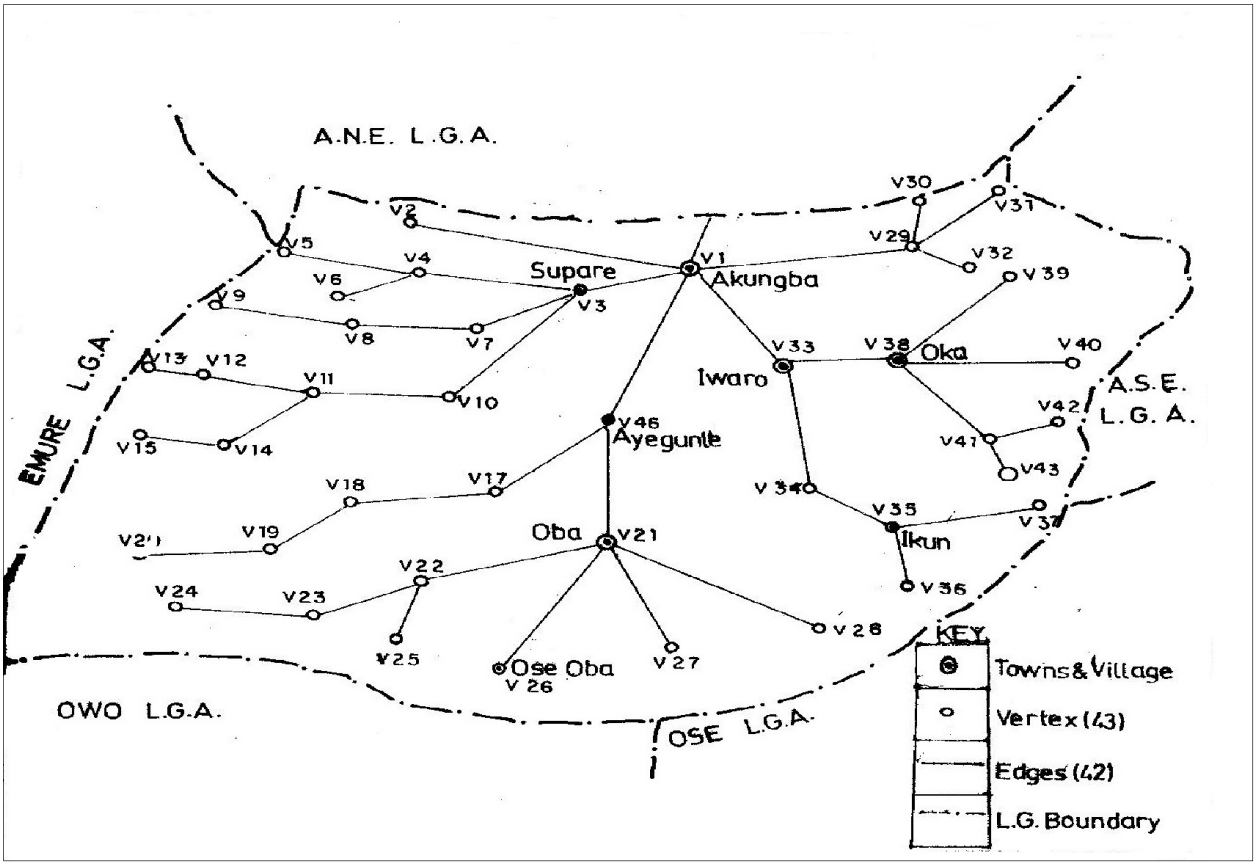

Fig3. Connectivity Routes-map of the study area.

Source: Field survey, 2014

6 CONCLUSION

The study had succeeded in showing that most of the road network in the study area are not accessible dew to their poor condition as a result of their neglect by the agencies responsible for the improvement or rehabilitation. The study has shown that road transport is poorly developed and, more often than not, rural communities have had to improve the road through community efforts for easy accessibility. In most cases, local materials were used for the rehabilitation of the routes. Hence, rural people required transport infrastructure that will link the rural areas with the urban centres so as to facilitate and enhance easy movement of people, goods and services in and out of the study area.

Fundamentally, it was revealed in the study that most of the routes were not adequately connected and accessible especially during the rainy season, thereby putting constraints to the maximum harnessing of food crops from the hinterlands to market points for sale; thus, leading to mass wastage and spoilage of food items in the field. The economic implication of this is that it leads to reduction in the profit margin of the farmers and the quantum of crops produced.

It was revealed that road improvement was a factor of farm size; that is, as the condition of the road improves, there is the tendency for the farmers to expand their farmland. This can as well lead to increase in output, since the trekking distances to farms have been overcome. Similarly, the neglect of village-to-farm and village-to-village accessibility by government in their development plan is a serious and costly omission, knowing fully well that the urban centres depend largely on the rural settlements for the supply of food stuffs. An investment in rural transport, therefore, will help a long way to solve the problem of rural-to-market accessibility in order to reduce drastically the wastage of human resources in the rural areas and, at the same time, improve the life style and standard of living of the rural populace.

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Heamatological Changes Associated with Gastrointestinal Parasites Infection in Domestic Animals attended to Outpatient Clinic of Faculty of Veterinary Medicine of Diyala University, Iraq

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ABSTRACT: *Background and aim:* This study conducted to determine gastrointestinal parasite (GI) infection and evaluation of some heamatological changes in domestic animals .
Methods: One hundred fecal samples and blood were collected (4 camels; 4 horse; 5donkey; 40 cattle; 26 sheep, 18 goats and 3 dogs).
Results: Of the total samples examined,86 (86.0%) were found positive for GI parasites. The hematological changes recorded in sheep, goat and cattle infected by GI parasites show decrease in PCV, Hb, RBCs and Plasma protein while slight increase in WBCs. Prevalence of GI parasite infection was higher (96.15%) in sheep compared with cattle (85.0%) and goats (83.33%). High percentage of infection (100 % / 60%) in horse than donkey was recorded respectively.
Significant difference (P<0.05) was recorded in prevalence of GI parasites among small age group when compared to adults in sheep goats and cattle. Parasites identified in this study includes protozoan Eimeria spp. (95.40%), Nematodes, as Strongyles type of eggs (86.20%), *Strongyloides papillosus* (47.12%), Parascaris eqiurum (4.59%) and *Oxyrius equi* (25.0%) . Cestodes (50.57%), as Monieza sp. (48.27%), *Monieza expansa* (52.38%) *Monieza benedeni* (47.61%) and Anaplocephalum sp.(2.29%). The percentage of *Monieza expansa* and Monieza benedeni in sheep was (55.0%), (45.0%) respectively and in Goat (66.66%), (33.33%) while in Cattle (30.0%), (70.0%) respectively. Mixed infection was detected in 73 (84.88%) while single infection was detected in 13 (15.11%) in domestic animals samples.
Conclusion: Mixed infections and young age come in consideration as a cause of hematological changes in farm animals.

KEYWORDS: Hematological changes, GI parasites, domestic animal.

1 INTRODUCTION

Parasitic diseases are the major obstacle in the growth and development of animal health all over the world (Saeed et al., 2010; Mahfooz et al., 2008). Gastro-intestinal (GI) parasitic infections are characteristic of pastoral grazing systems and many GI parasitic species have developed resistance to anthelmintic drugs (Waller, 1994; Min et al., 2005). The productivity of animals is constrained due to GI parasitic infections that can have extensive consequences, ranging from reduced animal performances to mortality (Sykes, 1994; Waller, 1999). Subclinical GI parasitic infections occasionally depress feed intake and animal productivity, impair tissue deposition and lower growth rate (Sykes, 1994). GI parasite in sheep and goat is a substantial problem plaguing farmers across the nation. As gastrointestinal parasite infection is the most important limiting

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factor of sheep and goat productivity, parasitism has a highly detrimental effect on the sheep than goat industry (Jones, 2001).Horses, among most domestic animals are reported to be more susceptible to a large number of parasites and may harbor different species at any time (Wannas, et al., 2012). An apparently healthy horse can harbor over one – half million GI parasites such as protozoa, trematodes, cestodes and nematodes (Martins et al., 2009; Stoltenow and Purdy, 2003). Donkeys act as a means of transport of goods. Donkeys do suffer from a major clinical illness. Parasitic infestation is a major cause of illness (Egan et al., 2010). Camel is known to tolerate a lot of parasitic infections of economic importance among many animals with minimal economic losses (Jackson ,.1987) but it is also known to infected with various helminth parasites which can cause diarrhea and other clinical signs and lead to a decrease in productivity of camels (Tembely, et al,. 1992). German shepherd dogs have been used for police work like tracking criminals, detecting and holding of suspects, detection of narcotics and explosives. They achieve this work by their keen sense of smell (Shadia,2009).

2 MATERIALS AND METHODS

2.1 AREA OF THE STUDY

The study conducted in outpatient clinic -College of Veterinary Medicine, University of Diyala-Iraq

2.2 ANIMALS

Total of (100) animals from different species, age, sex and breed were examined clinically. As in shown in table (I).

2.3 CLINICAL EXAMINATION

Animals are examined clinically for general body condition, signs of diarrhea, auscultation of respiratory and heart rate, mucus membrane and body temperature.

2.4 FECAL SAMPLES COLLECTION

The sample collected from the animal by two methods :

Directed from the rectum

- In large animals (cattle, camel and horse) by Introduce the hand into the anus using gloves and lubricant.
- In small animals (sheep , goat and dog) by one –two fingers are inserted inside the rectum using gloves and lubricant.

From the ground

When the animal is observed defecating.

The sample was put separately into plastic container with a lid and data pertaining to the sex, age and consistency of faeces were recorded.

2.5 HAEMATOLOGY

Animals infected by sever gastrointestinal parasite only were collected blood sample from Jugular vein to estimation of blood parameter. The blood was collected into vials containing sodium ethylenediamine tetracetic acid (Na2 EDTA) sufficient for 5 mL of blood to prevent coagulation. The tubes were gently rotated to ensure proper mixing of the blood with the anticoagulant without damaging the integrity of the cells and were transported to the laboratory.

a-Red cell indices packed cell volume (PCV)

The blood collected in special anticoagulant bottles were used to determine the PCV of each sample using micro-capillary tubes, which were filled by capillary action and centrifuged at 3000 rpm for 5 minutes after sealing the end of the tube. After the centrifugation the PCV in percentage was read in a special haematocrit reader and the results were recorded.

b-Red blood cell count (RBC)

Blood was drawn in to a special red cell pipette, which gave a dilution of 1 to 200 when the blood was drawn to the 0.5 mark and diluted to form the 101 mark. After been drawn and well mixed the dilution discharged onto hematocytometer counting chamber and allowed to settle for few minutes. The high dry objective of the microscope was used to evaluate the

total erythrocyte count. The total number of cells in five squares in the center of the counting chamber was determined and multiplied by 10,000.This value represented the total number of erythrocytes per cm3 of blood.

c- Haemoglobin concentration (Hb)

0.1 Normal hydrochloric acid added to whole blood using the acid hematin method, which depends on conversion of haemoglobin to acid hematin. Color of the blood in a test tube after addition of the 0.1 normal HCL observed with serial dilution with HCL until color matched a standard. The reading was reported in g/100 mL.

d-White Blood cell indices (WBC)

The hemocytometer method used. The dilution factor was 1:100 and the total leucocytes were determined by counting all of the cells in the entire ruled area of a hemocytometer. The total count was calculated using the following formula:

Total leucocytes in 4 squares mm × 50 = Leucocytes/ CU.mm.

2.6 DIAGNOSIS OF PARASITES

After samples collected from animals, the gastrointestinal parasites are diagnostic by.

A- Macroscopic examination of fecal sample

Fecal samples were subjected to general appearance as consistency of feces (formed, soft or watery), colour, odour (Soulsby 1986).

B- Microscopic examination of fecal sample

After collecting the samples a direct smear was first made using tap water, coverslip applied, and it was examined under the light microscope at × 40.

a) Floatation Technique

This technique is used easily for the identification of eggs of nematodes and cestodes. Briefly, faeces were comminuted in saturated salt solution, faecal debris were discarded. The fluid was poured into a straight-sided tube until a convex meniscus appeared at the top of the tube and a coverslip was applied immediately. The preparation was allowed to stand on level surface for fifteen minutes, the coverslip was removed and applied to the glass slide and examined (Soulsby, 1978).

b) Sedimentation Technique

This technique is good for trematodes eggs because they are heavier and so sediment down to the bottom of the container. The supernatant from the floatation technique was poured off and a small quantity of the sediment collected with a pipette/dropper and it was put on a glass microscope slide, coverslip was applied and examined (Soulsby, 1978).

c) Quantitative method as McMaster technique

used to counting eggs of parasites per gram of feces (EPG), according to techniques and morphological characteristics suggested by (Soulsby, 1978 , Zajac and Conboy 2006).

C- Detection of the larvae of GI parasites by Baerman technique

This test used to detection larva of lungworm species causing parasitic bronchitis or verminous pneumonia in sheep, cattle, horse.

Identification of parasite

The parasites were identified by using low and high power of microscope according to the keys and morphological characteristics (Soulsby, .1986).

3 RESULT

Clinically sever infected animal by Strongyles type of egg was passing from paleness of conjunctiva, loss of appetite, dehydration, anemia, emaciation, increase in respiratory and heart rate in some sheep, goat and she camel. Whenever, rough wool coat, weight loss ,pasty feces to yellowish diarrhea and dysentery in small age group (1 –<12 Month) of some sheep and goat infected by coccidiosis. Whenever, Coccidiosis in some cattle and camel exhibited by mucus with diarrhea. One horse infected by Oxyrius equi was suffered itching of perineum region and loss hair of tail.

The overall prevalence of GI parasites recorded in domestic animals examined was 86 (86.0%). Mixed infections represents 73 (84.88%) than single infection 13 (15.11%) in domestic animals.

The present study recorded three type of GI parasite infection as well as, protozoan (95.34%)Eimeria spp., Nematodes, as Strongyles type of eggs (87.20%), Strongyloides papillosus(46.51%),Parascaris eqiurum (4.65%) and Oxyrius equi (2.32%). Cestodes (50.0%),as Monieza sp. (47.67%), *Monieza expansa (*52.38%) Monieza benedeni (47.61%) and Anaplocephalum sp.(2.29%). The percentage of *Monieza expansa* and Monieza benedeni in sheep was (55.0%), (45.0%) and in Goat (66.66%), (33.33%) while in Cattle (30.0%) ,(70.0%) respectively, as in Fig.(1,2,3,4).

Six Eimeria species were identified; *E.ahsat* (28.0%), *E. crandallis* (24.0%), *E.granulosa* (20.0%) , *E.parva* (16.0%), *E. intricata* (12.0%), *E.pallida* (8.0%) in sheep and in goats are *E.ahsat* (33.33%) , *E. crandallis* (26.66%) , *E. intricate* (20.0%) and *E. parva* (13.33%).

The present study shows significant difference (P< 0.05) between sex of animals and breed of animals with percentage of GI parasite infection as in table (2). On the other hand there are difference between species of animals and percentage of infection as in table (2). The study shows high percentage of infection in small age group more than large age group as in table (3). Species of Eimeria which were diagnosed in this study was described and identified according to (Coles , 1986 and O'Callaghan et al. 1987). The interpretation result of McMaster counting for egg of nematode (Strongyles type of egg) in sheep and goat was a ranged from mild infection 800 EPG to severe infection 2600 EPG in small and adult age group, but in cattle was a mild infection about 600 EPG and severe infection 3200 EPG. Whenever mild infection (380 EPG) was recorded in horse and donkey. On the other hand, the severe infection by (Isospora rivolta.) was recorded in puppy of German shepherd dog. Baerman technique was used to detection larva of GI parasite infection in animals of study show negative result. Erythrogram and leukogram : Decrease in erythrocyte count ,hematocrit, hemoglobin and slight increase in WBC recorded in some animals infected by GI parasites in severe cases of infection as in Table (4).

Table 1: Number of animals examined according to species, sex and breed.

Species	Total number	Sex Male / Female	Breed
Sheep	26	16 / 10	(16) Local + (10)Gross
Goat	18	7 / 11	(10) Local + (8) Gross
Cattle	40	14 / 26	(22) Local + (18)Friesian
Camel	4	1 / 3	(4) Dromedary
Horse	4	3 / 1	(4) Local
Donkey	5	3 / 2	(5) Local
Dog	3	3 / 0	(3)German shepherd
Total	100	45/ 55	

Table 2: Identification Species of gastrointestinal parasite in farm animals

GI parasite species (%)	N.S - P.N (%)	*Emeria sp.*	*Strongyloid papillosis*	*Monezia Sp.*	*Strongyle type of egg*	*Parascaris equrum*	*Anaplocephalus sp.*	*Oxyrius equi*
Goat	18 - 15 (83.33)	15 (100.0)	10 (66.66)	11 (73.33)	13 (86.66)	0 (0.0)	0 (0.0)	0 (0.0)
Sheep	26 - 25 (96.15)	25 (100.0)	18 (10.0)	20 (80.0)	23 (92.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cattle	40 - 34 (85.0)	30 (88.23)	12 (35.29)	10 (29.41)	34 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Horse	4 - 4 (100.0)	4 (100.0	0 (0.0)	0 (0.0)	2 (50.0)	2 (50.0)	2 (50.0)	1 (25.0)
Donkey	5 - 3 (60.0)	3 (100.0)	0 (0.0)	0 (0.0)	1 (33.33)	2 (66.66)	0 (0.0)	1 (33.33)
Camel	4 - 4 (100.0)	4 (100.0)	0 (0.0)	0 (0.0)	2 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)
Dog	3 - 1 (33.33)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	100- 86 (86.0)	82 (95.34)	40 (46.51)	41 (47.67)	75 (87.20)	4 (4.65)	2 (2.32)	2 (2.32)

Table 3: Relation between sex and breed of animals with percentage of infection

Species	Total number of samples /positive samples	Sex						Breed					
		Male			Female			Local			Cross		
		No.	positive	Negative	No.	Positive	Negative	No.	positive	Negative	No.	positive	negative
Goat	18 - 15 (88.88%)	7	6 (85.71%)	1 (14.28%)	11	9 (90.9%)	2 (9.09%)	10	8 (80%)	2 (20%)	8	7 (87.5%)	1 (12.5)
Sheep	26 - 25 (96.15%)	16	16 (100%)	0 (0%)	10	9 (90%)	1 (10%)	16	15 (93.75%)	1 (6.25%)	10	10 (100%)	0 (0%)
Cattle	40 - 34 (85%)	14	12(85.71%)	2 (14.28%)	26	22 (84.61%)	4 (15.38%)	22	21 (95.45%)	1 (4.54%)	18	13 (72.22%)	5 (27.77%)
Horse	4 - 4 (100%)	3	3 (100%)	0 (0%)	1	1 (100%)	0 (0%)	4	4 (100%)	0 (0%)	0	0 (0%)	0 (0%)
Donkey	5 - 3 (60%)	3	2 (66.66%)	1 (33.33%)	2	1 (50%)	1 (50%)	5	3 (60%)	2 (40.0)	0	0 (0%)	0 (0%)
Camel	4 - 4 (100%)	1	1 (100.0)	0 (0%)	3	3 (100%)	0 (0%)	4	4 (100%)	0 (0%)	0	0 (0%)	0 (0%)
Dog	3 - 1 (33.33%)	3	1 (33.33%)	2 (66.66%)	0	0 (0%)	0 (0%)	0	0 (0.0%)	0 (0%)	3	1 (33.33%)	2 (66.66%)
Total	100 – 86 (86%)	45	41 (91.11%)	6 (14.63%)	55	45 (81.81%)	8 (17.77%)	61	55 (90.16%)	6 (9.83%)	39	31 (79.48%)	8 (20.51%)
X^2	X^2= 14.182				X^2= 464.75			X^2= 464.75			(P < 0.05) , S.D		

Table 4: Relation of age of domestic animals with percentage of infection

Species of animals	Age	Number of animals	Positive Number	Percentage of infection (%)
Sheep and goat	1 – <12 Month	23	22	(95.65)
	1 Year - 4years	21	18	(90.47)
Cattle	2- < 12Month	16	14	(87.5)
	1 Year – 6 Years	24	20	(83.33)
Horse and donkey	2 Month	2	2	(100.0)
	4-7 Years	7	5	(71.42)
Camel	2-4 Years	4	4	(100.0)
Dog	2-3 Month	1	1	(100.0)
	3-5 Years	2	0	(0.0)
Total		100	86	(86.0)
X2= 16.612 P<0.05 SD				

X^2= Chi-Square, P= Probability value (P< 0.05), S.D = Significant difference

Table 5: Heamatological changes and normal values of some animal study.

Test	N.V* ------- I.N Mean ± Std. D sheep	N.V* ----- I.N Mean ± Std. D Goat	N.V* --------- I.N Mean ± Std. D Cattle	N.V** ------ I.N (Puppy)
Hematocrit (Hct) (%)	27-45 -- 26.81 ± 2.9	22-38 -- 21± 1.7	24 - 46 --- 34.81±1.40	35-52-----22
Hemoglobin (Hb) (g/dL)	9-15 -- 7.8 ± 0.4	8 -12--- 6.4	8-15 ---- 10.93±1.03	12-18-----6.6
RBCs (per/µL)	9-15x106--5675000± 62.38	8-18x106.—5825000± 63.23	5-10x106------74500000± 671104	5.5-8.5x106-3666450
MCV (fL)	28-40 --- 44 ± 6.23	16 -25 ----30.76± 7.55	40-60 -----50.09± 4.08	60-77---- 60
MCH (pg)	8-12---- 13.12 ± 1.4	5.2-8 ----10.98±0.255	11-17 --- 15.85±0.26	20-25----18
MCHC (g/L)	30-36 --- 28.9 ± 1.8	31-34 --- 30.47±4.55	30-36 --- 32.32±2.67	32-36---- 30
Total plasma protein (TPP) (g/dL)	6-7.9 ---- 5.8 ± 0.178	6-7.9 ----- 5.6± 0.109	5.7-8.1 ---6.4 ± 0.209	5.1- 7----- 4.8
Thrombocytes (per/µL)	(100-800)x103 ---8120450	(250-750)x103--785245	(300-600) x103-- 6255120	2-9 x105 ---20850000
WBCs (per/µL)	(4-12)x103 --- 12240± 6.121 ↑	(4-13)x103-- 8550±711.1	(4-12)x103---8537.4±519.1	6-17x103----- 6850
Band Neutrophils (per/µL)	0--- 122.4± 0.632	0--- 171± 0.638	0-120 ---170.47±	0-300 --- 137
Segmented Neutrophils (per/µL)	700- 6000 --- 4161.6± 0.894	1200–7200--3249±1.788	600- 4000-- 2988.09± 3.76	3000-11500---3082.5
Eosinophils (per/µL)	0-1000 --- 1836± 1.505 ↑	0 –650 --- 1111.5±1.643 ↑	0-2400---- 1109.86± 1.5	100-1000 ---- 753.5
Basophils (per/µL)	0-300---- 122.4± 0.516	0-120 ---- 85.5± 0.516	0—85.73± 0.510	0-100 ---- 68.5
Monocytes (per/µL)	0—750 ---- 1591.5± 0.684 ↑	0—550--- 940.5± 0.694 ↑	25-800---1024.44±1.1	200-1400---890.5 ↓
Lymphocytes (per/µL)	2000–9000-- 4406.4 ± 0.894	2000-9000---2992.5±1.788	2500-7500-- 3158.69±4.58	2500-17500----1918↑

N.V= Normal value according to Radostits , et al.2007 and NV** Hoffmann, 2010).*

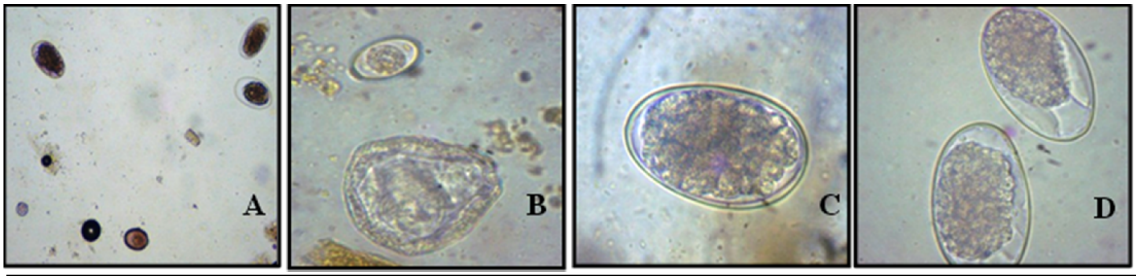

Fig [1].(A) Egg and Oocyst of GI parasite Mixed infection,(Flotation, 20 X) (B) Oocyst of *Eimeria sp* and *Moniezia benedeni* in cattle. (C) Strongyles type of eggs in cattle. (D).Strongyles type of eggs in equine (Flotation, 40X).

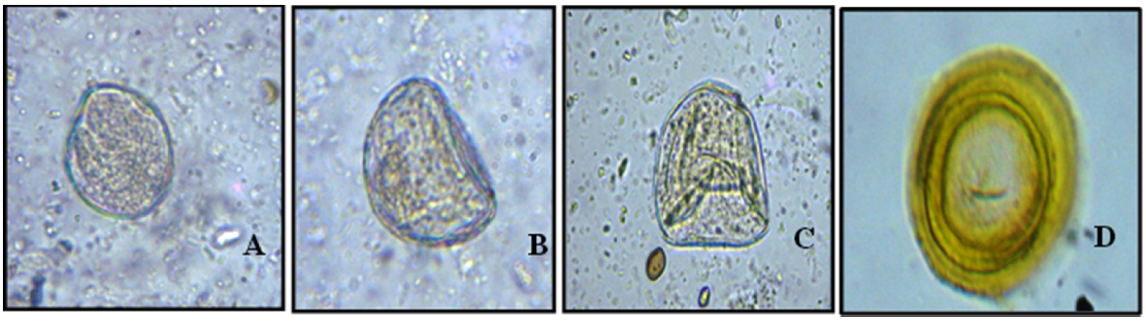

Fig .[2] (A),Egg with larva of *Strongyloides sp.* in horse,(B). Egg of *Oxyuris equi* ,(C). Egg of *Anoplocephalan* sp. , (D). Egg of *Parascaris equorum* in horse.(Flotation ,40X).

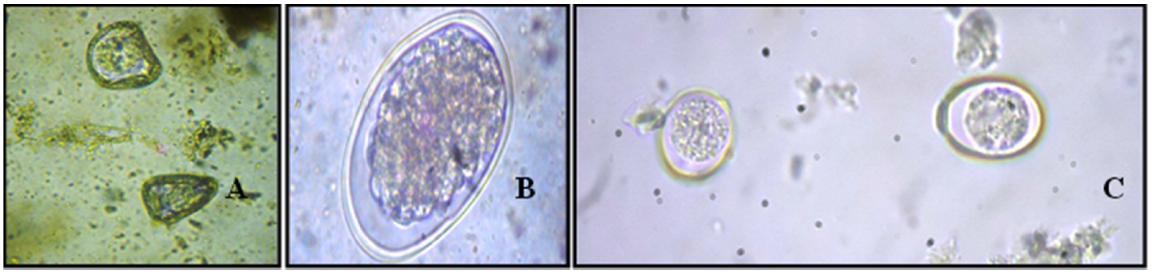

Fig .[3] (A). Egg of *Moniezia benedeni* (upper) and *Moniezia expansa* (lower), (Flotation 20X) (B). Strongyles type of eggs in sheep.(C). Oocyst of *Eiemeria granulosa* (right) and *Eiemeria ovioniondalis* (Left) in sheep. (Flotation, 40X)

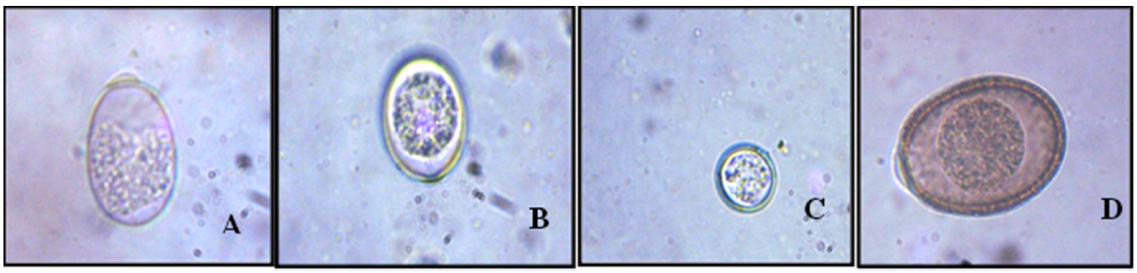

Fig.[4] (A) Oocyst of *Eiemeria ahsata* ,(B) *Eiemeria pallida* ,(C). *Eiemeria parva*,(D) *Eimeria intritica* in sheep

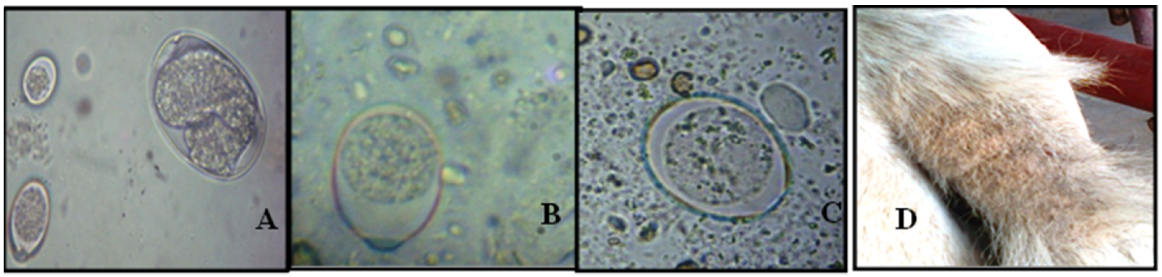

Fig [5].(A). *Egg of Strongyloides papillosus* in sheep(Flotation , 40X) ;(B). Oocyst of *Eimeria sp*. in cattle (C). Oocyst of *Eimeria sp*. in horse (direct smear, 40X) ;(D). Hair loss of horse tail infected by *Oxyuris equi*.

4 DISCUSSION

In the present study, Infection with GI parasites was recorded (86.0%) ,which comes in agreement to Sharma (1998) who reported 29.6 to 100% infection of GI parasite. High percentage of GI parasite in sheep than goat may be attributed to a variety of factors like ground grazing habit of sheep, relatively less cleanliness and extensive pasture grazing compared with goat which grazing at the tip of tree this finding agreement with (Javed, et al.1992 and Margaret, et al.1994). Species of Eimeria recognized in faculty of Vet. Med. of Diyala University are similar to those reported by others (Saleh, 2011; Platzer, et al. 2005; Reeg, et al., 2005 and Al-Kaabi, 2009).

The various species of gastrointestinal parasite recovered during this investigation had already reported by various researchers in different parts of the world (Gadahi, et al.2009) and this variation in prevalence of parasitic infestation depends upon difference in agro climatic condition and availability of susceptible host, management and housing grazing (open or close housing),Radostits,et al.,(2000). The high prevalence rate for Strongyloe sp is consistent with previous findings of other workers (Sardar, et al ., 2006 ; Gadahi, et al.,2009). It was also observed that farms in these areas lack fences and cattle, sheep and goats use the same pasture for grazing.

The breed of sheep and goat show high percentage of GI parasite infection in cross breed than local breed, this may be related to immunity of host this agreed with (Gorski, et al .,2004 and Gadahi, et al.,2009).Whereas, the breed of local cattle show higher prevalence of infection than Friesian cattle this finding may be attributed to a some factor as a less management, open housing grazing, un treated with anthelmintic chemotherapy and Whenever, disagreement with (Sardar,

et al ., 2006) they recorded the maximum rate of infection of gastro-intestinal parasite was recorded in crossbred than native cattle.

High percentage of GI parasite in horse than donkey may be related to the fact that gastrointestinal tract provides favorable environment for the survival and proliferation of many of these parasites (Egan et al., 2010 and Wannas, et al., 2012). On the other hand the higher percentage of coccidiosis in puppy than adult dog may be explained to decrease of immunity ,and age group whenever, the adult dog treated with deworming every 2-3 month . The higher infection of gastrointestinal parasite in young animal than adult may attributed to adults can carry heavy infections but show little evidence.All 4 camels samples examined were found positive for GI parasite infection, these are coincided with the results of other researchers (Rewatkar et al. 2009 and Pwaveno, et al. 2011).

The present study showed that GI parasite is affected in the blood parameters which represented by decrease RBC, PCV, Hb, MCH and MCHC, that causes anemia which differed in severity from mild to severe anemia in infected sheep and goat. These finding may be explained by the presence of the intestinal species of Strongyles type of egg as a blood sucking nematode, Haemonchus contortus. was cause diarrhea, weight loss and loss of appetite and the worms suck blood from the lining of the intestines which causes irritation and swelling of the intestinal membrane .Therefore The damaged mucosa results in malabsorption, impaired digestion and protein loss (Gorski, et al.,2004).

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CONFLICT OF INTEREST

non-declared

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CARACTERISATION DE LA CHARGE METALLIQUE DE LA REGION DU GHARB, MAROC

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ABSTRACT: Heavy metals are micro likely to cause nuisance even when they are released in very small quantities (toxicity develops through bioaccumulation). Moreover, small amounts are often offset by a volume effect into account the importance of water flow. The industry is responsible for almost all releases of heavy metals in water. In effect, water rivers, streams, canals, the sea has long been "outlet" that allowed to evacuate waste. This work focuses on the analysis and evaluation of metal contamination of raw sewage drained by three main collectors Oued R'dom (Morocco) through the spatio-temporal monitoring of the levels of some metals (Pb, iron, Zn, Cd, Cu and Cr). Sampling was conducted for one year from January to December 2013. Analysis of Fe, Zn, Cd, Pb, Cr and Cu revealed the presence of metal contamination from the Fe exceeded the threshold of acceptability, other metallic trace element exist in quantity accepted, they could be classified in order of abundance in the following manner: Fe> Zn> Cd> Pb> Cu> Cr. The average concentrations of metals Oued R'dom level in water are 3.11 mg / l for Fe, 2.17 mg / l for Zn, 0.046 mg / l for Pb, 0.01 mg / l for Cr, 0.043 mg / l for Cu and 0.083 mg / l for Cd.

KEYWORDS: sewage, heavy metals, wadi R'dom, Sidi Kacem, Morocco.

RESUME: Les métaux lourds sont des micropolluants de nature à entraîner les nuisances, leur toxicité se développe par bioaccumulation même quand ils sont rejetés en quantités très faibles. D'ailleurs, de petites quantités sont souvent compensées par un effet volume compte tenu de l'importance des débits d'eau. L'industrie est responsable du quasi totalité des rejets de métaux lourds dans l'eau. En effet, l'eau des fleuves, des rivières, des canaux, de la mer a longtemps été « l'exutoire » qui permettait d'évacuer ces déchets. Ce travail porte sur l'analyse et l'évaluation de la contamination métallique des eaux usées brutes drainées par les trois principaux collecteurs d'Oued R'dom (Maroc) à travers le suivi spatio-temporel des teneurs de certains éléments métalliques (Pb, Fer, Zn, Cd, Cu et Cr). L'échantillonnage a été effectué pendant une année depuis janvier à décembre 2013. L'analyse en Fe, Zn, Cd, Pb, Cr et Cu révèlent la présence d'une contamination métallique à part le Fe qui a dépassé le seuil d'acceptabilité, les autres éléments trace métalliques existent en quantité admise, ils pourraient être classés par ordre d'abondance de la manière suivante : Fe > Zn > Cd >Pb> Cu > Cr. Les concentrations moyennes de métaux au niveau d'Oued R'dom dans l'eau sont de 3,11 mg/l pour le Fe ; 2,17mg /l pour le Zn ; 0,046mg/l pour le Pb ; 0,01mg/l pour le Cr ; 0,043 mg/l pour le Cu et 0,083 mg/l pour le Cd.

MOTS-CLEFS: eaux usées, métaux lourds, oued R'dom, Sidi Kacem, Maroc.

1 INTRODUCTION

Actuellement, la pollution métallique des eaux est une préoccupation mondiale. Au Maroc plusieurs recherches ont essayé de déterminer le degré de pollution métallique dans les eaux superficielles et souterraines [13]. La contamination métallique des écosystèmes aquatiques constitue l'un des aspects de la pollution la plus menaçante pour l'environnement. Par ses effets néfastes, elle pourrait engendrer des situations critiques voire dangereuses affectant parfois l'équilibre écologique de ces écosystèmes.les métaux lourds ne sont pas éliminés par voie biologique, ce qui favorise leur effet

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cumulatif dans les divers compartiments de l'écosystème (eau, faune et flore).Une grande partie des eaux usées est rejetée soit directement en mer, soit dans le réseau hydrographique souvent sans épuration. Les eaux de surface, qui servent de milieu récepteur pour les agglomérations urbaines et les unités industrielles éloignées du littoral souffrent de cette pratique.

Par ailleurs, la réutilisation des eaux usées brutes comporte de sérieux risques pour la santé et pour l'environnement en raison de leur charge en matière organique, en espèces pathogènes et en particulier en métaux lourds. Par conséquent les procédés de traitements des eaux usées s'imposent préalablement à leur réutilisation ou à leur déversement dans le milieu récepteur.

Pour se faire, nous avons réalisé un suivi spatio-temporel de la teneur de six éléments métalliques; Fe, Zn, Cd, Cr, Pb et Cu dans les eaux usées de Oued R'dom et leur impact sur la santé publique, les usagers et l'environnement.

2 MATERIEL ET METHODES D'ETUDE

Milieu d'étude

Sidi kacem est située à 84Km à l'Est de la ville de Kenitra, à 82Km au Nord Ouest de la ville de Fès et à 46Km au Nord de la ville de Meknès Selon le recensement 2004, la population de Sidi Kacem était de 74.062 habitants s'étend sur une superficie géographique de 199.909ha.comprenant les cercles de Sidi Kacem et de Machràa bel ksiri et commune rurale de Khénichat qui relève le cercle de Had kourt . Par ailleurs un réseau important d'Oueds sillonne la province : Oued R'dom- Oued Ourgha- Oued Sebou.

La ville de Sidi Kacem est caractérisée par un climat de type continental semi aride à hiver tempéré. Les températures maxima varient de 16 à 38 °C. Quant aux températures minima, elles oscillent entre 4 et 20 °C. La pluviométrie annuelle moyenne est de 420 mm environ. La période sèche est relativement longue et s'étale généralement de Mai à Septembre.

Les prélèvements d'eaux usées brutes ont été effectués sur une période d'une année de janvier à décembre 2012, à la sortie des collecteurs A, B et C ils ont eu lieu dans la zone d'écoulement de l'égout où la circulation de l'eau est la plus active [11].

Nous nous sommes intéressés aux trois collecteurs de la ville.

-Collecteur A : Il draine l'amont d'Oued R'dom ;

-Collecteur B: Il draine les eaux usées de l'usine de lavage et remplissage des bouteilles de gaz et des citernes.

-Collecteur C: Il draine l'aval d'Oued R'dom;

Figure 1 : Localisation des stations de prélèvement à Sidi Kacem [10]

Méthodes d'étude

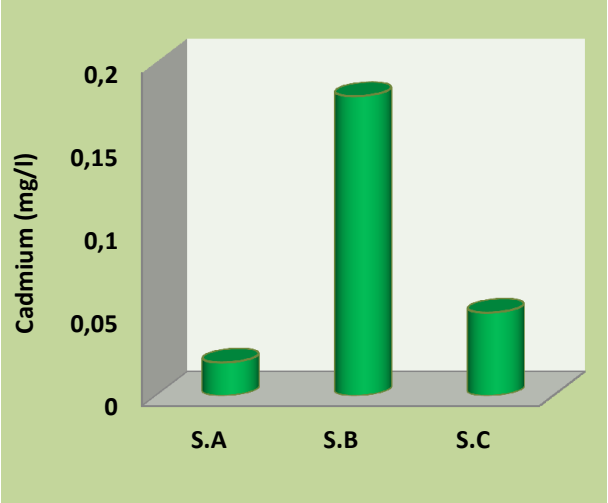
Les prélèvements d'eaux usées brutes ont étés effectués sur une période d'une année de janvier à décembre 2012, à la sortie des collecteurs A, B, et C. Les prélèvements ont eu lieu dans la zone d'écoulement de l'égout où la circulation de l'eau est la plus active. Et à quelques centimètres au dessus de la surface du collecteur [2]. La méthode adoptée pour l'analyse des métaux lourds est la spectrométrie d'émission atomique c'est une technique utilisée pour la détermination des concentrations à l'état de traces dans des échantillons elle permet de quantifier les éléments métalliques en solutions. Les échantillons d'eaux usées ont fait l'objet de dosage en éléments suivants : Fe, Zn, Cd, Pb, Cr et Cu.

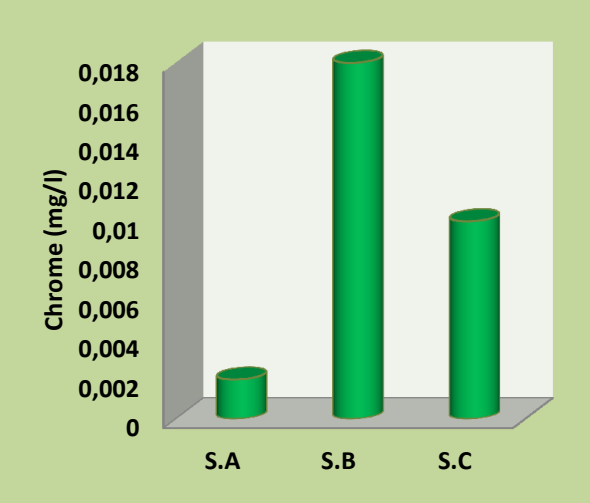
L'échantillonnage a été effectué dans des flacons en polyéthylène spécialement lavés à l'acide chlorhydrique (10 %) puis rincés à l'eau distillée. Les échantillons sont par la suite fixés par l'acide nitrique à 2 % et transportés à basse température (4 °C) jusqu'au laboratoire Environnement et Energies Renouvelables. L'ajout de 3ml d'acide nitrique à environ 27 ml d'eaux usées est nécessaire pour stabiliser les éléments à doser.

3 RESULTATS

Tableau1: Résultat de l'analyse métallique des eaux usées de la ville Sidi Kacem (mg/l)

	Cd	Pb	Zn	Cu	Fe	Cr
Amont	0,02	0,02	1,05	0,015	1,8	0,002
industriel	0,18	0,08	3,23	0,08	4,67	0,018
Aval	0,05	0,04	2,24	0,035	2,86	0,01
min	0,02	0,02	1,05	0,015	1,8	0,002
max	0,018	0,08	3,23	0,08	4,67	0,018
Moyenne$\pm$**Ecart type**	0,0833$\pm\mathbf{0,}$	0,0466 $\pm\mathbf{0,0}$	2,1733 $\pm\mathbf{1,3}$	0,0433 $\pm\mathbf{0,0}$	3,11$\pm\mathbf{2,6}$	0,01$\pm\mathbf{0,0}$





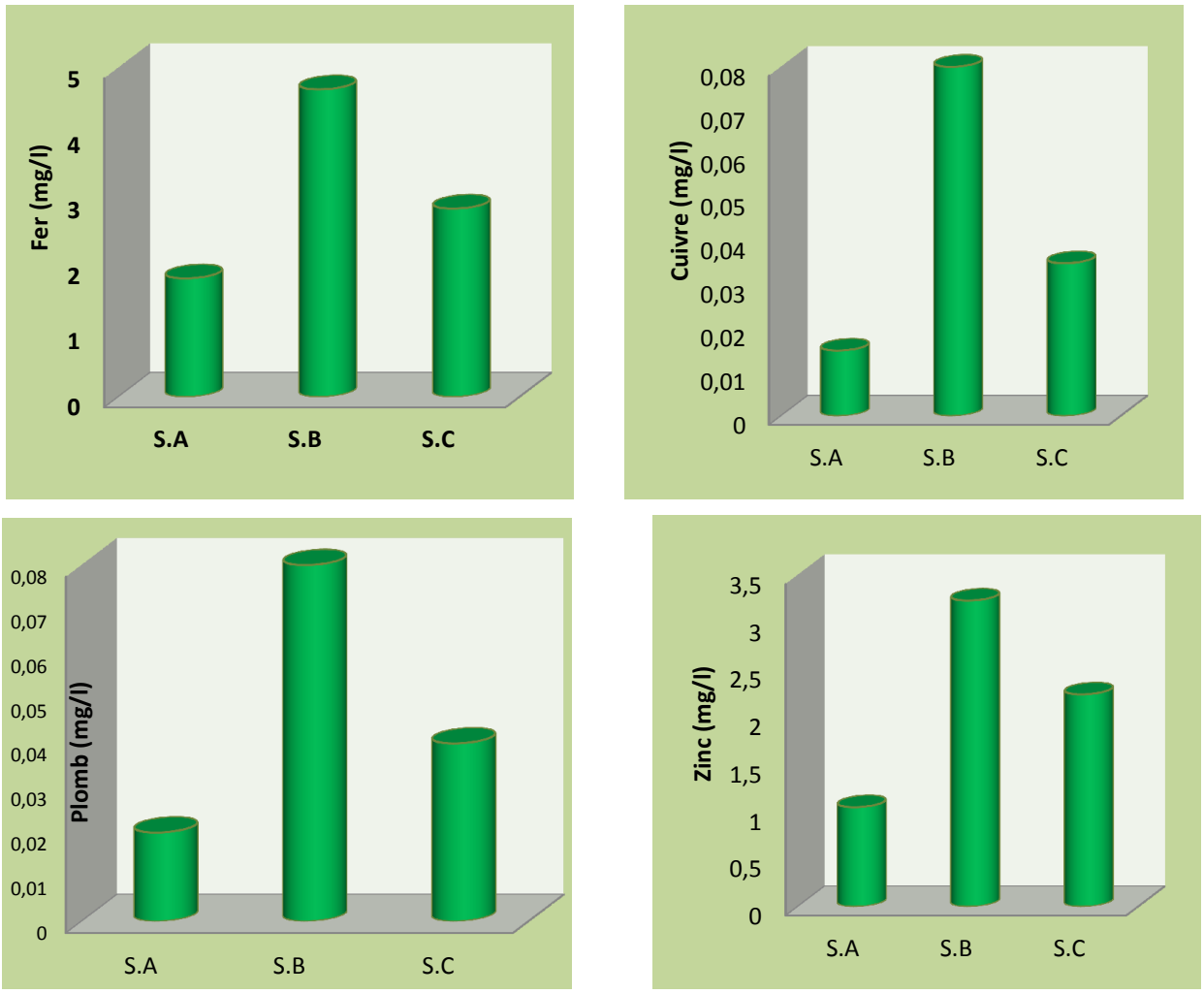


Figure2 : Variation spatiale de la teneur moyenne en Métaux lourds en fonction des stations de prélèvement.

4 DISCUSSION ET CONCLUSION

Les résultats montrent une faible contamination par le Cadmium dans toutes les stations. La valeur maximale est notée dans la station B (0,18 mg /l) et C en aval d'Oued R'dom qui peut s'expliquer par l'utilisation massive des engrais et des pesticides et des rejets déversés de certaines unités industrielles qui utilisent le Cadmium dans leurs activités notamment la métallurgie, la fabrication de céramique, l'industrie des colorants. La contamination par le chrome est répondue dans les trois stations, Ces stations reçoivent les rejets urbains et industriels de la ville qui sont à l'origine de cette contamination. La pollution par le fer est bien exprimée au niveau de la station B et C, avec des concentrations 4,67 et 2,86mg/l ; la contamination de l'aval indique une origine anthropique de ce métal, ainsi l'utilisation du fer par les installations industrielles dans les alliages et la métallurgie est en faveur de la pollution par ce métal, de même la pollution du plomb est bien exprimée dans les stations B et C avec des teneurs respectivement de 0,08 et 0,04mg /l qui reçoivent les rejets urbains et industriels (la fabrication des batteries électriques, la céramique, les alliages, la soudure et les tuyaux). La pollution des eaux par le cuivre est généralisée, Cette pollution peut être attribuée aux activités de la ville. La pollution par le zinc est bien marquée dans les stations étudiées, cette pollution peut s'expliquer par l'utilisation du zinc et ses composés dans quelques applications industrielles De même on trouve la pollution du zinc à l'aval qui peut s'expliquer par une utilisation excessive des pesticides en agriculture, l'emploi de ces produits dont leur préparation nécessite les sels de zinc et sont utilisés dans les zones agricoles modernes en aval dont les résidus sont drainés par les affluents dans Oued R'dom.

Les métaux lourds sont présents dans tous les compartiments de l'environnement, mais en général en quantité très faibles. On dit que les métaux sont présents « en traces ». Ils sont aussi « la trace » du passé géologique et de l'activité de l'homme.

Dans les eaux analysées, à part le Fe qui a dépassé le seuil d'acceptabilité, les autres éléments trace métalliques existent en quantité admise. Nos travaux concordent avec ceux de [3] et ceux réalisés au Nigéria concernant des études sur la pollution sur 26 cours d'eau de certains des Etats du sud et du nord du Nigéria[1], sur des cours d'eau du delta du Niger[5], sur la zone cacaoyère de l'Etat de Ondo dans le sud-ouest du Nigéria[8] et dans les eaux de Lagos[9] et ont montré que, à l'exception du fer, les concentrations de la plupart des métaux lourds présents dans les eaux de surface sont généralement inférieures à la moyenne mondiale des eaux de surface et aux normes internationales concernant l'eau potable.
En effet en absence de secteurs industriels très polluants raccordés directement au réseau d'assainissement, les concentrations en métaux lourds dans les effluents domestiques sont constantes et sous formes de traces dont l'essentiel est retenu dans les boues résiduaires. Ces éléments traces, immobilisés dans les zones superficielles du sol, peuvent provoquer des troubles de métabolisme des végétaux et animaux et donc contaminer les chaînes trophiques.

Les métaux lourds étudiés pourraient être classés par ordre d'abondance de la manière suivante : Fe > Zn > Cd > Pb > Cu > Cr.

L'enrichissement en fer est dû au contexte géologique régional. La même étude a montré que le sol de cette région est plus ou moins hydromorphe, la roche mère est constitue par la formation rouge (argile sableuse rouge), elle est surmonté par un horizon d'accumulation argilo-férrique provenant du lessivage de l'horizon supérieur. D'autre part, les sols cultivés peuvent contribuer dans l'apport en Zn. En effet, les fertilisants utilisés sont responsables de cet apport. Les travaux de [7] ont montré que les fertilisants à base azotée-phosphatée peuvent contenir jusqu'à 83,3 mg de Zn/Kg de fertilisants. En revanche, les sites de prélèvements étant localisés à proximité des zones d'habitation, ne témoignent d'aucune pollution importante par ces métaux.
L'absence, dans la quasi-totalité des cas, de traitement préalable des rejets industriels serait en grande partie responsable de la contamination des eaux souterraines de la région de Sidi Kacem, par les métaux lourds analysés. Nos résultats concordent avec ceux de [12] réalisées à Mohammedia et les travaux de [6], Ils sont arrivés à la conclusion que les concentrations de métaux ne constituaient pas un risque pour le biotope du lac Nakuru. Six ans plus tard, [4] ont étudié l'eau, le sédiment, le benthos et les poissons et ont mentionné des concentrations légèrement en hausse par rapport aux valeurs trouvées par [6].

L'activité industrielle est la principale responsable de la dégradation de cet écosystème, La présence de contaminants métalliques dans les eaux usées urbaines non traitées représente des dangers pour les organismes aquatiques et peut grandement affecter l'équilibre de l'écosystème. Cependant, si les concentrations enregistrées n'incitent pas à des inquiétudes immédiates et ne peuvent être à l'origine de toxicité aiguë, il faut souligner que le risque écotoxicologique réside dans le caractère cumulatif des métaux lourds qui interviennent dans des phénomènes de bioaccumulation, voire de bioamplification d'où la nécessité d'installer une station d'épuration dans la ville de Sidi Kacem et plus précisément au sain de chaque unité industrielle.

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Statistical tolerance analysis by integrating form deviations

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ABSTRACT: The objective of this paper is to present the analysis of geometric tolerances of the assembly design with the deviations and clearance method, for this we will study initially the tolerance analysis using the worst case method, in a second step we will integrate statistical Tolerancing approach, and finally we will integrate form deviations of the parts to study the impact of these deviations on the tolerance analysis.
To illustrate this process of analysis we used a classic case of assembly and we considered the location tolerance (perpendicularity) and the form tolerance (flatness).
Finally, a comparative study between the two statistical methods was illustrated.

KEYWORDS: Tolerance analysis, Deviations and Clearance method, Worst case method, Form deviations, Statistical method.

1 INTRODUCTION

The tolerance analysis is an estimate process of the accumulation of manufacturing tolerances and assemblability variations in a mechanism, due to dimensional and geometric variations in manufacture, orientation and position deviations of the various parts of the mechanism. A preliminary analysis of tolerances is essential to estimate the accumulation of the tolerances and avoid failures due to the propagation of the tolerances and infeasibility of assemblies.

We discuss in this paper the statistical analysis of geometric tolerances with the deviations and clearance method with consideration of form deviations.

The analysis of geometric tolerances without consideration of form deviations considers that the functional surfaces of the assembly parts are without form deviations, but in reality the form deviations affect the functional condition of mechanism (assembly mechanism), then it is necessary to integrate the influence of these deviations in the statistical tolerance analysis.

2 THE DEVIATION AND CLEARANCE DOMAINS METHOD

The deviations and clearances domains method allows the analysis of geometric tolerances of mechanical systems. Dimensional and geometric tolerances of the parts being fixed, the method used to define the relationship between functional tolerances and specific tolerances of the functional surfaces. This method has been developed and applied to mechanisms with links in series and in parallel [1], [2].

This approach is based on the small displacement torsor to specify the clearance and the deviation domains [3], [4], [8].

2.1 THE DEVIATION DOMAIN

Any surface has six deviations: 3 translations and 3 rotations. These deviations are low amplitude relative to the positions of the surfaces, it is possible to characterize with a small displacements torsor, where: $\overrightarrow{\delta\theta}$is the rotation vector and $\overrightarrow{\delta(M)}$ is the translation vector [5].

$$\left\{\begin{matrix}\overrightarrow{\delta\theta}\\ \overrightarrow{\delta(M)}\end{matrix}\right\}_M = \begin{pmatrix} r_x & t_x \\ r_y & t_y \\ r_z & t_z \end{pmatrix} \quad (1)$$

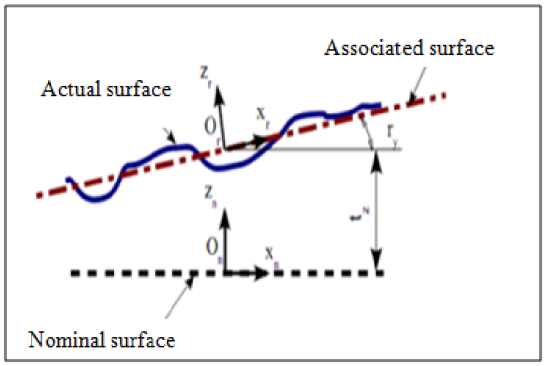

Fig. 1. Plan deviations

2.2 THE CLEARANCE DOMAIN

We considered a link between two parts; this connection is made by two contact surfaces. The clearance torsor of the link expresses the possible degrees of freedom between the two parts. The clearance torsor depends on the nature of the contacting surfaces.

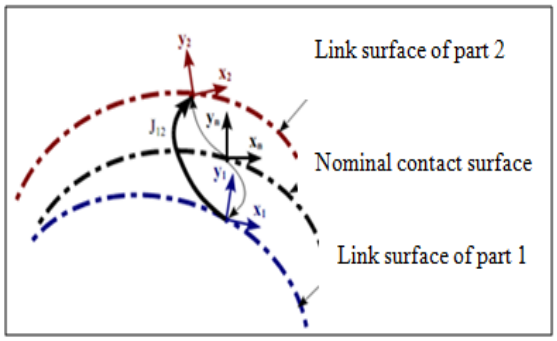

Fig. 2. Clearance between two parts

The clearance torsor of this link is noted J1A2:

$$J_{1A2} = \begin{Bmatrix} r_x & t_x \\ r_y & t_y \\ r_z & t_z \end{Bmatrix} \quad (2)$$

3 TOLERANCING USING THE DEVIATIONS AND CLEARANCE DOMAINS METHOD

In this article we will study a prismatic assembly of two parts, the objective is to study the tolerance analysis of this system. For this we will use three methods: the tolerance analysis with the worst case method, the statistical tolerance analysis method and the statistical tolerance analysis method with form deviations. [6], [7], [9], [10], [11],[13].

3.1 EXAMPLE STUDY

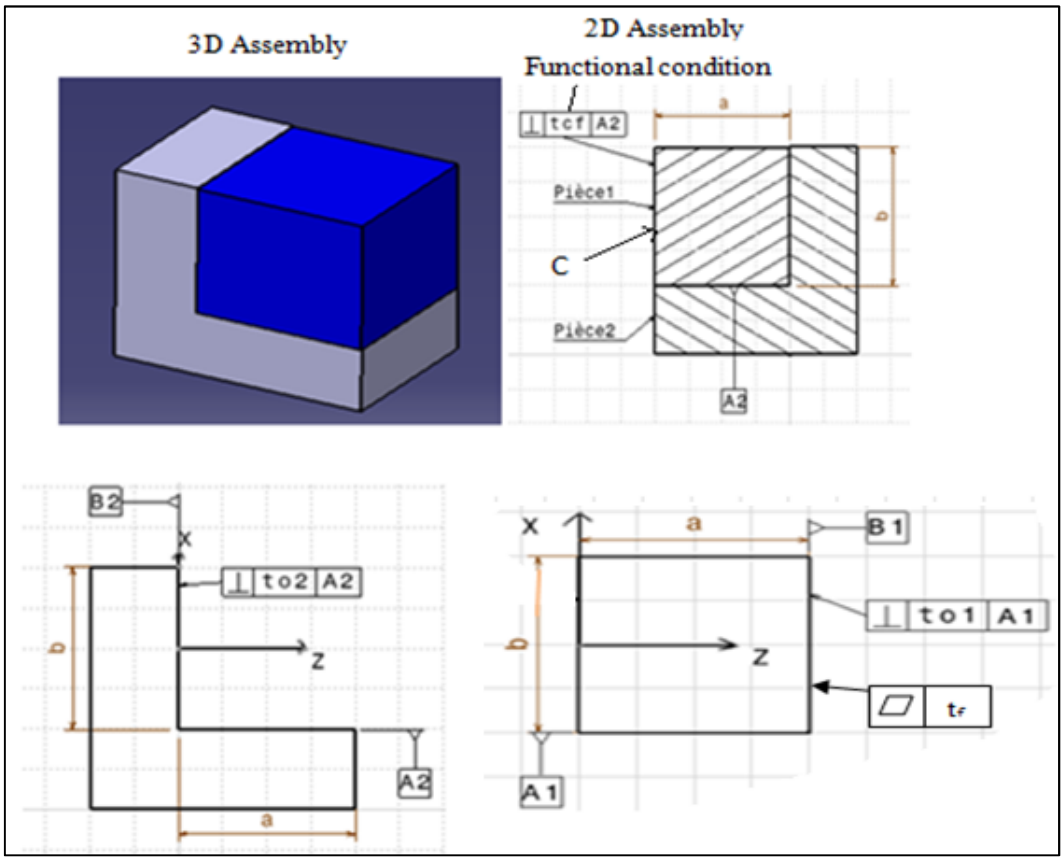

Fig. 3. Example Study

Hypothesis

- The assembly of two parts (1) and (2) is made without clearance.
- The study concerns only the parts functional surfaces (surfaces that influence the functional condition)
- The assembly is without deformations of parts
- It is assumed that a = b

3.2 TOLERANCING WITH THE WORST CASE METHOD

- Study of the deviations domains
    - Deviation domain of the part (1)

The surface (A1) of the part (1) is a reference surface of the perpendicularity tolerance of the surface (B1), then the deviation domain of this surface is: $E_{1A} = 0$

The surface (B1) is a flat surface with the perpendicularity tolerance and then the deviation torsor of this surface is:

$$E_{1B} = \left\{ \begin{matrix} r_x & 0 \\ r_y & 0 \\ 0 & t_z \end{matrix} \right\}_{(O,x,y,z)} \quad (3)$$

To respect the perpendicularity tolerance of the surface (B1) requires that the displacement of the points O1, O2, O3and O4 along the axis Z does not exceed the tolerance interval (to1) [12].

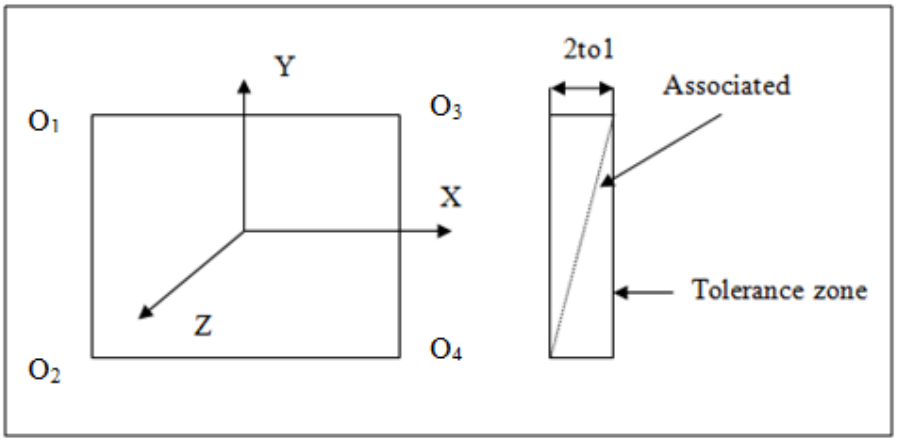

Fig. 4. Presentation of the tolerance zone of perpendicularity

This condition can be represented as follows:

$$\begin{cases} -t_{o1} \leq \overrightarrow{\delta 01}.\vec{z} \leq t_{o1} \\ -t_{o1} \leq \overrightarrow{\delta 02}.\vec{z} \leq t_{o1} \\ -t_{o1} \leq \overrightarrow{\delta 03}.\vec{z} \leq t_{o1} \\ -t_{o1} \leq \overrightarrow{\delta 03}.\vec{z} \leq t_{o1} \end{cases} \quad (4)$$

The deviation domain E1B in the center of the flat surface (B1) is represented by the following inequalities:

$$(E_{1B})_O = \begin{Bmatrix} -t_{o1} \leq ar_y + ar_x \leq t_{o1} \\ -t_{o1} \leq ar_y - ar_x \leq t_{o1} \end{Bmatrix} \quad (5)$$

The graphical representation of the deviation domain E1B is the following form:

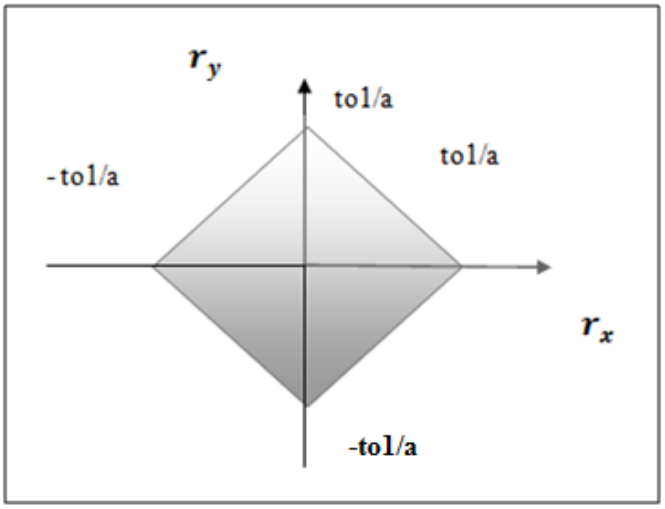

Fig. 5. Representation of the Deviations Domain E1B of perpendicularity

- Deviation domain of the part (2)

The surface (A2) of the part (2) is a reference surface of the perpendicularity tolerance of the surface (B2), then the deviation domain of this surface is: $E_{2A} = 0$

The surface (B2) is a flat surface with the perpendicularity tolerance, and then the deviation torsor of this surface is:

$$E_{2B} = \left\{ \begin{matrix} r_x & 0 \\ r_y & 0 \\ 0 & t_z \end{matrix} \right\}_{(O,x,y,z)} \quad (6)$$

To respect the perpendicularity tolerance of the surface (B2) requires that the displacement of the points O1, O2, O3 and O4 along the axis Z does not exceed the tolerance interval (t_{o2})

Similarly of the deviation domain E1B, The deviation domain E_{2B} in the center of the flat surface (B2) is represented by the following inequalities:

$$(E_{2B})_O = \begin{Bmatrix} -t_{o2} \leq ar_y + ar_x \leq t_{o2} \\ -t_{o2} \leq ar_y - ar_x \leq t_{o2} \end{Bmatrix} \quad (7)$$

The graphical representation of the deviation domain E2B is the following form:

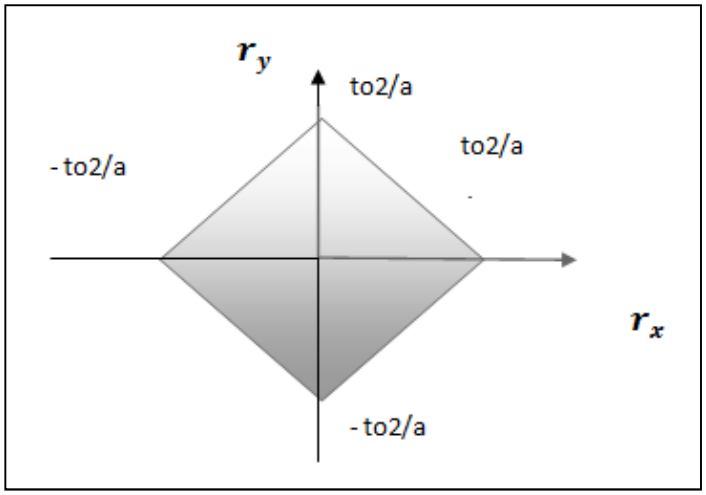

Fig. 6. Representation of the Deviations Domain E2B of perpendicularity

- The deviation domain of functional condition

In this example the functional condition of the assembly is the respect of the perpendicularity of the surface C of the part (1) relative to a reference surface A2 of the part (2).

Similarly the deviation domain E1B and E2B, the deviation domain of the functional condition E_{CF} is obtained by the following inequalities:

$$(E_{CF})_O = \begin{Bmatrix} -t_{cf} \leq ar_y + ar_x \leq t_{cf} \\ -t_{cf} \leq ar_y - ar_x \leq t_{cf} \end{Bmatrix} \quad (8)$$

The graphical representation of the deviation domain ECF is the following form:

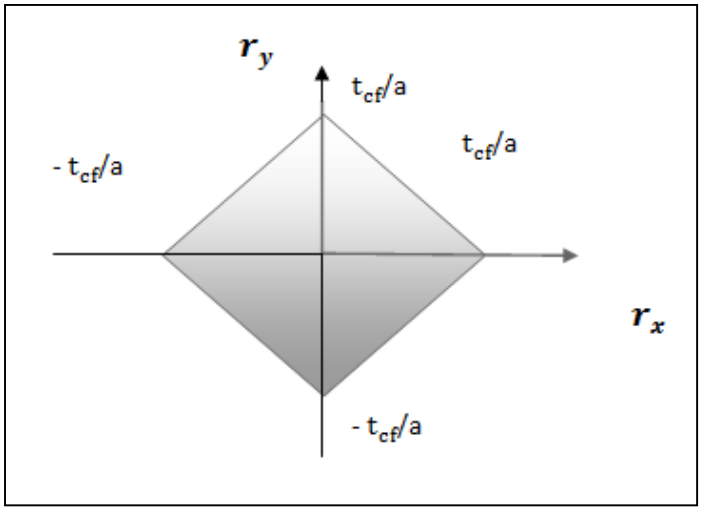

Fig. 7. Representation of the Deviations Domain ECF

- Verification of the functional condition

In this case we have an assembly of parts (1) and (2) without clearances, then to respect the functional condition, it is necessary that the Minkowski sum of deviations domains E_{1B} and E_{2B} is less than the deviation domain of functional condition: $E_{1B} + E_{2B} \leq E_{CF}$

In worst case we have: $t_{o1} + t_{o2} = t_{cf}$

3.3 TOLERANCING USING THE STATISTICAL METHOD

The tolerance analysis with the worst case method considers that the deviations domain components are uniformly distributed as shown in the following figure, or in reality the components are normally distributed relative to the center (towards the center) , then with the worst case method we guaranteed the functional condition but we increase the cost of product . [12]

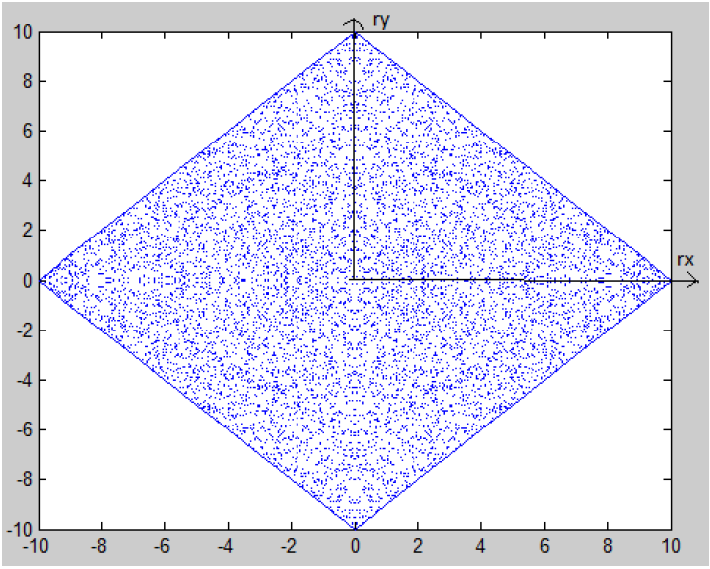

Fig. 8. Worst case Tolerancing (uniformly distribution)

To extend the tolerance intervals and reduce the cost of production, we use the tolerance statistical method.

- Simulation data
  - Tolerance orientation (perpendicularity): to= 0.1mm =100 µm
  - Lengths: a = b = 10 mm
  - r_x: is the normal distribution with mean (m = 0 µm) and standard deviation (σ = 3.33 µm)
  - r_y: is the normal distribution with mean (m = 0 µm) and standard deviation (σ = 3.33 µm)
  - Deviation form (flatness) are not taken into account
- The statistical simulation algorithm

➢ *Define constant values, and initiate counter number of parts*
- ✓ *a=b=10mm*
- ✓ *t_0=100 µm*
- ✓ *c= 0*

➢ *For i from 1 to n do:*
- ✓ *r_x: receive a random value according to a normal distribution with mean and standard deviation (0, 3.33)*
- ✓ *r_y: receives a random value according to a normal distribution with mean and standard deviation (0, 3.33)*
- ✓ *Calculate the displacement of extreme points of the surface to be checked Z_1, Z_2.*
  - *$Z_1 = ar_y + br_x$*
  - *$Z_2 = ar_y - br_x$*
- ✓ *Check the requirements for functionality and acceptance of the part i:*
  - *IF ($-to \le Z_1 \le to$ & $-to \le Z_2 \le to$)*
  - *Plot (r_{xi} , r_{yi})*
  - *Increment the counter c with +1*
- ✓ *End the IF condition check*

➢ *End of repeat loop for*

➢ *End of algorithm*

- Program execution and interpretation of results

After executing the program with Matlab (c = 10286 points) we obtained the following figure:

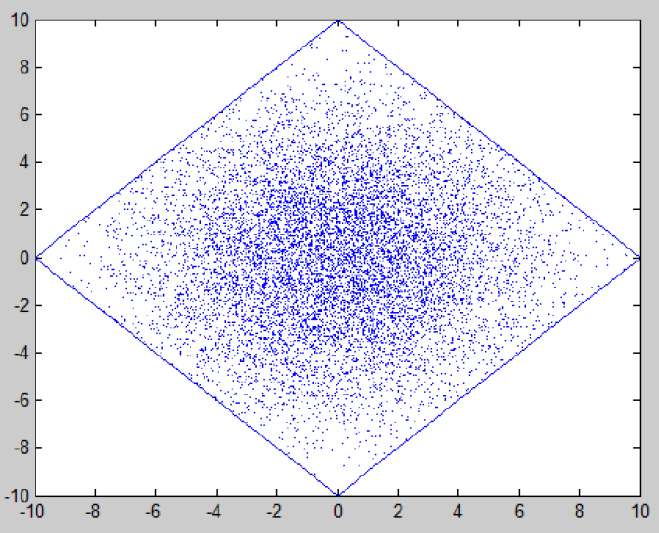

Fig. 9. Statistical Tolerancing (normal distribution)

With this statistical tolerance analysis we note that the parts distribution is centered on the origin of the tolerance zone, this means that there is a low probability that the part is on the limits of the tolerance zone, therefore we can extend specific tolerances of the individual parts without losing much on the functional condition to reduce the cost of production of the product.

3.4 TOLERANCING USING THE STATISTICAL METHOD WITH FORM DEVIATIONS

Usually a piece generates two types of defects: the orientation defect and a form deviation, in our example we have these types of defects, so to make a precise statistical tolerance analysis, we must integrate the deviation form in the analysis.

We note that when the orientation deviation of a part is minimal, the deviation forms do not affect the functional condition, but when the orientation deviation is maximum, the form deviation affect the functional condition.

The objective of this section is to treat the same example using the statistical method with form deviation (flatness).

- Simulation data
    - Tolerance orientation (perpendicularity) :to= 0.1mm
    - Lengths: a = b = 10 mm
    - r_x: is the normal distribution with mean (m = 0 µm) and standard deviation (σ = 3.33 µm)
    - r_y: is the normal distribution with mean (m = 0 µm) and standard deviation (σ = 3.33 µm)
    - tf: the tolerance of form is the normal distribution with mean (m=10 µm) and standard deviation (σ = 3.33 µm)
    - r = 0.2: this is the ratio between the orientation deviation and form deviation
    - c1: Counter of the accepted parts taking into account form deviation
    - c2: Counter unaccepted parts with consideration of form deviations
    - c = c2 / (c1 + c2) is the rate of non-conformities
- The statistical simulation algorithm
    - *Define constant values, and initiate counter number of number of parts*
        - ✓ *a=b=10 mm*
        - ✓ *to=100 µm*
        - ✓ *c1= 0*
        - ✓ *c2=0*
    - *For i from 1 to n do:*
        - ✓ *r_x: receive a random value according to a normal distribution with mean and standard deviation (0, 3.33)*
        - ✓ *r_y: receives a random value according to a normal distribution with mean and standard deviation (0, 3.33)*
        - ✓ *tf : receives a random value according to a normal distribution with mean and standard deviation (10, 3.33)*
        - ✓ *Calculate the displacement of extreme points of the surface to be checked Z_1, Z_2.*
            - *$Z_1 = ar_y + br_x$*
            - *$Z_2 = ar_y - br_x$*
        - ✓ *Check the requirements for functionality and acceptance of the part i:*
            - *IF $(-to \leq (Z_1 - t_f/2)$ &$(Z_1 + t_f/2) \leq to$ & $-to \leq (Z_2 - t_f/2)$ & $(Z_2 - t_f/2) \leq to)$*
            - *plot (r_{xi} , r_{yi}) in green*
            - *Increment the counter c1 with +1*
            - *ELSE IF $(-to \leq Z1 \leq to$ & $-to \leq Z2 \leq to)$*
            - *Plot (r_{xi} , r_{yi}) in red*
            - *Increment the counter c2 with +1*
        - ✓ *End the IF condition check*
    - *End of repeat loop for*
    - *End of algorithm*

- Program execution and interpretation of results

After executing the program of this simulation we obtained the following figure:

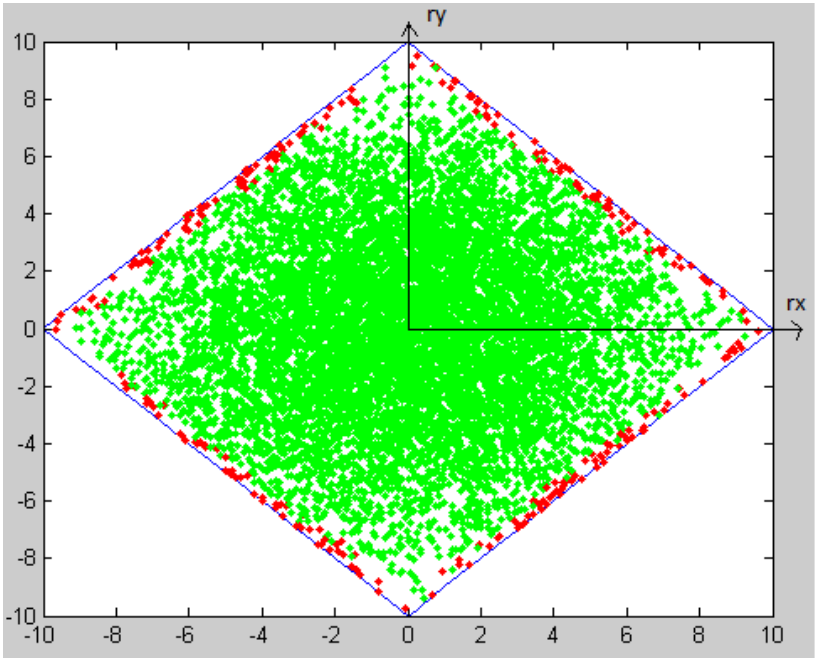

Fig. 10. Statistical Tolerancing taking into account the form deviations

Parts drawn in green are accepted parts with a tolerance analysis with consideration of two types of defects perpendicularity and flatness, while the parts are drawn in red is the defective parts with consideration of form deviations (the flatness)

To illustrate the influence of this type of defects we calculated a rate of non-compliance ten times and we took an average this rate of 2.9, around 3% of non-conforming parts.

4 CONCLUSION

In this paper we presented a simple example for tolerance analysis method with the deviation and clearance domain method in worst case and statistical approach and with influence of form deviations

At first we studied the example with the worst case method and using the statistical method and finally we integrated the influence of form deviation on the statistical tolerance analysis

To illustrate a comparison between the statistical method with and without consideration of form deviations we calculated a rate of non-conformity which shows the rate of part no-conforms by integrating form deviations

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SMS-Based Alert Notification for Credit Applications Queuing Systems

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ABSTRACT: This paper defines the building blocks and derives basic queuing systems that provide some sort of services by moving customers in a particular order to a specific service according to the customer requirements and also integrated Alert Notification via SMS to be sent to customers updating them of the progress as they wait. The study focuses on the bank line system mostly on credit applications, the different queuing algorithms that are used in banks to serve the customers, and the average waiting time. The main aim of this research is to develop a Model that integrate Alert notification via SMS on credit applications during queuing system and analyze the queue status to decide on which customer to serve. The researcher adopted empirical approach to achieve his objectives. The target population covers mainly the customers at Bank. The researcher applied a probability sampling technique to select respondents. There were a couple of interviews and questionnaires conducted to bank customers to find out their satisfaction level about the current system and acceptance of the proposed system during data collection which enable easy of analysis. The data was then tabulated and presented in a graph for presentation purposes. The researcher used the research study findings to design and develop a model. The requirements for this model were obtained from the responses that the target population gave. Some of the variable loaded low than the theoretical established entry values were therefore dropped, while the ones that loaded higher than these thresholds were retained. These are the ones that were included in the final loaded model constructed using AMOS software.

KEYWORDS: Building Blocks, Model, Queue System, Algorithms.

ABBREVIATIONS:

SMS: **S**hort **M**essaging **S**ervices
AMOS: **A**nalysis of **MO**ment **S**tructures

1 INTRODUCTION

Alert Notification via SMS is an system that uses Short Messaging System (SMS) to notify customers from their remote mobile phone on the progress of their loan applications. It is incorporated on customer credit applications services. According to Zudiana,(2006), Short Message Services (SMS) allow for the delivery of short, text-based messages, usually between wireless devices such as cell phones which can be used for making decision. Alerts are typically delivered through a notification system and the most common application of the service is machine-to-person communication (Jennifer Rizzo, 2011).

Queuing system is defined as a mathematical study of waiting lines, or queues. According Sundarapandian, (2009), queuing theory intends to develop model to assist in predicting the queue lengths and waiting times. The delays in receiving service, which lead to queuing, are the usual problems in banking services (Harchol-Balter, 2012). This is majorly affect the credit application services where the customers wait in vain for the confirmation of their credit application progess (Van , 2014).

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In this paper, the researchers investigated three basic elements associated with queuing systems and which are thought to be service oriented: Priorities, state dependent arrivals and SMS Notifications which covers the application cycle in Model development. Queuing systems are particularly suitable for organizations which offer services that rely on the physical appearance of their customers. This physical appearance usually leads to queues of people when those services are frequented extensively (Lothar , 2014). The system enables these customers to be updated automatically instead of visiting the banks, hence are able to perform other useful economic activities.

The paper used the Innovation Diffusion Theory to examine the Integration of Alert Notification via SMS on credit application on queuing systems. The empirical analysis was based on the observed data of credit application services at the credit department unit of a bank. These data were analyzed and analysis of moment structures method was used to design and develop an adoption model for SMS-Based Alert Notification For Credit Applications Queuing Systems (SBANCA). The developed queuing model could enhance customer service, improving efficiency, track the progress and reducing time. This is possible through building a homogenous way that analyze the queue status and take decisions about which customer to serve by using the appropriate scheduling algorithm.

2 RELATED WORK

2.1 QUEUING SYSTEMS CHARACTERISTICS & SCHEDULING ALGORITHM

In his research Hardik, (2010), the characteristic of a queuing system consists of one or more servers that provide service to arriving customers during their application. It is extremely useful in predicting and evaluating system performance in an institution. Figue1 below show the building blocks of a typical queuing system.

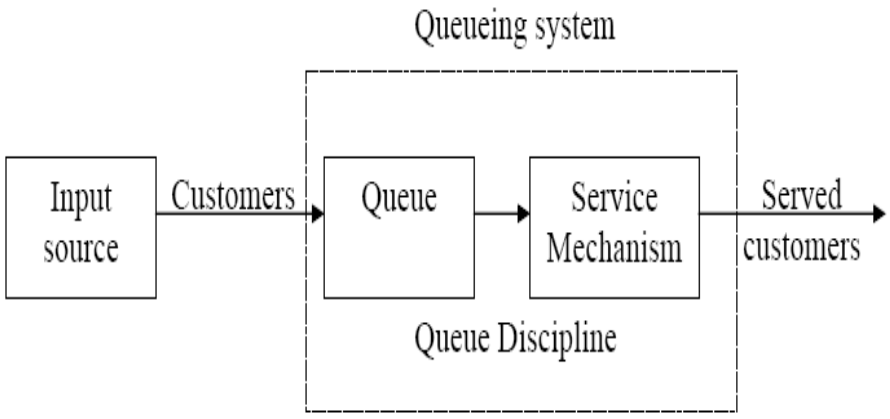

Figure 1: Characteristics Of Queuing System

Characteristics of a queuing system can be completely described by the input or arrival pattern (customers), the service mechanism (service pattern), the "queue discipline", the customer's behavior and the arrival to the service center in a random fashion (Ahmed, 2011). Queue represents a certain number of customers waiting for service. The capacity of a queue is either limited or unlimited. Bank is an example of unlimited queue length.

According to Sarka (2011), the number of arrivals of customers during some time period *T*, can be predicted by equation 1 below. The distribution appears as in equation 1and is obtained by finding the probability of exactly *n* arrivals during *T*. If the arrival process is random, the distribution is the Poisson (Little, 2013), and the formula is:

$$PT(n) = (\lambda T)^n e^{-\lambda T}/n! \quad (1)$$

The average utilization of the bank teller is given by relation 2 as:

$$\rho = \lambda/\mu \quad (2)$$

where ρ is the ratio of total arrival rate to service rate for a single *teller, λ is the* Arrival rate *and μ is the* service rate.

The average number of customers in the waiting line is given by relation 3:

$$Lq = \lambda^2/\mu(\mu - \lambda) \quad (3)$$

The average number of customers in the system is given by equation 4:

$Ls = \lambda/\mu - \lambda$ (4)

Average waiting time in the bank line is as given by equation 5:

$Wq = Lq/\lambda$ (5)

Average waiting time in the system is obtained by using the equation 6:

$Ws = Ls/\lambda$ (6)

The above equations were considered during the process of developing the proposed model.

2.2 SCHEDULING ALGORITHM

In his study, Mohamad, (2011) noted that the most general scheduling algorithms are

- FCFS (First Come First Serve): The customers are served in the order of their arrival, which is most visibly fair because all customers think of themselves as equal.
- RSS (Random Selection for Service): In this algorithm, customers are selected for service at random, so each customer in the queue has the same probability of being selected for service irrespective of his/her arrival in the service system.
- PRI (Priority Service): The customers are grouped in priority classes according to some external factors. The customer with the highest priority is served first.
- SPF (Shortest Processed First): The algorithm assumes that the service times are known in advance. When several customers are waiting in the queue, the SPF algorithm picks the shortest service time first.

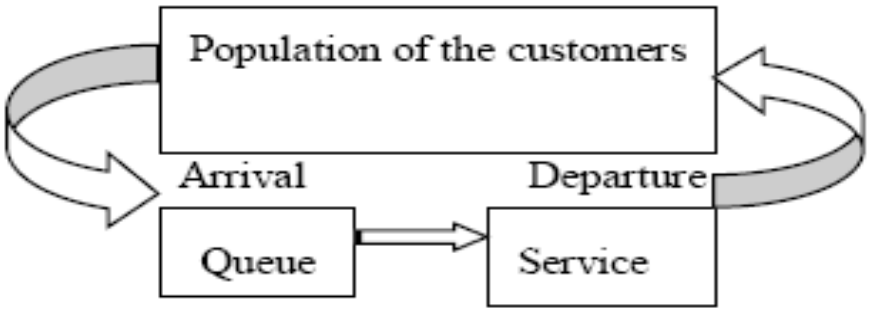

Figure 2: Simplest Queuing System

The departure represents the way customers' application leave the system. According to Huda (2011), queuing system consist of models such as:

Single Queue: In this model each customer waits till the service point is ready to take him for servicing.

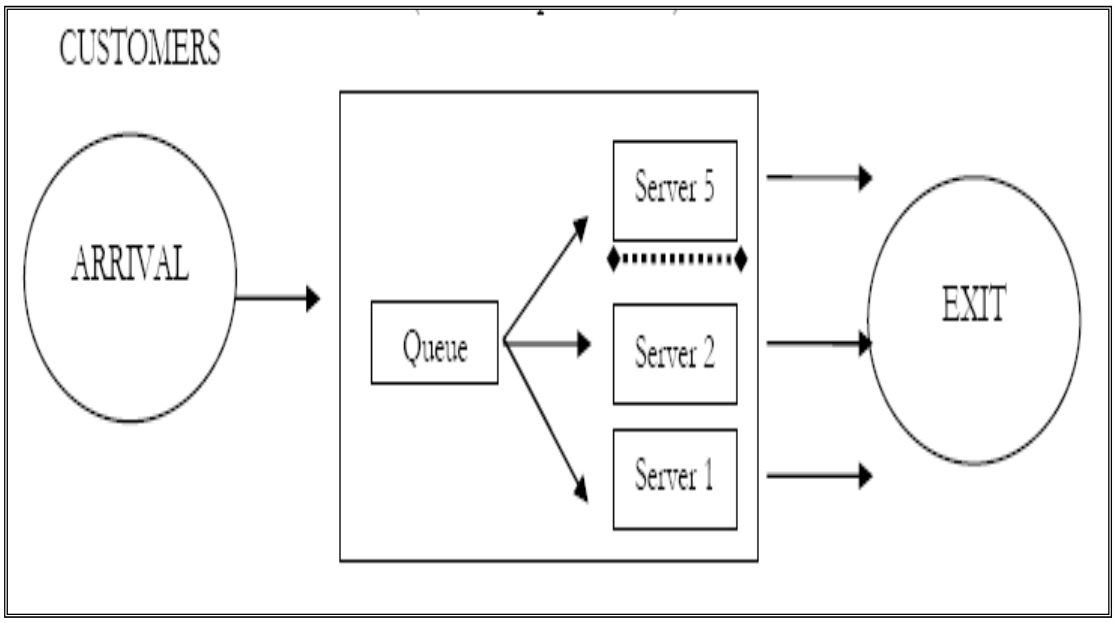

Figure 3: Single Queuing Model With Single –Queue And Multiple Parallel Servers

- **Multiple Queues:** In this model each customer tries to choose the shortest queue from a number of individual queues.

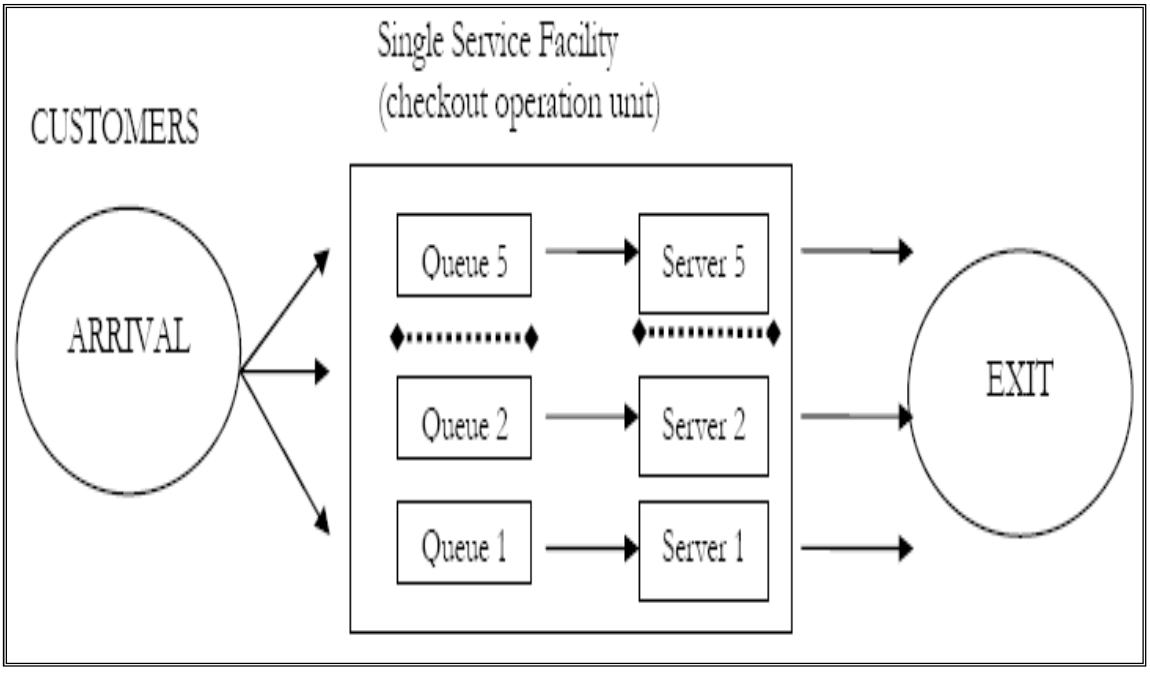

Figure 3: Single Stage Queuing Model With Multiple –Queue And Multiple Parallel Servers

- **Diffuse Queue:** In this model each customer take a ticket from a ticket machine with single or multiple buttons each for specific service. After the customer registers his/her place in the queue by a ticket he/she will monitor the ticket number being served. The customers can not estimate when they will be served.

3 METHODOLOGY

According to Rajasekar(2013), methodology is a science of studying how research is to be carried out, essentially, the procedures by which researchers go about their work of describing, explaining and predicting. A survey methodology was adopted for this research study.

Queuing Theory is a mathematical method of analyzing the congestions and delays of waiting in line during a service. It examines every request of waiting in line to be served, including the arrival process, service process, number of servers, number of system places and the number of customers (Ben McClure, 2014). Researchers in the area of Information Systems and Information Technology are interested in investigating the theories and models that will have power in predicting and explaining behaviour across many domains. The key objectives of these researches are to investigate how to promote usage and also examining what hinders usage and intention to use the technology.

The researchers used the innovation diffusion theory (IDT) to design and develop the proposed SMS-Based Alert Notification for Credit Applications Queuing Systems (SBANCA). The conceptual model of this IDT I shown in Figure 4 below.

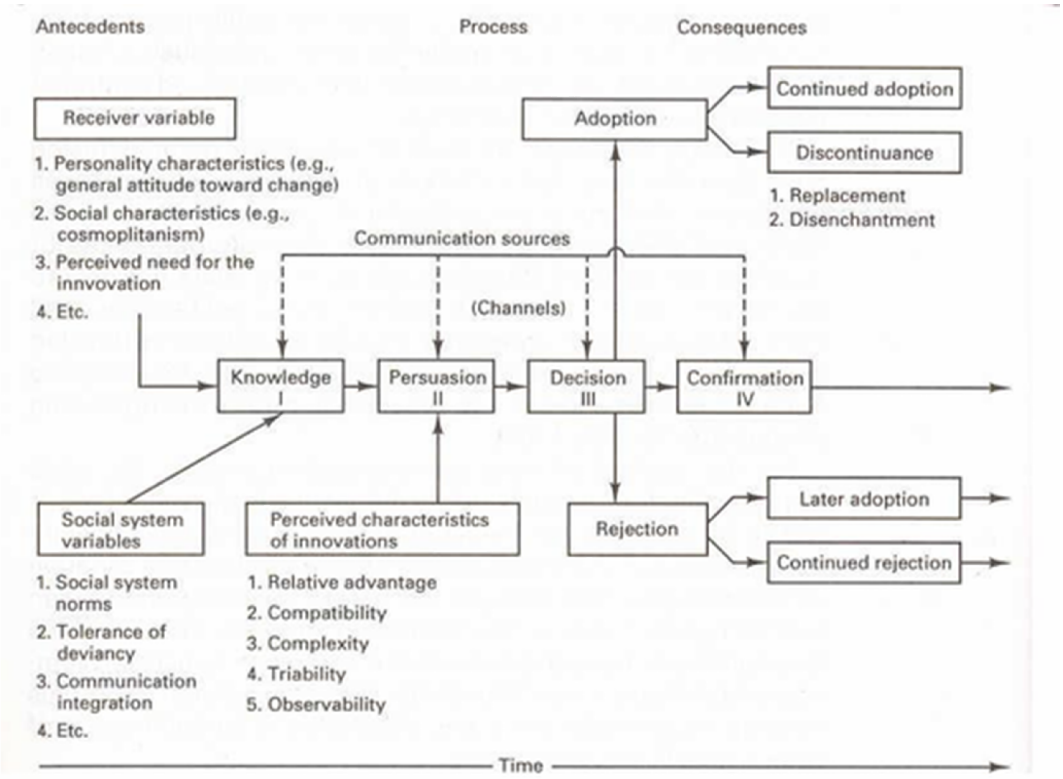

Figure 4: Conceptual Framework Of The Innovation Diffusion Theory

The researchers modified the IDT by adding ten observable variables. The Receiver Variables included three variables: Flexibility To Accommodate Change (FTAC), Faster Decision Making Process (FDMP), and Quick System Response (QSR). The Social Systems Variables incorporated three variables: Level Of Education Of The Customers (LOEOC), Experience Of The Customers With Technology (EOCWT) and Financial Status Of Customers (FSOC). Finally, the Perceived Characteristics Of Innovation was measured using three variables: Convenience (CONV), Efficiency (EFF), Compatibility With Existing GSM Phones (CWEGP) and Easy Deployment (ED). The Receiver Variables (RVs), Social Systems Variables (SSVs) and Perceived Characteristics Of Innovation (PCOI) formed the latent variables for the study. From these variables, ten null and alternate hypotheses were derived as follows. The researchers then used the P-value method to determine if the null hypotheses should be rejected or adopted.

Receiver Variables (RVs)

H1RVs - Customers' flexibility to change can positively influence SMS-Based Alert queuing system adaption

H_0: μ_F-μ_S =0; H_A: μ_F-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μ_F is mean for flexibility while

μ_S is the mean for SMS-Based Alert queuing system adaption

H2RVs – Faster decision making process positively influence SMS-Based Alert queuing system adaption

H_0: μ_D-μ_S =0; H_A: μ_D-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μ_D is mean for decision making while μ_S is the mean for SMS-Based Alert queuing system adaption

H3RVs – Quick system response positively influences SMS-Based Alert queuing system adaption

H_0: μ_R-μ_S =0; H_A: μ_R-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μ_R is mean for response while

μ_S is the mean for SMS-Based Alert queuing system adaption

Social Systems Variables (SSVs)

H1SSVs – Customers' level of education affects their adoption of SMS-Based Alert queuing system

H_0: μ_E-μ_S =0; H_A: μ_E-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μE is mean for education while

μ_S is the mean for SMS-Based Alert queuing system adaption

H2SSVs – Customers' experience with technology affects their adoption of SMS-Based Alert queuing system

H_0: μ_X-μ_S =0; H_A: μ_X-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μ_X is mean for experience while μ_S is the mean for SMS-Based Alert queuing system adaption

H3SSVs – Customers' financial status affects their adoption of SMS-Based Alert queuing system

H_0: μ_F-μ_S =0; H_A: μ_F-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μ_{FS} is mean for financial status while μ_S is the mean for SMS-Based Alert queuing system adaption

Perceived Characteristics Of Innovation (PCOI)

H1PCOI – Convenience of an SMS-Based Alert queuing system can positively influence its adoption

H_0: μ_{CON} -μ_S =0; H_A: μ_{CON}-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μ_{CON} is mean for convenience while μ_S is the mean for SMS-Based Alert queuing system adaption

H2PCOI – Efficiency of an SMS-Based Alert queuing system can positively influence its adoption

H_0: μ_{EF}-μ_S =0; H_A: μ_{EF}-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μ_{EF} is mean for response while μ_S is the mean for SMS-Based Alert queuing system adaption

H3PCOI – Compatibility with existing GSM phones of an SMS-Based Alert queuing system can positively influence its adoption

H_0: μ_{COM}-μ_S =0; H_A: μ_{COM}-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μ_{COM} is mean for response while μ_S is the mean for SMS-Based Alert queuing system adaption

H4PCOI – Easy deployment of an SMS-Based Alert queuing system can positively influence its adoption

H_0: μ_{DEP}-μ_S =0; H_A: μ_R-μ_S ≠0; H_0 is the null hypothesis, H_A is an alternate hypothesis; μ_{DEP} is mean for response while μ_S is the mean for SMS-Based Alert queuing system adaption

A survey was conducted to collect sample data to examine the proposed research model. The sample selected for the analysis was some appropriate IT innovation project, which were useful to validate the proposed model. The methods utilized include the descriptive statistics methods to deal with the raw data from the survey, and the statistical inference methods (use of Independent Samples t-test)) to prove the hypotheses above. The conceptual model that was utilized was as follows.

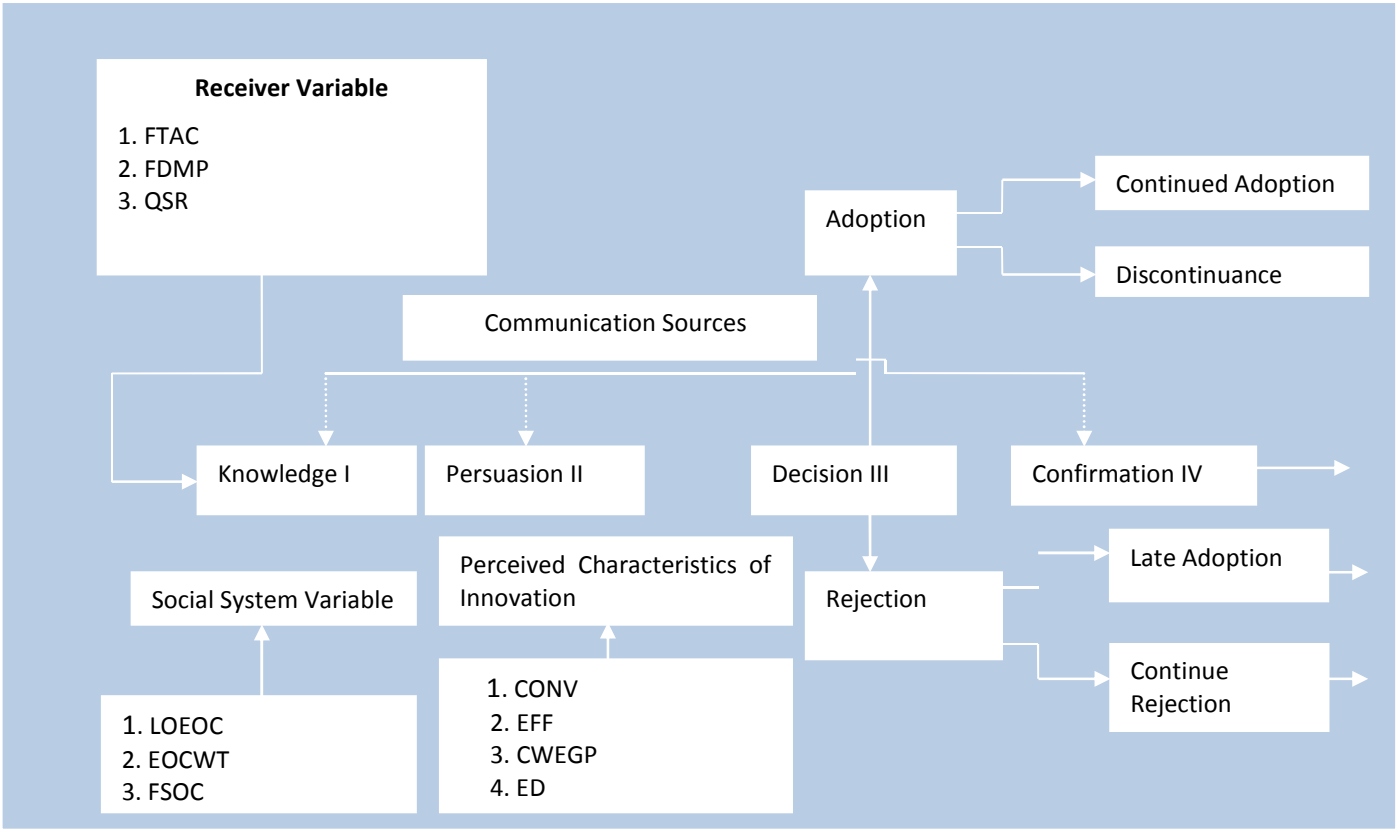

Figure 5: Conceptual Model

4 RESULTS AND DISCUSSION

The added variables in Figure 5 above were formulated into a questionnaire that was then availed to the bank credit services customers. To accept or reject the null hypotheses above, P-value was used. This "Sig" value is what is referred to as the P-value. It is the probability of seeing a test score this extreme or more [in the direction of the alternative hypothesis] if the null hypothesis is true. The smaller the number, the more rare our test score is under Ho and the more likely that the null hypothesis isn't true. Using the .05 significance level (Petrović, 2013) as our cutoff various null hypotheses proposed above were tested. The essence was to determine if there is a statistical difference in the adoption of an SMS-Based Alert queuing system of and the various factors that influence its adoption. Sine Sig is 2-tailed, we divided by 2, subtract this value from 1 to get the actual value for the P-value.

Scenario 1 - $H_0: \mu_F-\mu_S=0$; $H_A: \mu_F-\mu_S\neq0$

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
FTAC	Equal variances assumed	6.618	.026	-.972	11	.352	-.475	.488
	Equal variances not assumed			-1.111	10.941	.290	-.475	.428

Figure 6: Independent Samples T-Test For FTAC Against Adoption

The P-value was 0.352/2= 0.176; 1-0.176=0.824, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is flexibility and adoption are correlated (*H_0: μ_F-μ_S=0; Strongly accepted*).

Scenario 2 - *H_0: μ_D-μ_S=0; H_A: μ_D-μ_S≠0;*

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
FDMP	Equal variances assumed	.004	.951	-.492	11	.632	-.225	.457
	Equal variances not assumed			-.470	7.415	.652	-.225	.479

Figure 7: Independent Samples T-Test For FDMP Against Adoption

The P-value was 0.632/2= 0.316, 1-0.316=0.686, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is flexibility and adoption are correlated (*H_0: μ_D-μ_S=0; accepted*).

Scenario 3 - *H_0: μ_R-μ_S=0; H_A: μ_R-μ_S≠0;*

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
QSR	Equal variances assumed	.081	.781	.055	11	.957	.025	.457
	Equal variances not assumed			.052	7.415	.960	.025	.479

Figure 8: Independent Samples T-Test For QSR Against Adoption

The P-value was 0.957/2= 0.479, 1-0.479=0.521, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is flexibility and adoption are correlated (*H_0: μ_R-μ_S=0; loosely accepted*).

Scenario 4 - *H_0: μ_E-μ_S=0; H_A: μ_E-μ_S≠0;*

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
LOEOC	Equal variances assumed	12.692	.004	-1.188	11	.260	-.250	.211
	Equal variances not assumed			-1.528	7.000	.170	-.250	.164

Figure 9: Independent Samples T-Test For LOEOC Against Adoption

The P-value was 0.260/2= 0.130, 1-0.13=0.87, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is flexibility and adoption are correlated (*H_0: μ_E-μ_S=0; Strongly accepted*).

Scenario 5 - $H_0: \mu_X-\mu_S=0$; $H_A: \mu_X-\mu_S\neq0$;

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
EOCWT	Equal variances assumed	3.291	.097	-.777	11	.453	-.125	.161
	Equal variances not assumed			-1.000	7.000	.351	-.125	.125

Figure 10: Independent Samples T-Test For EOCWT Against Adoption

The P-value was 0.453/2= 0.227, 1-0.227=0.773, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is flexibility and adoption are correlated ($H_0: \mu_X-\mu_S=0$; *Moderately accepted*).

Scenario 6 - $H_0: \mu_F-\mu_S=0$; $H_A: \mu_F-\mu_S\neq0$;

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
FSOC	Equal variances assumed	.662	.433	-.794	11	.444	-.325	.409
	Equal variances not assumed			-.743	6.938	.482	-.325	.437

Figure 11: Independent Samples T-Test For FSOC Against Adoption

The P-value was 0.444/2= 0.222, 1-0.222=0.778, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is flexibility and adoption are correlated ($H_0: \mu_F-\mu_S=0$; *Moderately accepted*).

Scenario 7 - $H_0: \mu_{CON}-\mu_S=0$; $H_A: \mu_{CON}-\mu_S\neq0$;

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Convience	Equal variances assumed	.019	.893	-1.282	11	.226	-.650	.507
	Equal variances not assumed			-1.279	8.572	.234	-.650	.508

Figure 12: Independent Samples T-Test For CONV Against Adoption

The P-value was 0.226/2= 0.113, 1-0.113=0.887, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is Convenience and adoption are correlated ($H_A: \mu_{CON}-\mu_S\neq0$; *strongly accepted*).

Scenario 8 - $H_0: \mu_{EF}-\mu_S=0$; $H_A: \mu_{EF}-\mu_S\neq0$;

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
EFF	Equal variances assumed	.504	.492	-.429	11	.676	-.250	.583
	Equal variances not assumed			-.433	8.876	.676	-.250	.578

Figure 13: Independent Samples T-Test For EFF Against Adoption

The P-value was 0.676/2= 0.338, 1-0.338=0.662, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is Convenience and adoption are correlated (H_A: μ_{EF}-$\mu_S \neq 0$; *accepted*).

Scenario 9 - H_0: μ_{COM}-$\mu_S = 0$; H_A: μ_{COM}-$\mu_S \neq 0$;

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
CWEGP	Equal variances assumed	.657	.435	.429	11	.676	.125	.291
	Equal variances not assumed			.368	5.274	.727	.125	.340

Figure 14: Independent Samples T-Test For CWEGP Against Adoption

The P-value was 0.676/2= 0.338, 1-0.338=0.662, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is Convenience and adoption are correlated (H_A: μ_{COM}-$\mu_S \neq 0$; *accepted*).

Scenario 10 - H_0: μ_{DEP}-$\mu_S = 0$; H_A: μ_R-$\mu_S \neq 0$;

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Easy Development	Equal variances assumed	1.244	.288	-.608	11	.556	-.325	.535
	Equal variances not assumed			-.634	9.790	.541	-.325	.513

Figure 15: Independent Samples T-Test For FTAC Against Adoption

The P-value was 0.556/2= 0.278, 1-0.278=0.722, which was above the cutoff of 0.05, leading to the adoption of the null hypothesis, that is Convenience and adoption are correlated (H_A: μ_{DEP}-$\mu_S \neq 0$; *Moderately accepted*).

To further determine the correlation weight of these constructs in regard to other constructs and modulating constructs, AMOS was run .The researchers then used the path coefficients cut-off (0.05) to accept and reject some constructs.

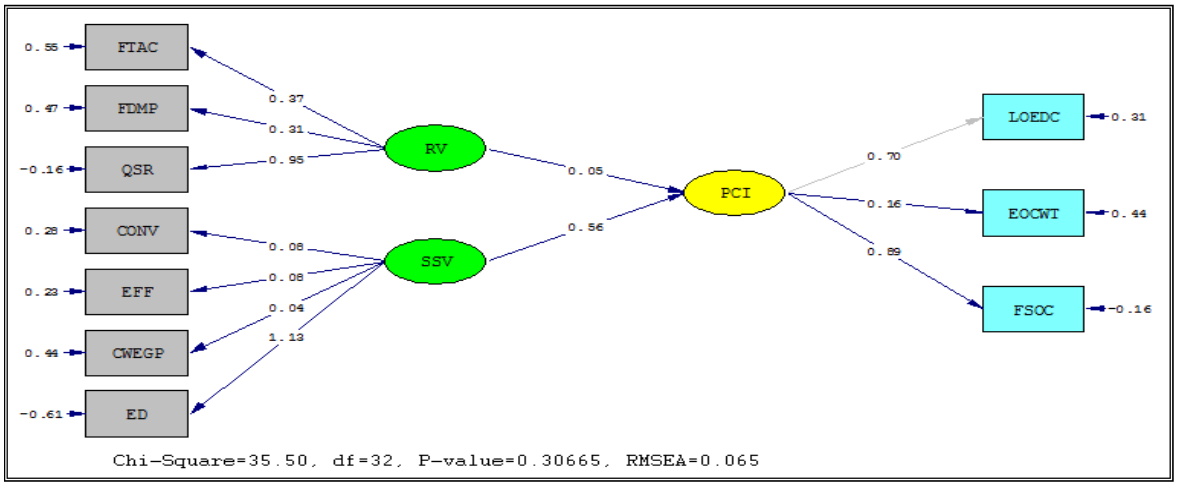

Figure 16: Correlation Weights For SBANCA Model

Construct CWEGP loaded 0.04, 0.01 below the threshold value and was therefore dropped. Of the ten constructs, FTAC, LOEOC and CONV were strongly accepted, ED, FSOC and EOCWT were moderately accepted, EFF and FDMP were accepted while QSR was loosely accepted. The final model was then developed as shown in Figure 17 below.

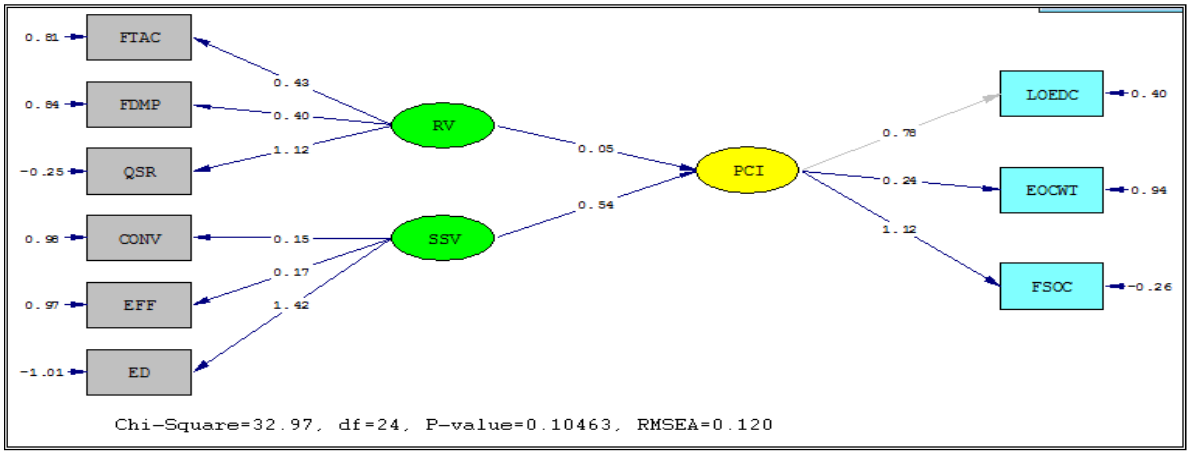

Figure 17: Final SBANCA Model

5 CONCLUSIONS

This research aimed to create an SMS-Based Alert queuing system model, which can be utilized to improve the adaption rate of Information Technology innovations. The main contribution of the proposed model is considering the growth and flexibility of the IT innovation projects. Since it has potential to grow, it would be easier to adapt the innovation. The consideration of flexibility can help to measure an innovation more completely. It is a better model to select the IT innovation project and to consider its future development. The research findings indicate that nine of the proposed hypothesis were significant at levels greater than 0.05. Therefore flexibility, convenience, easy of deployment, faster decision making, quick system response, level of education, experience of the customer with technology, financial status of the customers and efficiency are key for the adoption of an SMS-Based Alert queuing system.

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Analysis of Grammatical Errors of Utterance Structure

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ABSTRACT: The study examined the grammatical errors of Technology student teachers' utterance structure. It was conducted to answer two questions: (1) what are the language backgrounds of the Technology student teachers; and (2) what are their common grammatical errors during the on-campus teaching. To address the first question, the participants were personally interviewed for their language profile utilizing the developed and modified interview guide. To address the second question, the participants' Technology classes were observed and video recorded for transcription. The findings show that misinformation and omission account for most of the total grammatical errors identified, with addition and ordering of elements being less frequent. It is observed that the student teachers repeatedly use the wrong forms of the words in place of the correct ones. These errors in their utterance structure are the results of the influence of their native language structures to produce a spoken discourse of the English language (L2). It can be noted then that grammatical errors on spoken discourse are different from written discourse as the spontaneous utterances encompass several errors. Data present a Philippine English variety based on the utterances of student teachers which are patterned on the Philippine language structures.

KEYWORDS: Error Analysis, Technology Student Teachers, Philippine English variety.

INTRODUCTION

This research study describes errors on grammatical aspects of spoken English with theoretical background of error analysis. It empirically through qualitative and quantitative method finds out the errors the student teachers' utterances during their actual Observation and Participation (OP) classes.

Errors are the flawed side of speakers which are parts of conversation that deviate from some selected norms of utterances. To analyze the grammatical errors of student teachers during their actual on-campus teaching or the Observation and Participation (OP), the typology of errors of Dulay, Burt and Krashen (1982) was utilized. The four types of errors are omission, addition, misformation, and misordering**.**

Research studies cited in this present research dealt mainly on error analysis of spoken discourse particularly on its grammatical features. Ting, Mahadhir and Chang (2010), for instance, examined the grammatical accuracy in spoken English in simulated oral interactions among less proficient ESL learners in a Malaysian tertiary institution. The findings show the surface structure description on misinformation and omission account for the majority of the grammatical errors among ESL learners in the tertiary institution in Malaysia.

Studying spoken discourse has been difficult to handle because the spoken data are particularly messy Foster, Tonkyn, and Wigglesworth, (2000) and second language oral data are generally messier. Moreover, Abbasi and Karimian (2011) investigated grammatical errors among Iranian Translation Students. Their findings illustrated that almost all of the participants had grammatical problems and most of errors were influence of the mother language.

Such research studies in grammatical errors in spoken discourse, would serve an educational reason by showing educators what students have learned and what they have not yet mastered in spoken discourse. Such researches would as well add to literature on error analysis of student teachers' utterances.

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Research Question No. 1. What is the language profile of the student teachers?

Table 1 illustrates the responses of the student teachers on the questions asked during the interview.

Table 1. Language Profile of Student Teachers

Items	Student Teacher A	Student Teacher B	Student Teacher C	Student Teacher D	Student Teacher E	Student Teacher F
Language first learned to speak	F	F	F	F	F	F
Language most frequently used at home	F	F	F	F	F	F
Language best understood in listening	F	F	F	F/E	F/E	E
Language spoke fluently	F/E	F	F	F	F/E	F/E
Language used best in writing	F/E	E	F	E	F	F/E
Language best understood	F	E	F	F/E	F	F/E
Language usually used in thinking	F/E	E	F	F/E	E	F/E
Language most frequently used in classes	E	E	E	E	E	E
Language most frequently used outside classes	F	F	F	F	F	F

F- Filipino E-English F/E – both Filipino & English

Table 1 shows that Filipino language is the prevailing verbal communication medium among the participants.

Based on the data, all of the participants claimed that Filipino is the first language they learn to speak and the most frequently used by the participants in their respective homes. They declared that they spoke English frequently during class hours; however, they tended to shift to Filipino language when not in classroom or in an informal setting within the vicinity of the campus.

With the language profile of the student teachers, evidence confirms that their mother tongue seems to play a role in using the second language. Bühmann and Trudell (2008) even stressed that the research evidence today clearly shows that using the learners' mother tongue is crucial to effective learning. Kroll (1990) further claims that there is an underlying cognitive or academic proficiency that is common to languages and this enables transfer of literacy related skills across languages.

Research Question No. 2. What are the common grammatical errors of the student teachers during the on-campus teaching?

The slips were categorized as errors of misformation, addition, omission, and ordering to analyze the grammatical error of student teachers' utterances.

Misformation Errors

Errors of misformation occurred when student teachers chose the wrong forms of the words in place of the correct ones. This also includes mistakes where they supplied something although it was incorrect.

Table 2 presents the utterances showing the misformation errors of Student Teacher A.

Table 2. Student Teacher A's Misformation Errors

Line No.	Utterances
Lines 55-56	*: Because I understand that there are terms that is still jargon to us. So I want us to define it first.*
	:These two tanks pump and both has uhm…water.
Lines 74-75	*:Those people who doesn't have you may share with your group mates.*
Lines 94-95	*:The first two digits actually are the digits that is very significant in reading capacitors.*
Lines 127-128	*: Has anyone, anybody in here have a diode?*
Line 177	*:if there is a… two terminals,*
Lines 276-277	*:that there are a wide variety*
Line 371	*: There are lots that is also an avalanche diode.*
Line 376-377	*: So, imagine all this circuits that can contain up to a million electronic components!*
Line 588	*Actually, these numbers and letters, is actually…*
Lines 597-598	*Most common families you know is the 78 and 79 series, right?*
Line 608	

As seen in the table, misformation errors in subject-verb-agreement were commonly observed in Student Teacher A in lines 55-56 and in lines 94-95. She explicitly displayed an error when she used "*that is*" instead of "*that are"* to describe the subject of the sentence *"terms*" which is in plural form. Another mistake she exhibited is in line 74-75. Here, student teacher A exhibited ungrammaticality on numbers in which she violated the subject -verb agreement. Similarly, Student teacher A mistakenly used "doesn't" to describe the subject "those people". Student Teacher A made use of *wrong form after do* in the latter part of her utterance in lines 74-75. Another instance is in line 371 which again SVA is violated. The verb of a sentence must agree with the subject *variety* in number. It should have been said, *there is a wide variety*.

Table 3. Student Teacher B's Misformation Errors

Line No.	Utterances
Line 645	*: Last time you have an activity entitled PCB design.*
Line 650	*: Ohm's law was actually named after a German physicist Georg*
Line 692	*: so this is the formulas you are going to use.*
Line 725	*: it seems like our marker have a problem*
Line 751	*: So transformer have parts,*
Line 753	*: the secondary winding are calls*
Lines 766-767	*: Before I forgot this is the schematic diagram*
Line 770	*: So transformer have types according to class*
Lines 772-773	*: while these two is according to construction*
Line 801	*: the definition have different output voltages*
Lines 832-833	*: Norton's Theorem is actually named after a scientist who have bell laboratories*
Line 855	*: that the teacher or teachers is telling you*
Line 873	*: voltage sources that is replaced*
Line 881	*: So let us said that R1 is 10ohms,*
Lines 931-932	*: These is terminals A B.*
Line 989	*: Oh no I haven't forgot that.*
Line 994	*: does all of you got the correct answer?*

Table 3 presents the misformation errors made by Student Teacher B. In line 645, she exhibited an error in the use of present for simple past. Here, she slipped in *tense sequence* (Richards, 1970). For Dulay Burt and Krashen (1982), they regard this error as the surface structure of taxonomy in *misformation* which means Student Teacher B opted to use the wrong forms in her utterance.

Another occurrence is when Student Teacher B made an attempt to introduce the new subject matter in line 650. She again exhibited a shift in tense.

Another subject-verb-agreement violation is demonstrated in line 692, when Student Teacher B wrongly said, *this is* for *these are,* when she meant more than one formula. In lines 725-726 as well, she illustrated a misused of *have* for *has* to noun *marker* in which both utterances have errors in misformation in subject-verb-agreement (Dulay, Burt, Krashen 1982).

Table 4. Student Teacher C's Misformation Errors

Line No.	Utterances
Line 1047	*: it's the same like our previous topic…*
Lines 1133-1134	*: So, I remember when we took up the digital electronics, ah, there is one experiment that we use the transistor*
Line 1178	*: it means it is a upgraded version*
Line 1228	*: so means it is the upgraded version*
Line 1331	*: the MSB is copied or duplicate*

Table 4 illustrates the misformation errors of Student Teacher C. In line 1047 for instance, she mistakenly added the word *like* when she perhaps meant *as*. Equally, in lines 1133-1134, Student Teacher C displayed a slip in the use of present tense for simple past, the word *use* for *used.* Another misformation error is in line 1228, when she incorrectly used the word *means* for *meaning.* In line 1331 for however, she committed error when she failed to emphasize the past participle of the verb *duplicate*. The incidence of misinformation errors indicates that the Student Teacher C was aware of the need to use a particular grammatical feature in certain parts of the utterances but made an incorrect choice, for example, in line 1331, she was able to give the correct form of the verb at the beginning part of the utterance but failed to do the same on the latter part.

Table 5. Student Teacher D's Misformation Errors

Line No.	Utterances
Lines 1514-1515	*: Have you noticed these inputs? A0, B0, A1 and B1, have you noticed it?*
Lines 1539-1540	*: that I have mentioned a while ago*
Lines 1593-1594	*: Last time you act like a combinational logic circuits*
Line 1615	*: these three resistor is connected*
Lines 1629-1630	*: we will got the low input from the beginning*
Line 1648	*: I didn't prepared a game*

Table 5 shows the utterances of Student Teacher D for misformation errors. Lines 1514-1515 exhibited an error in pronoun antecedent, *it* for *them*. In lines 1539-1540, the use of present perfect for simple past is observed. The use of present tense for simple past is also seen in line 1593. Student Teacher D wrongly said *is* for *are,* when she meant more than one resistor.

A severe case of misformation error is observed in lines 1629-1630, we *will got the low input from the beginning.* The use of verb in the simple past to attach to the auxiliary *will* is a misformation error. The verb *got* should have been said with the base form of the verb *get*. Another error is noticed in line 1648 when Student Teacher D used the past participle of the verb *prepare* with the auxiliary verb *didn't.* The data indicate that Student Teacher D was uncertain with the use of the correct tense of the verb. She combined the present tense, past tense and future tense. Thus, she committed tense errors.

Table 6. Student Teacher E's Misformation Errors

Line No.	Utterances
Lines 1743-1744	*: you will going to make plate*
Lines 1744-1748	*: I will going to give you basic techniques*
Line 1828	*: you will going to shade that*
Line 1936	*: you will going to use into your pictorial drawing*
Line 1939	*: So you will going to apply that*
Line 1980	*: you will going to use only the smudging in drawing*
Lines 1981-1982	*: you will going to apply shading*
Line 1982	*: the technique you will going to use is smudging*
Lines 1995-1996	*: you will going to make a pictorial drawing*
Lines 2004-2005	*: in way back 20th century uhm they use their innovative skills*
Line 2200	*: but still I will going to give a quiz*

As observed in Table 6, Student Teacher E committed similar misformation errors repeatedly in all utterances except in lines 2004-2005, where she used the present for simple past. The habitual misformation error of Student Teacher E was in the use of *will going*. As a rule after certain auxiliary verb such as *will*, the base form of the verb shall be used.

Table 7. Student Teacher F's Misformation Errors

Line No.	Utterances
Line 2267	*: but since he did not published his work*
Line 2275	*: Capacitors also, yes, is made up of uhm, an insulating device*
Line 2439	*: And this negative-positive-negative are what?*
Line 2492	*: Collector current are those current that flows from the collector*
Lines 2511-2512	*: only the connections that is needed*

Table 7 shows the committed misformation errors of Student Teacher F. As shown in line 2267, an error in the verb is seen. The verb *published* should be in the base form because it came after the auxiliary verb *did.* On the other hand all the succeeding lines from 2275 to 2511 violate the subject verb agreement. The verbs of the sentences must agree with their subjects in number and in person.

These misformation errors make up the most of errors in the sets of the video transcripts of the student teachers were they mainly confused with the subject- verb- agreement (SVA) and tenses.

Addition Errors

Another ungrammatical element that was observed in the study was the errors of addition. Addition errors are the reverse of omission. The student teachers sometimes added items which must not appear in a well- formed utterance.

Table 8. Student Teacher A's Addition Errors

Line No.	Utterances
Lines 104-105	*: Actually those numbers… numbers represents the value of the capacitor that you are holding right now.*
Lines 130-131	*: it's a ceramic capacitors…*
Lines 284-285	*: This means that there will be a repletion. There will be a repletion of the direction.*
Line 296	*: if there is a repulsion?*
Lines 301-302	*: We understand the anodes carries positive holes right?*

As shown in Table 8, Student Teacher A added unnecessary tense markers such "-s,-es,-ies" after the verbs that follow the plural nouns. In lines 104-105 for instance, *numbers represents the value of the capacitor…*and in lines 301-302 *the anodes carries positive holes.* Both utterances violate subject-verb-agreement.

In lines 130-131, *it's a ceramic capacitors,* also violates the number agreement. A noun and the words that modify that noun must agree in number. In here, Student Teacher A performed an addition error of the article ***a***.

In lines 284-285 and line 296 however, there is an error in addition of the article *"a*". If one is using a noun that cannot be counted or divided, such as "*repulsion" and* "*repletion",* it is incorrect to modify that noun with *"a,"* "each," "every," "either," or "neither."

Table 9. Student Teacher B's Addition Errors

Line No.	Utterances
Lines 672-673	*: So the first one is voltage is equals to current times the resistance*
Line 675	*: the next one is current is equals to voltage over resistance*
Line 692	*: this is the formulas you are going to use.*
Line 890	*: V over R and I_B which is equals to V over R*
Line 891	*: V is equals to 10 ohms*

Table 9 presents the addition errors committed by Student Teacher B. As observed in lines 672-673 *voltage is equals to current,* the utterance exhibits an error when an ***s*** is added to the word *equal,* which is used as an adjective to modify the noun voltage. Similar errors were observed in lines 675, 890, and 891 when the utterances used the word *equal* as verb instead of adjective. In line 692 however, addition error occurred when *s* is added to the predicate nominative *formula* in which its subject (this) and verb (is) are both singular.

Table 10. Student Teacher C's Addition Errors

Line No.	Utterances
Lines 1150-1151	*: what does the symbol or number in the transistor or semiconductor code stands for?*
Lines 1164-1165	*: the first letter is always letter S in a Japanese*

Table 10 shows the utterances of Student Teacher C that exhibit addition errors. As seen in lines 1150-1151 for instance, the utterance has auxiliary verb *does* and the main verb *stands*. This utterance violates the rule after auxiliary verb *does* in which it requires the base form of the verb *stand*.

Another addition error is observed in lines 1164-1165 when Student Teacher C added the article *a* before the noun Japanese. It goes against the number agreement. If one is using a proper noun such as "Japanese," it is incorrect to modify that noun with "a".

Table 11. Student Teacher D's Addition Errors

Line No.	Utterances
Line 1584	*: chains of light that walks*

As shown in Table 11, there is a distinctive occurrence of addition error committed by Student Teacher D. The utterance in line 1584 *chains of light that walks* violates the SVA. Student Teacher D committed an error of addition when she added ***s*** as singular inflection of the verb ***walk*.**

Table 12. Student Teacher E's Addition Errors

Line No.	Utterances
Lines 1855-1856	*: what is the difference of the picture A from picture B. Anyone?*
Line 1949	*: So this what shading is about*

Table 12 shows the utterances with errors of addition carried out by Student Teacher E. As seen in line 1949 S*o **this what** shading is about,* Student Teacher E displayed an error on extra word. Only one of the marked words is necessary to signal that a noun follows. Instead of S*o **this what** shading is about,* consider S*o **this** shading is about.*

Table 13. Student Teacher F's Addition Errors

Line No.	Utterances
Lines 2242-2243	*: capacitors are devices that stores an electrical charge*
Line 2457	*: wherein positive and negative charges flows*
Lines 2533-2534	*: photos means light*

Table 13 presents the addition errors of Student Teacher F. As shown, he violated the subject-verb-agreement in all his utterances in the table. In line 2457 for instance, the subject charges is in plural form that requires a plural verb. The verb *flows* therefore should be said as *flow* instead of *flows*. As similar error is noted in lines 2533-2534 *photos means light*. The verb *mean* agree with its subject *photos*.

Omission Errors

Errors of omission, on the other hand, consist of the omission of necessary elements in tense or number markers, for instance, the omission of the grammatical morphemes. These include the omission of "-s/-es/-ies" for the verbs after the third person singular in the simple present tense. Thus, the omission errors appear when the student teachers omit some the elements from their utterances.

Table 14. Student Teacher A's Omission Errors

Line No.	Utterances
Lines 486-487	*: So have any idea what we'll have this morning?*
Lines 559-560	*: So at that time it very crucial*
Line 591	*: Lots of circuit into that small point of a pen*

As shown in Table 14, Student Teacher A performed few omission errors in her utterances. In lines 486-487 for example, she missed her subject and auxiliary verb for her yes/no question. In lines 559-560 on the other hand, she committed the error of omission when she overlooked the verb after the subject ***it***. The omission was mainly related to the use of the copula be. Similarly, in line 591, the verb was also omitted. The omission of the copula ***is,*** which functions as the main verb in affirmative statements, makes the utterance ungrammatical in English.

Table 15. Student Teacher B's Omission Errors

Line No.	Utterances
Line 682-683	*: So it actually come from the ohm's law triangle*
Line 723	*: Is there anyone who get the answer for number one?*
Line 829	*: You're dismiss__.*
Line 842	*: voltage can be represent__ with current source*
Lines 957-958	*: Norton's equivalent circuit which is surely look like this.*
Line 971	*: so you can be prepare_*
Line 991	*: so class please quiet,*

Table 15 presents Student Teacher's B errors of omission in her utterances. Noticeably, the singular inflection of verbs in lines 682-683, line 723, and lines 957-958 were missed. Subject- Verb -Agreement was violated in the identified utterances. In line 829, line 842 and line 971 however, there was a loss of past participle inflection of verbs. This type of error may be a case of "past tense and present tense being not morphologically marked" (Bautista & Gonzales, 2006, p.135). In line 991 however, the omission was mainly related to the use of the copula *be,* which functions as the main verb in the utterance, making it ungrammatical in English.

Table 16. Student Teacher C's Omission Errors

Line No.	Utterances
Lines 1042-1043	*: its output is measure*
Lines 1049-1050	*: So, the first thing we have to__ is*
Lines1058-1059	*: there will be no such thing or bad things happen*
Lines 1065-1066	*: its output is measure*
Lines 1085-1086	*: because I know you master the way or measuring ahh…..*
Line 1109	*: it would be pass tomorrow.*
Line 1128	*: It act as a switch and as an amplifier.*
Line 1154	*: a unique code so that they can be specify*
Lines 1154-1155	*: or describe from the other types*
Lines 1175-1176	*: it range from 100-9999*
Line 1270	*: then you ask, they ask them*
Line 1330	*: it shift into the right direction*
Lines 1395-1396	*: you can have three person in a group*

As shown in Table 16, Student Teacher C committed the omission errors when she missed the past participle inflection of verbs *measure*, *master*, *pass*, *specify*, *describe*, *range* and *ask*. She also unsuccessfully produced the singular inflection of verbs ***act*** in line 1128 and ***shift*** in line 1330. In lines 1049-1050 however, Student Teacher C missed out a certain ***verb*** after the infinitive ***to*** and overlooked a certain ***conjunction*** before the verb ***happen.*** The plural inflection of the noun ***person*** in lines 1395-1396 was also neglected.

Table 17. Student Teacher D's Omission Errors

Line No.	Utterances
Lines 1450-1451	*: Ok somebody tell me what ah activity we have done...?*
Line 1615	*: these three resistor is connected*
Line 1669	*: Ma'am Mae Ann___ given you an assignment.*
Line 1689	*: it like waiting someone in the tricycle terminal*

As observed in Table 17, omission errors were made by Student Teacher D. In line 1450-1451 for instance, she failed to produce the auxiliary verb ***will*** to her interrogative utterance. The plural inflection of the noun ***resistor*** in line 1615 was ignored. In line 1669 however, the helping verb ***has*** was omitted. Student Teacher D also failed to produce the singular inflection of verbs ***like*** in line 1689.

Table 18. Student Teacher E's Omission Errors

Line No.	Utterances
Line 1740	*: perhaps it also make the object beautiful*
Lines 1773-1774	*: It is coming from different direction*
Lines 1780-1781	*: it follow the shape of the object.*
Lines 1789-1790	*: It also make the object you know*
Lines 1808-1809	*: and let's assume that it is 45 degrees*
Line 1809	*: and the light rays reach the object*
Lines 1814-1815	*: and you notice that there's someone following you*
Line 1821	*: Base on our discussion*
Lines 1900-1901	*: have different direction over-lapping each other*
Lines 1910-1911	*: it contours or follow the shape of the object*
Line 1914	*: it seem so easy to identify*
Line 1973	*: Base on our discussion*
Lines 2022-2023	*: there are different result*
Lines 2092-2093	*: So as you have notice in the sketch*
Line 2097	*: as you have notice that in the lower part*
Line 2102	*: ahh will be increase*

Table 18 shows the error of omissions committed by Student Teacher E. Most of the errors were in the past participle inflection of verbs. She unsuccessfully produced these all, perhaps because of her unawareness of the inflected morpheme "ed". Other omission errors were on the loss of the singular inflection of verbs in line 1740, lines 1789-1790, lines 1910-1911 and 1914 respectively. The use of the base form of the verb for singular subjects (e.g. It follow the shape of the object) is a subject-verb- agreement error on the basis of the surface structure. However, in most of the utterances of Student Teacher E, the type of error may be another case of past tense and past participle being not morphologically marked.

Similarly, the plural inflection of the nouns in lines 1773-1774, lines 1900-1901 and lines 2022-2023 were all missed out by Student Teacher E. These errors in using the correct plural form of nouns were found to some extent in the spoken discourse of Student Teacher E in which the "s" marking for plurality is left out. The difficulty with plural form may be due to L1 influence, a conclusion reached by Maros, Hua, and Salehuddin (2007).

Table 19. Student Teacher F's Omission Errors

Line No.	Utterances
Lines 2259-2260	*: is an insulating device which prevent those plates*
Line 2536	*: this thing resist light*

As shown in Table 19, Student Teacher F produced the error of omission in his utterances. In lines 2259-2260, he exhibited the loss of the singular inflection of verb ***prevent.*** In the same way***,*** in line 2536 the singular inflection of verb ***resist*** was also omitted. In these utterances, the final "s" is omitted from the verb in the third person singular in the present tense.

To sum up, student teachers evidently missed out certain verbs in their utterances. Also, in the succeeding utterances of student teachers, the final "s" was omitted from their verbs in the third person singular in the present tense. With the omission of (-s), Duskova (cited in Richards, 1970) notes, "Since (in English) all grammatical persons take the same zero verbal ending except the third person singular in the present tense...omissions of the (-s) may be accounted for by the heavy pressure of all other endingless form."

Ordering Errors

Errors of ordering are made when the correct elements are wrongly sequenced. These happen when student teachers put incorrect position of a morpheme or a group of morpheme.

Table 20. Student Teacher F's Ordering Errors

Line No.	Utterances
Lines 2647-2648	*: you have to tell your classmates how are you going to do that*

Table 20 presents the ordering error of Student Teacher F. In lines 2647-2648 for example, in the use of phrasal verbs," *you have to tell your classmates how are you going to do that".* It should be noted that if an utterance includes a statement about a question rather than a direct question, the subject should come before the verb. So, it should have been said as "*You have to tell your classmates how you are going to do that".* Though there was a single case identified, it doesn't necessarily mean that the other student teachers have mastered the rule of ordering in verb forms but it may only show that they are by some means grammatically competent in terms of avoiding errors of ordering.

The participants committed ungrammatical utterance structure, which supports the claim of Abbasi and Karimian (2011) that most of errors of non- native speakers of English were of interlingual, indicating the influence of the mother language. The slips were categorized as errors of misformation, omission, addition, and ordering.

CONCLUSION

Misformation errors make up the most of errors in the sets of video transcripts in which they were mainly confused with the Subject- Verb- Agreement (SVA) and tenses. There were also errors of omission on "-s/-es/-ies" for verbs after the third person singular in the simple present tense. Another ungrammatical element that was observed in the study was on addition, in which unnecessary tense markers were used. Errors of ordering were also produced when correct elements were wrongly sequenced. An examination of the types of errors based on surface structure descriptions (Dulay, Burt & Krashen, 1982) shows that the most frequent error is misinformation, followed by omission, then addition errors, and then the

misordering. It can be noted then that grammatical errors on spoken discourse are different from written discourse as what Beattie (1983) states that the spontaneous speech contains several errors and utterances are usually brief

Thus, data of the present study reveal that there was an interference of Filipino language (L1) in structures of the utterance of English language (L2). Data further present a variety of Philippine English based on the utterances of student teachers which are patterned on the Philippine language structures.

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AN EXPLORATORY STUDY ON LESS PARTICIPATION OF FEMALE IN EDUCATION IN RURAL AREAS OF DISTRICT LAYYAH, PAKISTAN

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ABSTRACT: For the development of any country the education is necessary. Education is the right of both genders male and female. In the different rural areas of Pakistan it is a red signal that people deprived their female from education. Layyah is the backward district of Punjab where the literacy rate is comfortable as compare to as a whole but in the rural areas of this district the female participation is very low. This research was conducted in the three union councils of district Layyah. This is quantitative research because it was an exploratory study. These UCs were selected through systematic random sampling. A sample size of 150 respondents was selected through systematic random sampling. District Layyah was selected as the universe for the present research. Another reason for selecting this city was the easily accessibility of collecting data from rural area. Parents of girls who were illiterate were selected as respondent for the present research. Interview schedule was used as the tool for data collection. The reason was that the mostly people showed non serious behavior towards questionnaire and majority of respondents were illiterate. Before the collection of actual data, it was required to test the accuracy the work ability of information .For this purpose the interview schedule was pre-test to 10 respondents on the basis of response the interview schedule was finalized after introducing some modification in interview schedule to make it more relevant and understandable. The data was present in tabulated form with the percentage was used for data representation and SPSS was used for data analysis.

KEYWORDS: Female less Participation, Female Education problems, Layyah.

1 INTRODUCTION

Functional literacy is the basis for the realization of full potentials of individuals as it impacts strongly on every sphere of life. Acquisition of effective literacy skills is crucial for success not only in academics, but also in personality development, occupational growth and in domestic harmony Functional literacy which goes beyond the ability to read and write is a continuous process of training, retraining and reinventing self in order to sharpen one's attitudes and interests, so as to be able to come to terms with one, think critically, identify problems and take realistic measures to solve problems. In other words, functional literacy ensures that individuals are sufficiently motivated to achieve development; self-esteem and character that will enable them live functionally in the society and consequently, achieve economic emancipation. Succinctly put, it bestows on the recipients the ability and willingness to make the right choices, face the demands and challenges of everyday life and achieve higher level of self-control (Webster, 1999). Since the literacy level correlates with personality development and economic emancipation ,it implies that illiteracy causes poverty, low self-esteem, and underdevelopment Therefore, nations with high rate of illiteracy are poor nations, and to reduce their poverty level; functional and development orientated literacy is required (UNESCO, 2005). At the international scene, the situation is not any different. It has been revealed that girls who drop-out of primary school are more than boys by ten million (Action-aid, 2008) and that nearly two-thirds of the world's 780 million illiterates are women (UNESCO, 2005). Men have institutionalized the exploitation of women using, customs, education, socio- economic order and religious apparatus to relegate women to the background. In other words, it would appear that low literacy level of women is being used deliberately as a social control mechanism because if women are well informed they could harness their numerical strength and demand for their rights. But if women

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are ignorant, poor and voiceless they will be easily controlled. Ironically, the consequences of high illiteracy level of the female gender on the family and the nation is more devastating than it is on the personality of the women because of its multiplier effects on every member of each woman's household. Direct victims of illiteracy- women -who still suffer discriminations, crude exploitation and oppression, are ignored, excluded and undermined in the scheme of things (Ochefu, 2007) Secondly, reduction in girls' enrollment into secondary school brings about increase in maternal mortality, child mortality, malnutrition a higher prevalence of depression and other mental illness Men who perpetrate gender inequality have had to lose their own lives to critical heath problems because, their wives who have been subordinated to the point of being mentally colonized could neither take nor act on decisions immediately. Businesses and property labored for by men have also been lost this way at the demise of some men. (Muodumogu, 2007).

Female Literacy Ratio in Pakistan

Table 1. Pakistan Literacy Rate 2001 to 2009

Total	Male	Female
2001-02	58%	33%
2004-05	66%	41%
2006-07	67%	42%
2007-08	68%	46%
2008-09	69%	45%

Source: *http://pakistanandculture.wordpress.com/2011/06/08/literacy-rate-of-pakistan-in-2009*

These tables show the % of literacy rate among male and female year wise. In 2001-02 the male literacy was 58 % and female literacy was 33%.in 2004-05 the male literacy was 66% and female literacy was 41%.in 2006-07 the male literacy was 67% and female literacy was 42%.only 1 % literacy rate increase and ratio was same in male and female. In 20007-08 the literacy was 68% in male and 46% in female. But in 2007-08 the ratio of female literacy increased by 4% but male literacy was remain constant only 1%.in 2008-09 the male literacy was increase only 1% and became 69% and female literacy decreased for 1% and became 45%.

Table 2. Pakistan millennium development report 2009

Total	Urban Male Female		Rural Male Female	
Year distribution	**Male**	**Female**	**Male**	**Female**
2001-02	71%	56%	50%	22%
2004-05	78%	61%	58%	29%
2006-07	79%	65%	61%	31%
2007-08	82%	64%	64%	34%
2008-09	80%	66%	64%	32%

Millennium development report 2010(rural and urban literacy rate)
Source: http://pakistanandculture.wordpress.com/2011/06/08/literacy-rate-of-pakistan-in-2009

This table shows the year wise distribution of rural and urban literacy ratio among male and female. in 2001-02 the urban male literacy was 71% and female literacy was 56% and rural male literacy was 50% while female literacy was only 22% which was below than half of male literacy. In 2004-05 the urban male literacy was 78% and female literacy was 61% and rural male literacy was 58% while female literacy was only 29%.in 2006-07 the urban male literacy was 79% and female literacy was 65% and rural male literacy was 61% while female literacy was only 31%. In 2007-08 the urban male literacy was 82% and female literacy was 64% and rural male literacy was 64% while female literacy was only 34%. In 2008-09the urban male literacy was 80% and female literacy was 66% and rural male literacy was 64% while female literacy was only 32%. According to the official definition, the literacy rate is that percentage of the population ten years and above which is able to read and write in any language. Though more than half of the rural population is illiterate, the ratio improved by over half a percentage point to 49.2 per cent by June 30, 2010 due to an increasing number of women and girls who can read and write. The female literacy ratio improved to 34.2 per cent, a progress of 0.8 per cent in a year. In rural areas, the 63.6 per cent male literacy rate improved by only 0.4 per cent in comparison. The literacy rate in urban areas marginally declined due to a dip in

the number of men who qualify as literate. The urban literacy ratio decreased 0.1 per cent to 73.2 per cent, due to a fractional reduction in the male literacy rate. At present more than eight out of ten urban males are educated but the ratio is below that of 2008-09. In terms of level of education, near four out of ten literate people are not even matriculates. Another one out of ten is below intermediate, the survey reveals. Only 4.7 per cent of the total literate population has cleared intermediate but not bachelor's and just 4.3 per cent have a bachelor's or above. Even today over four out of ten Pakistanis are illiterate according to official figures.(Samad 2011)

Importance of education

All human beings come in this world without knowing that what will be done with him/her in future. It is the education which makes him/her a respectable person of society. Education provides the human being all those traits through which he/she can survive in the society

Significance of study

Each and every lining organism has its self respect as well as rights of freedom in which all facilities are included. In these rights the right of getting education is also include and this right equally facilitate to both sexes gender wise. No one can resist them from getting education anyhow in different regions and areas in this world, some people are discriminated from this right. Mostly in India and Pakistan this trend was alarming in the world before the partition. The reason behind this practice was that Hindus and Muslims were living together but they were totally against to each other and always try to tease to each other. They fear from the rape with daughters though they didn't send to school. Now in Pakistan in some areas the female literacy is low as compare to male. This study is going to conduct for the investigation of causes behind the female illiteracy which can be helpful to eradication of this problem.

Objectives of the study

- To find out the socioeconomic level of people living in district Layyah.
- To investigate the hurdles in the way of female literacy
- To find out the causes of female illiteracy

2 THEORTICAL FRAMWORK

The Functionalist Theory

Education produces knowledge, skills, information and many more things which are the basic need of human beings. These things are transformational which can be transfer from one generation to the next. Educations also well socialize the children. In the socialization of children mother plays an important role. If the mother is educated then she can produce good citizens of society. Mother provide aware the children with all of the norms, values, Cultural traditions. This all traits transfer to a child through mother's interaction. Educated mother transfer it properly according to current situation of society. An educated woman knows about her rights and duties. She can perform her duties properly and secure her rights if she is educated. By this condition the chance of exploitation decrease and a social control remain in society. A country can get progress if there will be a social control in the country and this control can be only through education. Female education can preserve the culture and it also changes the culture.

The Conflict Theory

In our country both societies are existed socialism and capitalism. Capitalism for those people who are consider as superiors and elite through their economy and wealth, and the socialism for those who were considered as middle and lower class people. As the sorting of schools on the base of this economic discrimination similarly the sorting and grouping of school is on the base of gender inequality. In our society the condition of "Haves and Have not" is present. Boys are consider as haves and girls are consider as have not because girls are mostly consider as the property of other home where she will be marriages. The parents invested mostly on their sons rather than daughters. They can afford all the expense of education for their boys but they show resistances at the time of spend money on female.

The Symbolic Interaction Theory

In our society each and every school has male workers in the different forms like teachers, sweepers, drivers, peons, gate keeper and security guard. The interactions of male teachers depend on the mental level of teachers as well as female student. If t6he polite and soft way of talking towards the female is for the positive means but parents and students interpret

it negative means then it becomes a difficult foe female to get education. The attitude and behavior of male workers towards female can be the reason of their illiteracy.

3 RESEARCH METHODOLOGY

The researchers adopted quantitative research design because the respondents of present research were easily available. Population of district Layyah was selected as the universe for the present research because Layyah was one of the cities in South Punjab where the female literacy ratio was low. Parents of girls who were illiterate were selected as respondent for the present research.In 1st stage researchers select a tehsil Layyah from district Layyah through simple random sampling. In 2nd stage researchers select 19 rural area Ucs out of 23 union councils in Tehsil Layyah and finally 3 UCs were selected where the female literacy was low at least and female population was more than male population. These UCs selected through systematic random sampling. In the present research 150 parents of girls selected through simple random sampling and Interview schedual was used as the tool for data collection. The reason was that the mostly people showed non serious behavior towards questionnaire and majority of respondents were illiterate. The interview schedule was pre-test to 10 respondents on the basis of response the interview schedule was finalized after introducing some modification in interview schedule to make it more relevant and understandable and SPSS was used for data analysis.

4 ANALYSIS OF THE DATA

Quantitative analysis was used for presenting and interpreting the Numerical data.

Variable	Frequency	Percentage
Age		**(%)**
20-30 years	3	2.00
31-40 years	26	17.30
41-50 years	69	46.00
Older than 50 years	52	34.70
Total	**150**	**100.00**
Gender		
Male	147	98.00
Female	3	2.00
Total	**150**	**100.00**
Education		
Literate	8	5.30
Illiterate	142	94.70
Total	**150**	**100.00**
Occupation		
laborer	65	43.30
farmer	75	50.00
shop keeper	9	6.00
housewife	1	0.70
Total	**150**	**100.00**

This table shows that 2% respondents were in the range of 20-30 years old and 17.3% respondents were in the range of 31-40 years old, 46% respondents were in the range of 41-50 years old, 34.7% respondents were at the age of more than 51. According to this situation maximum respondents were old, 98% respondents were male while only 2% respondents were female. Father participation shows that there is a patriarchy system in the rural area of district Layyah, 5.3% respondents were literate and 94.7% respondents were illiterate. This shows that the illiteracy of parents itself is the major reason of female illiteracy. This show that over all literacy rate is low. People know nothing about the literacy as well as female education. How can an illiterate person know about the advantages of education and 43.3% respondents were laborers by profession, 50% respondents were farmers, 6% respondents were shop keepers,.7% respondents were housewife. Cammish (1994), the owners of the schools collected a lot of revenue from the parents of the students which were learning there. The rules and regulations in the matter of fees and revenue were very strong and strict. Parents were bound to pay the fees and other dues on time. And these dues were very heavy which were difficult to pay for parents. So, many of the parents left

their daughters from the school because they cannot pay these expenses. This was the reason that increased the female illiteracy

Table 3. Distribution of respondents regarding income

Categories	Frequency	Percent
1000-5000	26	17.3
6000-10000	101	67.3
11000-15000	21	14.0
More than 16000	2	1.3
Total	**150**	**100.0**

This table shows that 17.3% respondents earn only Rs.1000 to Rs. 5000 monthly.67.3% respondents earn Rs.6000 to Rs.10000 monthly.14% respondents earn 11000 to 15000 monthly. And only 1.3% respondents earn more than 16000 monthly incomes. It means mostly respondents are hand to mouth and they are living in difficult economic condition.

Table 4. Distribution of respondents regarding number of daughters

Categories	Frequency	Percent
1-2	27	18.0
3-4	85	56.7
5-6	38	25.3
Total	**150**	**100.0**

This table shows the number of daughters living in a family.18% respondents had range of 1 to 2 daughters.56.7% respondents had 3 to 4 daughters. And 25.3% respondents had 5 to 6 daughters. Maximum rang of daughters was 3 to 4 daughters. . These figures show that the families are large but the income is low. So how can it possible that the children of a poor person get education.

Distribution of respondents regarding their perception about female education

Categories	Frequency	Percent
Strongly Agree	31	20.7
Agree	51	34.0
Neutral	33	22.0
Disagree	14	9.3
Strongly Disagree	21	14.0
Total	**150**	**100.0**

This table shows that 20.7% respondents replied that male education is more important than female education, 34% respondents were agreed that male education is more important than female education.22% respondents were neutral.9.3% respondents disagree with this statement while 14% respondents were strongly disagreed with this statement that male education is more important than female education. Marilee K (1995) Inequality is the common practice in different societies which is the great barrier in the way of female education. People remain stop at home their daughters and didn't send to school. Parents invest their money only on their male offspring. They think that boys are that the boys are the key of business for them but they consider the female as the property of other home where she will be marry. So, they think it will be the loss of money to invest on girls.

Table 5. Distribution of respondents regarding enrollment of their daughters

Categories	Frequency	Percent
Yes	36	24.0
No	114	76.0
Total	**150**	**100.0**

This table shows that 24% respondents replied that they sent their daughters to school while 76% respondents replied that they didn't sent their daughters to school. This makes it clear that the majority of people don't send their daughters to school. They were hesitating to send their girls to school.

Table 6. Distribution of respondents regarding fee structure of schools in their area

Categories	Frequency	Percent
Self finance	99	66.0
Free of cost	51	34.0
Total	**150**	**100.0**

This table shows the fee structure of schools in rural areas.66% respondents replied that fee structures of schools in their areas are self paid. Only 34% respondents replied that the schools in their areas are free of cost.

Table 7. Distribution of respondents regarding school distance

Categories	Frequency	Percent
1-2km	119	79.3
3-4km	31	20.7
Total	**150**	**100.0**

This table shows that 79.3% respondents replied that the school distance of their daughter was near to home and only 20.7% respondents replied that the school distance was some far from the house. This made it clear that school distance is not an issue in the target area.

Table 8. Distribution of respondents regarding early marriage as a reason of illiteracy

Categories	Frequency	Percent
To great an extent	25	16.7
To some an extent	60	40.0
Not at all	65	43.3
Total	**150**	**100.0**

This table shows that 16.7% respondents replied that early marriage is a reason of not sending their daughters to school.40% respondents also not sent their daughters to school due to reason of early marriage. While 43.3% respondents replied that it was not a reason. Panos (2003) in the educational sector as the issue of public health, human rights and the educational constraint. This report stress to address the problem vigorously where it happens and also ensure that curricular and extracurricular opportunities allow young people to expose there sexual lives with violence and which can never effect on the education

Table 9. Distribution of respondents regarding perception about their daughter as she is property of other house

Categories	Frequency	Percent
To great an extent	67	44.7
To some an extent	43	28.7
Not at all	40	26.7
Total	**150**	**100.0**

This table shows that 44.7% respondents think that their daughters will serve to other house when she will get marriage. Similarly 28.7% respondents think as this while only 26.7% respondents replied that it was not a reason. So we can say that people's negative thinking is also a reason of less participation of female in education.

Table 10. Distribution of respondents regarding the domestic activities of their daughters

Categories	Frequency	Percent
Yes	142	94.7
No	8	5.3
Total	**150**	**100.0**

This table shows that 94.7% respondents replied their daughters perform domestic activities. While only 5.3% respondents replied that their girls do not perform domestic activities. Marilee K (1995) Girls are often considered as a source of household labor that will leave their families upon marriage and become part of the labor force of another family. Boys, on the other hand, are expected to provide support to their families of origin when they become adults. When this is the case, it is economically sounder to invest in the education of boys than in that of girls, particularly where money for education and basic necessities is scarce.

Table 11. Distribution of respondents regarding their opinion about female education

Categories	Frequency	Percent
I want to provide education to girls but society creates hurdles	48	32.0
Islam does not allowed female to get education	57	38.0
Women remain in the boundary wall	20	13.3
It is immoral that women come out of house	10	6.7
Female become over clever and do not obey the parents after getting education	7	4.7
Due to bad situation of environment through wandering boys	3	2.0
Because of coeducation	5	3.3
Total	**150**	**100.0**

This table shows the opinion of those people who were against the female education.32% respondents told that I want to provide education to my daughters but the people of society cannot bear it.38% respondents told that Islam does not allowed the female to get education. They have misperception about the Islamic education.13.3% respondents replied that women should remain only within the house four wall. Similarly 6.7% respondents replied that it is immoral that women come out of house to get education.4.7% respondents replied that female become over clever after getting education and don't obey the parents.2% respondents replied that they don't sent their daughters out of house to get education due to bad situation of environment by wandering boys. 3.3% respondents replied that they are against the coeducation system.

Null Hypothesis: Negative attitude of community people about female education has no effect upon the ratio of female enrollment in school.

Alternate Hypothesis: Negative attitude of community people about female education has effect upon the ratio of female enrollment in school.

Hypothesis testing 1

Table 12. Cross tabulation between the negative attitude of people towards female education and less enrollment of girls to school.

If the answer is b then to what an extent you think that this behavior of the people is the reason of female illiteracy			Total
People of your area are in the favor of female education	Yes	No	
great an extent	22	41	63
some an extent	27	35	85
not at all	16	9	25
Total	**65**	**85**	**150**

Level of Significance = 0.05, Level of Confidence = 0.95, Degree of freedom=2

Chi-Square Test = $X^2 = \sum \frac{(fo - fe)^2}{fe}$ = 6.165, Tabulated Value= 5.99

Calculated value 6.165 was greater than the tabulated value 5.99. So, the alternate hypothesis is true. Thus it was proved that Negative attitude of community people about female education decrease the ratio of female enrollment in schools. The null hypothesis agreed that there was no relationship between two variables. The alternate hypothesis agreed that there was relationship between two variables. Thus the alternate hypothesis accepted that Negative attitude of community people about female education has an effect upon the ratio of female enrollment in school. The value of chi square was 6.165 and the tabulated value was 5.99 the difference between the observed frequency and the expected frequency was very large and thus the null hypothesis rejected. It was the opinion of the majority of the respondents that they didn't sent their daughters to schools for getting education. When the researcher asked the reason behind this answer then they replied that they want to send their daughters to school but the negative behavior of the people toward female education hesitate them to send their daughters to school. Some people had misperception of Islamic ideas about female education.

Hypothesis testing 2

Null Hypothesis:A long distance of school from the houses has no effect upon the enrollment ratio of girls in school.

Alternate Hypothesis:A long distance of school from the houses has an effect upon the enrollment ratio of girls in school.

Table 13. Cross tabulation between the school distance and less enrollment of girls in school.

How many distance of girl's school from your house?			Total
To what an extent you think that the distance of the school is the reason of not sending her to school?	1-2km	3-4km	
great an extent	10	19	29
some an extent	29	11	40
not at all	80	1	81
Total	119	31	150

Level of Significance = 0.05, Level of Confidence = 0.95, Degree of freedom=2

Chi-Square Test = $X^2 = \sum \frac{(fo - fe)^2}{fe}$ =55.374, Tabulated Value= 5.99

The calculated value of Chi-Square 55.374>Tabulated value 5.99, so we rejected the null hypothesis at .05 level of significance. Thus it was proved that long distances of school from the houses decrease the enrollment ratio of girls in school. The null hypothesis agreed that there was no relationship between two variables. The alternate hypothesis agreed that there was relationship between two variables. Thus the alternate hypothesis accepted that Long distances of girl's school decrease the participation rate of female in education. The value of chi square was 55.374 and the tabulated value was 5.99 the difference between the observed frequency and the expected frequency was very large and thus the null hypothesis rejected. The opinion of the parents was that they have no spare time in which they pick and drop their girls to school more over they cannot trust any other person who agree to facilitate their daughters to pick and drop them because of the fear of rape, illegal sex and pregnancy. During their comments researcher absorb that the people of these areas were financially weak and hand to mouth and they spent their most of time in their earning and had no time for their daughters. So they prefer illiteracy rather than education.

5 CONCLUSIONS & MAIN KEY FINDINGS OF THE STUDY ARE THE FOLLOWING

In the UCs jamman shah ,thal jandi and sreshta thal regions girls indeed drop out of schools, but the Prevalence of the event is less for UC jamman shah and higher for ,thal jandi and sreshta thal when a comparison is made in relation to the national statistics. Findings revealed that more systematic efforts are apply to reduce the female illiteracy jamman shah. The highest proportion of female illiteracy in the study is unmarried. As far as the parental background of girls is concerned, most of the household heads included in the samples are females, in UC jamman shah and, thal jandi and sreshta thal. In, thal jandi and sreshta thal and the UC jamman shah, parents whose daughters dropped out are engaged in low income and misperception of Islamic education.

1- Majority of respondents was in the range of 41-50 years old. . According to this situation maximum respondents were old. In the early age of Pakistan the overall literacy rate was very low and people knew nothing about the education. They have misperception about the female education according to Islamic educations.

2- Majority of respondents were male while only 2% respondents were female. This figure shows that there is a patriarchy system in the rural area of district Layyah. This result shows that there is patriarchy system in the rural areas of district Layyah because people were disagree that any person talk with their females.

3- Majority of respondents was illiterate. This shows that the illiteracy of parents itself is the major reason of female illiteracy. This show that over all literacy rate is low. People know nothing about the literacy as well as female education. How can an illiterate person know about the advantages of education?

4- Majority of respondents earn Rs.6000 to Rs.10000 monthly. It means mostly respondents are hand to mouth and they are living in difficult economic condition. So how can they provide costly education to their daughters?

5- In mostly houses head of families were father. This figure shows that there is a patriarchy system in rural areas of district Layyah.

6- Majority of the respondents replied that they sent their boys to school while only 34% respondents replied that they didn't sent their boys to school. This makes it clear that the people send their boys to school while they are hesitate to send their girls to school. So, we can say that it is gender discrimination.

7- The standard time duration in Punjab is 6 working hours but due to lose monitoring system each school has its own tome function. This factor affect on people that they think that there is a little study in the schools. Due to this situation they do not send their offspring to schools.

8- Mostly people don't send their daughters to school due to the male teaching and other staff working in female school. People are threatening about the rape with her daughter and illegal pregnancy.

9- Some parents threaten about the teacher's punishment over to their daughters. They bring up their daughters with great love and cannot accept any stress on their daughters but when they go to school they punished by the teacher which is unbearable by the parents. So this is also a reason.

10- Mostly parents think that teachers get some personal work from their daughters like foot and head massage, engage their children etc. They think that their daughters go to school only for the service of teachers. So they don't send them to school.

11- Mostly people of those areas are poor and hand to mouth. They cannot afford the expenses of boarding. This is also a major reason.

12- It is a trend of those areas that they married their daughters in early age. So they don't provide education while in her practical life she will not continue her study. So this little education is nothing for her. They think that it is better for her to still home while go to school.

13- A very dangerous and negative thinking is found in those areas. They think that their daughter is the properties of the other house where she will be go after marriage. So it is a total loss for them. Due to this reason they don't send them to school.

14- Domestic work and crop field work is considered as the major and responsible work in those areas. People engaged their daughters in the domestic and crop field works.

15- Mostly people of those areas were illiterate and were aware less about the advantages and right of female education. They were disagreeing about the female education.

16- It was a huge patriarchy system in those areas which was against of female education due to illiteracy.

17- Some people respond that they are in the favor of female education and they also want to provide education to their daughters. But the people of society cannot accept this. They told that govt should provide awareness to the illiterate people about the advantages and right of female education.

18- Some people commented that girls become over clever after getting education and they forget their norms value and attempt to shout on their parents. Girls feel that they have more thinking as compare to their parents after getting education and they neglect the respect of their parents.

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Etude socio-économique et technologique de fabrication des boulettes de céréales pour la production d'une boisson fermentée de type probiotique consommée au Bénin

[Socio-economic and technological study of manufacture of the pellets of cereals for the production of a fermented drink of probiotic type consumed in Benin]

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ABSTRACT: The pellets are foodstuffs obtained by manual taxiing of cereals flours mixed with water. After steam cooking, pellets are then mixed with a fermented milk to give a beverage called dèguè. The aim of this study is to finalize a technology of production of pellets with the cereals flours in order to making them available to manufacturers of dèguè and for others applications. For that, a survey was conducted in the municipalities of Abomey-Calavi, Cotonou and Porto-Novo. These municipalities are considered as the areas of high production and consumption of dèguè in Benin. The results of this survey show that the technology of the pellets production is dependent on empirical knowledge of producers. These are the same producers of pellets preparing dèguè. So, there aren't producers which specialized solely in the pellets production. According to the producers surveyed, the original technology is only based on millet. Statistical analysis showed that there is no significant difference at 5% between the technologies of production used in the three municipalities. However, a solar drying of pellets during 28hours is effective for the conservation for three months. Microbiological characteristics reveal the absence of Salmonella, *Staphylococcus aureus*, coliforms and lactic acid bacteria. Regarding physico-chemical parameters there is no significant difference between pH, dry matter of pellets varieties contrary to proteins rate, total sugars and lipids. Sorghum pellets contain more protein (10.10%) and energy (145.74Kcal/100g). Sensory analysis showed that 76.6% of tasters have more appreciated pellets dried of sorghum than the other types.

KEYWORDS: Pellets, cereals, technology, drying, conservation.

RESUME: Les boulettes sont des aliments obtenus par roulage manuel de farines des céréales mélangées avec l'eau. Après une cuisson à la vapeur, les boulettes sont mélangées au lait fermenté pour donner une boisson appelée dèguè. Cette étude vise à mettre au point une technologie de production des boulettes à base de farines de céréales afin de les rendre disponibles aux fabricants de dèguè et pour d'autres applications. Pour cela une enquête a été réalisée dans les communes d'Abomey-Calavi, de Cotonou et de Porto-Novo considérées comme des zones de forte production et consommation de dèguè au Bénin. Les résultats de cette enquête montrent que la technologie de production des boulettes est tributaire des connaissances empiriques des productrices. Ce sont ces mêmes productrices qui préparent dèguè. Il n'y a donc pas de productrices spécialisées uniquement dans la production des boulettes. Selon les productrices enquêtées, la technologie originelle est uniquement à base de mil. L'analyse statistique a montré qu'il n'y a aucune différence à 5% entre les technologies de production utilisées dans les trois communes. Cependant, le séchage solaire des boulettes pendant 28heures

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est efficace pour la conservation sur trois mois. Les caractéristiques microbiologiques révèlent l'absence des salmonelles, *Staphylococcus aureus*, coliformes et des bactéries lactiques. Quant aux paramètres physico-chimiques, il n'y a pas de différence significative entre les pH, les matières sèches des variétés de boulettes contrairement aux taux de protéines, de sucres totaux et de lipides. Les boulettes de sorgho sont plus riches en protéine (10,10%) et en énergie (145,74Kcal/100g). L'analyse sensorielle a montré que 76,6% des dégustateurs ont plus apprécié les boulettes de sorgho séchées que les autres types de boulettes.

MOTS-CLEFS: Boulettes, céréales, technologie, séchage, conservation.

1 INTRODUCTION

La transformation des céréales fait partie intégrante de l'artisanat alimentaire et de la vie socio-économique des peuples d'Afrique et en particulier ceux du Bénin. Il s'agit en effet des pratiques endogènes, transmises et pérennisées à travers l'éducation familiale ou le système traditionnel d'apprentissage. Ces pratiques furent progressivement intégrées et utilisées à plus grandes échelles dans les activités marchandes très actives dans la restauration en milieu urbain. Par ailleurs, l'alimentation de rue est sans nul doute aujourd'hui un des secteurs d'activité les plus pourvoyeurs d'emplois urbains dans les pays en voie de développement [1].

La référence [2] montre que le secteur de la transformation traditionnelle des denrées alimentaires joue un rôle stratégique dans la sécurité alimentaire nationale par la transformation des produits locaux ; l'approvisionnement alimentaire par la préparation d'aliments localement connus sur le plan culturel et l'emploi des femmes dont la transformation des aliments étant leur principale source de revenu dans les zones urbaines.

Au Bénin, d'après [3], les revenus journaliers générés par le commerce d'aliments de rue s'élevait à un montant compris entre 1.500 et 15.000 FCFA par vendeuse. Le style de vie contemporain est fort éloigné de ce qui se faisait par le passé. Ainsi, pressé par le temps, l'augmentation du nombre de personnes célibataires, de familles monoparentales et de femmes qui travaillent, a conduit à des changements profonds dans la préparation des aliments et des habitudes de consommation. Le secteur de l'alimentation de rue prend cependant une dimension toute particulière dans les centres urbains africains où l'urbanisation rapide et les difficultés économiques ont favorisé l'augmentation du nombre de vendeurs d'aliments sur la voie publique [4]. Cependant, c'est un secteur d'activités impliquant d'importantes sommes d'argent et est pourvoyeur d'emplois à une large proportion de la population, y compris des femmes et des familles entières [5].

D'après [4], la sécurité sanitaire des aliments de rue est cruciale. Ceci concerne les aliments en général et les aliments fermentés en particulier. Ce secteur a été défini par la FAO comme le secteur produisant des aliments et des boissons prêts à être consommés, préparés et/ou vendus par des vendeurs, spécialement dans les rues et dans les autres lieux publics similaires. Par ce canal, le système de restauration urbaine offre aussi bien des aliments traditionnels à base des produits locaux que des plats et des pratiques nouveaux ou améliorés, adaptés aux besoins et aux faibles revenus de nombreux résidents urbains.

Parmi ces produits, les céréales (maïs, mil, sorgho, riz) occupent une place de choix en raison de la large gamme d'aliments qu'elles permettent d'obtenir. Ces céréales sont consommées sous forme de bouillie (koko, aklui, akluiyonou), de pâte (tö, owo, makumè, kafa, akassa), de boulettes (yèkè-yèkè, ciéré, wassa-wassa, attiékè, arraw), de boisson (chapkalo, tchoukoutou ou burkutu, dolo) ou de galettes, qui constituent les plats coutumiers des populations [6]. Ces produits céréaliers apportent dans la ration alimentaire l'énergie nécessaire et certaines protéines.

Les boulettes sont des produits céréaliers obtenus par roulage manuels de la farine et d'eau. Elles sont cuites à la vapeur et ensuite mélangé au lait fermenté ; cela constitue une boisson très énergétique appelée dans la région Ouest africaine dèguè. Dèguè est obtenu à partir du lait de vache ou du lait en poudre fermenté mélangé aux boulettes de farine de céréales ; c'est une boisson largement consommée au Bénin. Elle est préparée et vendue, tous les jours, à l'état frais, aux abords des voies, à proximité des zones d'activités, dans les marchés et super marchés par les petites unités de production [7]. Autrefois, dèguè se consomme au cours des fêtes religieuses chez les musulmans. Par exemple, lors de la rupture du carême ou pendant la fête de tabaski. Depuis quelques temps, cette boisson traditionnelle est devenue un produit de grande consommation. Cependant, la production des boulettes, une étape indispensable dans la production de dèguè, comporte plusieurs opérations unitaires pénibles. Ce qui ne permet pas aux producteurs de produire dèguè en quantité suffisante pour couvrir les besoins réels de la demande sans cesse croissante des consommateurs. C'est donc pour faire de la production des boulettes une unité à part entière dans la production de dèguè afin de facilité la tâche aux producteurs que la présente étude

est initiée. L'objectif de cette étude est de mettre au point une technologie de production des boulettes à base des farines de céréales afin de les rendre disponibles aux fabricants de dèguè et pour d'autres applications.

2 MATERIEL ET METHODES

2.1 COLLECTTE DE MATERIEL

Le matériel végétal est constitué du mil (*Pennissetum glaucum*), du sorgho (*Sorghum bicolor)* de couleur rouge et du maïs (*Zea mays L.*) de couleur blanche. Le matériel animal était le lait en poudre de marque LACSTAR d'origine irlandaise. Toutes ces matières premières ont été achetées au marché international Dantokpa au Bénin.

Le yaourt nature de marque Comtesse acheté à la pharmacie Togoudo à Abomey-Calavi a servi de matériel biologique. L'eau de la SONEB (Société Nationale des Eaux du Bénin) a été utilisée pour toutes les manipulations.

2.2 ENQUETE SOCIO-ECONOMIQUE DE LA PRODUCTION DES BOULETTES

L'enquête a été effectuée pour appréhender la technologie de production des boulettes ainsi que l'impact socio-économique de cette activité. Elle s'est déroulée sous forme d'entretien sur la base d'un questionnaire, et de l'observation des acteurs au travail. Elle a comporté trois phases principales à savoir : une phase exploratoire ; une phase de collecte des données ; une phase d'analyse des données selon la méthode décrite par [8].

2.2.1 PHASE D'ECHANTILLONNAGE

Le nombre de productrices à enquêter est déterminé par la formule de Dagnelie [9]. Ainsi, **l**a taille de l'échantillon obtenue est de 59 productrices. La répartition des enquêtées par commune est présentée dans le tableau 1 ci-après.

Tableau 1. Répartition des enquêtées par Commune

Communes	Nombre de femmes par Commune	Taux de sondage	Nombre d'enquêtés par Commune	Pourcentage d'enquêtés par Commune
Abomey-Calavi	334 003	0,40	24	40,68
Cotonou	353 590	0,43	25	42,37
Porto-Novo	138 733	0,17	10	16,95
Total	826 326	1	59	100

[10].

2.3 PHASE D'EXPERIMENTATIONS

Les travaux d'expérimentations ont consisté à la production de trois variétés de boulettes, dont les boulettes de maïs, de mil et du sorgho selon la technologie traditionnelle des productrices. Des échantillons ont été prélevés pour des analyses microbiologiques et physico-chimiques. Les différentes boulettes préparées ont subi un séchage solaire afin d'évaluer leurs aptitudes à la conservation après séchage.

2.3.1 PRODUCTION DES BOULETTES

Les grains de céréales pesés, nettoyés (triés, tamisés) et lavés trois fois à l'eau de robinet ont été égouttés puis séchés pendant quarante-huit (48) heures sous les rayons solaires. Ensuite, ces grains propres et séchés ont été pesés de nouveau et moulus dans un moulin à disques de marque N°A PREMIER GRINPING avec une fréquence de 1760tours/min, sa puissance est de 25,50kwa afin d'obtenir les différentes farines. 1kg de farine a été divisé en trois parties égales. On prélève 2/3 de ladite farine que l'on mélange avec 700mL d'eau ; ensuite on malaxe bien et on obtient une pâte. Les boulettes se réalisent par roulage manuel en mélangeant petit à petit le 1/3 restant à la pâte et en tournant régulièrement pendant 5 à 10 minutes. Les boulettes formées sont enfin cuites à la vapeur pendant 15 à 20 minutes. Après refroidissement, elles sont prêtes pour l'emploi.

2.3.2 SECHAGE DES BOULETTES ET RECONSTITUTION DES BOULETTES SECHEES

Les boulettes précédemment cuites sont séchées au soleil en vue d'évaluer leurs aptitudes à la conservation par réduction de la teneur en eau. Ainsi, trois lots constitués chacun de quatre échantillons de boulettes sont séchés au soleil à des durées différentes. Les trois lots de boulettes sont séchés respectivement pendant 0h, 7h, 14h, 21h et 28h au soleil. Puis ensuite il a été dénombré le nombre de jours où les boulettes restent intactes sans détériorations des caractéristiques organoleptiques (noircissement, aspect gluant, fermentation). Les boulettes séchées sont conditionnées et stockées dans des sachets bien sellés.

La reconstitution des boulettes été faite par aspersion des boulettes sèches d'eau à la température ambiante et laissées au repos pendant 5min afin de facilité la cuisson. Les granules humidifiées sont cuites à la vapeur pendant 20min et laissées refroidir. On obtient ainsi des boulettes reconstituées prêtes à être mélangées au lait fermenté pour la préparation de dèguè.

2.4 ANALYSES MICROBIOLOGIQUES

Les analyses microbiologiques ont consisté au dénombrement de la flore mésophile totale [11] sur PCA (Oxoid CM 0463), des levures et moisissures [12] sur Sabouraud Dextrose Agar (Oxoid CM 0041) au chorampphénicol (0,05g /l), des bactéries lactiques [13] sur MRS-Agar (Oxoid CM 0361), des coliformes totaux [14] et thermotolérants [15]sur VRBA (Oxoid CM 0107), des *staphylocoques auréus* [16] sur Gélose de Baird-Parker (BP OXOID CM 0275) au jaune d'œuf et au tellurite de potassium et des salmonelles [17] sur SS Agar (Oxoid CM 0099). Les analyses microbiologiques ont été réalisées en trois répétitions sur chaque échantillon.

2.5 ANALYSES PHYSICO-CHIMIQUES

Les analyses physico-chimiques ont été faites afin de connaître le pH, les teneurs en eau, en cendres, en protéines brutes, en glucides, en lipides et en fer des échantillons. Ainsi, la teneur en eau et le taux de matière sèche ont été déterminés par la méthode [18], à partir de 5g de produit, par dessiccation et par pesée différentielle. La teneur en cendres a été déterminée à partir de la matière sèche par calcination à 550°C pendant 12heures. La teneur en protéines brutes (N x 6,25) a été déterminée par la micro méthode de Kjeldahl. Le pH a été mesuré à l'aide d'un pH-mètre à sonde électronique préalablement étalonné avec des solutions tampons de pH 7 et pH 4 à la température de 28°C. Cette mesure a été prise sur 25 mL de l'échantillon. Le fer a été dosé par spectrophotométrie d'absorption atomique et les sucres totaux par la méthode de [19]. Les matières grasse ont été dosées par la méthode classique «Soxhlet» à l'aide d'un équipement DET-GRAS N qui fonctionne par chauffage électrique et qui est un extracteur de graisses par solvant.

2.6 DETERMINATION DE LA VALEUR ENERGETIQUE DES BOULETTES

La valeur énergétique d'un composé alimentaire est la somme des produits de chaque aliment majeur (glucides, protéines, lipides) et son coefficient thermique d'atwater correspondant [20]. Ainsi, la valeur énergétique (VE) pour 100g de boulettes est alors obtenue par la formule: VE (Kcal) = Protéines (%) × 4 + glucides (%) × 4 + lipides (%) × 9.

2.7 EVALUATION SENSORIELLE

L'analyse sensorielle a été effectuée pour évaluer les différentes caractéristiques organoleptiques des variétés de boulettes séchées et non séchées. Les caractères appréciés sont: la couleur, le goût, l'arôme (l'odeur), la texture et l'acceptabilité globale sur une échelle de 1 à 9 avec 1 = extrêmement désagréable, 5 = identique à l'échantillon de référence et 9 = extrêmement agréable [21]. Un panel de dégustateurs de 33 personnes choisies au hasard et formées pour la circonstance a été constitué.

2.8 ANALYSE STATISTIQUE

Les données collectées sur le terrain et les résultats d'analyse de laboratoire ont été insérées dans les logiciels tels que : Excel et SPSS 16.0. Le logiciel Excel a permis de tracer les graphes. Les proportions, les moyennes ainsi que les fréquences ont été déterminées par SPSS 16. Ce même logiciel a servi aux analyses de variance et les tests de comparaison deux à deux de Tukey. Le niveau de signification des tests est de 5% ($P<0,05$).

3 RESULTATS

3.1 CARACTERISTIQUES SOCIO-ECONOMIQUES DES PRODUCTRICES

Les figures 1 et 2 indiquent respectivement la tranche d'âge et le niveau d'instruction des productrices.

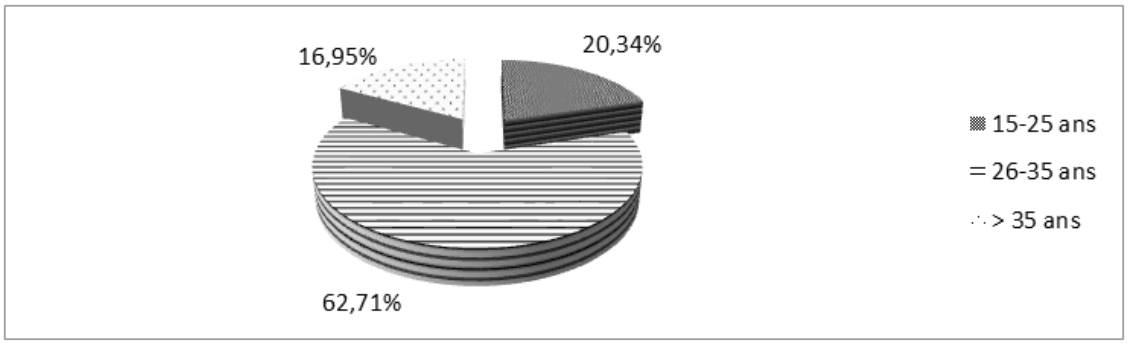

Fig. 1. Répartition des productrices par tranche d'âge

La plupart des productrices ont plus de 25 ans et sont non scolarisées. On remarque que plus de 50% de ces femmes n'ont jamais fait les études primaires. Le reste des femmes ont des niveaux diversifiés.

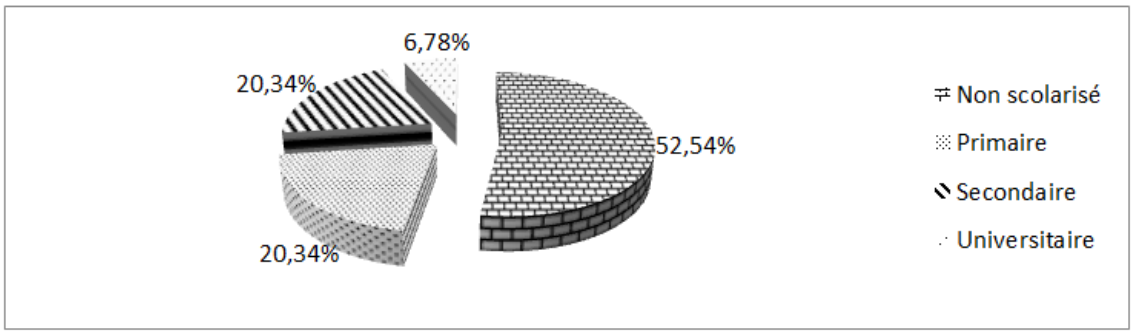

Fig. 2. Niveau d'instruction des productrices

3.2 VARIETES DE BOULETTES PRODUITES ET CRITERES DE CHOIX

La quasi-totalité des femmes produisent des boulettes à base de mil. Cependant, certaines y ajoutent d'autres variétés de boulettes pour obtenir deux types de dèguè. Ainsi 57,6% produisent en plus des boulettes à base de mil, des boulettes à base du couscous de blé alors que 11,9% des productrices font des boulettes à base du mélange riz et mil. Plusieurs considérations motivent le choix des variétés de boulettes par les productrices. Ces choix sont entre autres en fonction de l'habitude alimentaire des populations, du goût, de la consistance et du désir des consommateurs. La figure 3 présente les raisons du choix des variétés de boulettes.

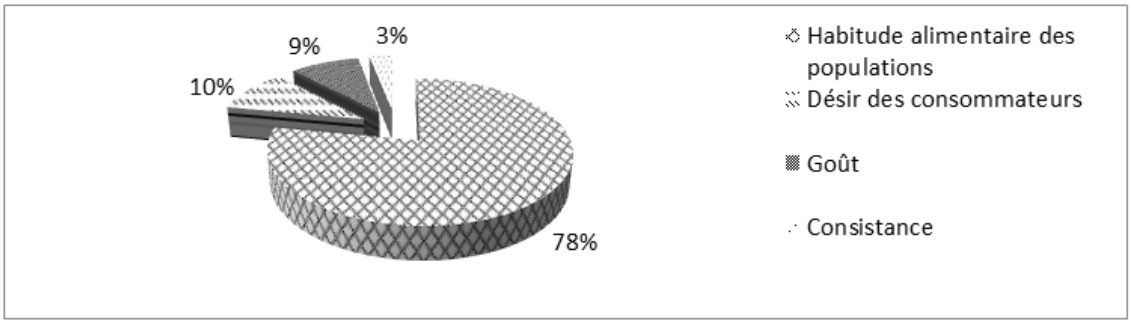

Fig. 3. Raisons du choix des variétés de boulettes produites

3.3 FREQUENCE DE PRODUCTION ET CONTRAINTES LIEES A LA PRODUCTION DES BOULETTES

Dans le but de maximiser le profit et de satisfaire la clientèle, les productrices travaillent tous les jours. 86,4% affirment qu'elles fabriquent les boulettes du lundi au samedi, seulement 22% produisent tous les jours de la semaine y compris les dimanches. La préparation de boulettes est un travail pénible pour les productrices car elle est essentiellement manuelle et fastidieuse. Les enquêtées avouent unanimement que l'obtention des boulettes constitue l'étape la plus importante et que si cette étape est ratée toute la production de dèguè est ratée. 81,4 % des productrices affirment que l'opération unitaire la plus difficile lors de la fabrication des boulettes est le roulage, tandis que le reste des productrices trouvent que cette difficulté réside dans le nettoyage des grains de céréale et le malaxage.

3.4 TECHNOLOGIE DE PRODUCTION DES BOULETTES

La production des boulettes est une succession d'opérations unitaires allant du nettoyage des grains à la cuisson des boulettes. Elle reste traditionnelle et le savoir-faire se transmet de mère en fille et de génération à génération. Ceci concorde bien avec le fait que 77% des productrices affirment avoir hérité cette technologie directement d'un parent. Ces résultats confirment que la technologie de production des boulettes est tributaire des connaissances empiriques des productrices. La figure 4 présente la répartition des productrices par origine d'acquisition de la technologie.

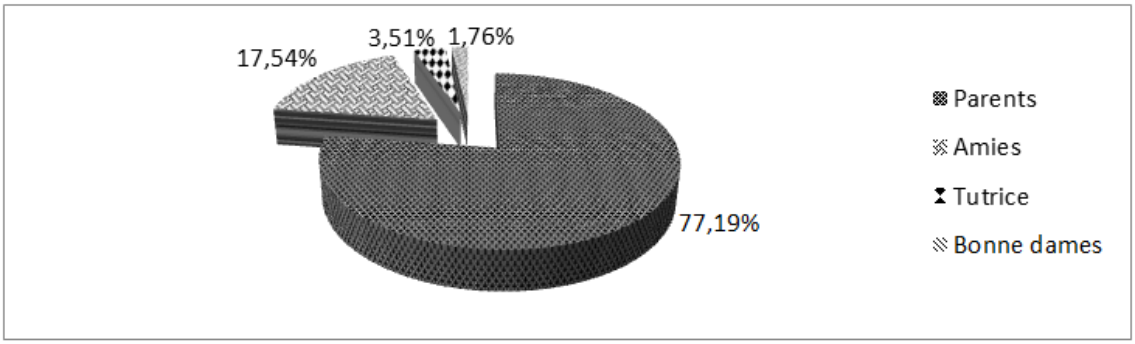

Fig. 4. Répartition des productrices de boulettes par origine d'acquisition de la technologie

L'analyse statistique des paramètres technologiques est résumée dans le tableau 2.

Tableau 2. Comparaison des paramètres technologiques de la production des boulettes

Paramètres	Communes		
	Abomey-Calavi	Cotonou	Porto-Novo
Durée de séchage des grains (heures)	37,00± 14,97[a]	38,50 ± 11,18[a]	37,20± 10,51[a]
Temps de cuisson (heures)	20,25 ± 6,10[b]	20,41± 4,91[b]	21,10± 3,87[b]
Mode de cuisson	à vapeur	à vapeur	à vapeur

Les valeurs moyennes portant la même lettre sur la même ligne ne sont pas significativement différentes au seuil de 5%.

Le schéma technologique de la figure 5 ci-dessous nous a permis de produire trois différents types de boulettes de céréales.

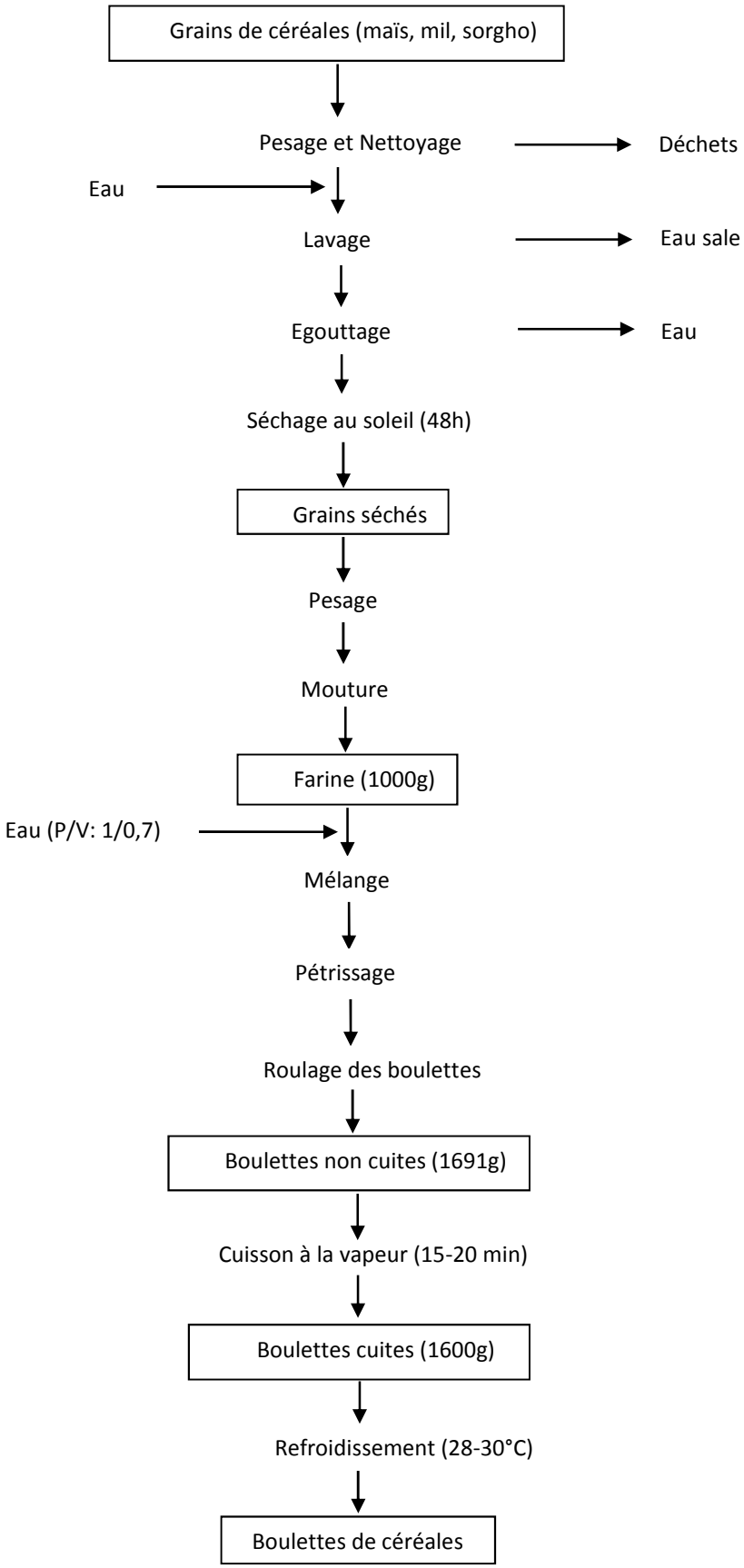

Fig. 5. Diagramme technologique de production des boulettes de céréales

3.5 UTILISATION ET COMMERCIALISATION DES BOULETTES

Les boulettes ne sont pas souvent consommées seul, elles sont mélangées avec du lait fermenté. Cette association boulette et lait fermentée donne une boisson traditionnelle appelée dèguè qui est beaucoup appréciée au Bénin et dans plusieurs pays de Afrique de l'Ouest.

3.6 CONSERVATION ET APTITUDE AU SECHAGE DES BOULETTES

La conservation des boulettes constitue l'épineux problème des productrices de dèguè. Cette situation les contraint à une production journalière. L'enquête a permis de faire une comparaison entre les durées de conservation moyennes obtenues dans les trois communes d'études. La figure 6 suivante présente la durée de conservation relevée dans trois différentes localités du Bénin.

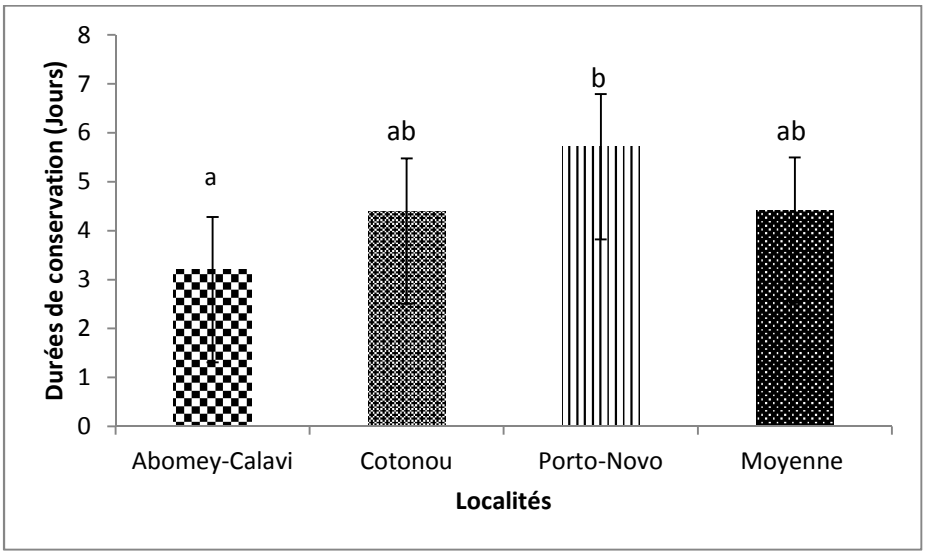

Fig. 6. Durées de conservation des boulettes en fonction de la localité

Les valeurs moyennes portant la même lettre ne sont pas significativement différentes au seuil de 5%.

L'analyse de cette figure montre que la durée de conservation moyenne dans l'ensemble des trois localités est d'environ 4jours. Par ailleurs une possibilité de conservation sur une durée relativement plus longue permettrait une production massive afin d'éviter la production journalière. Ainsi, pour pallier cette situation et rendre disponible les boulettes de céréales, nous avons testé l'aptitude au séchage des boulettes. La figure 7 montre la technologie de production des boulettes séchées.

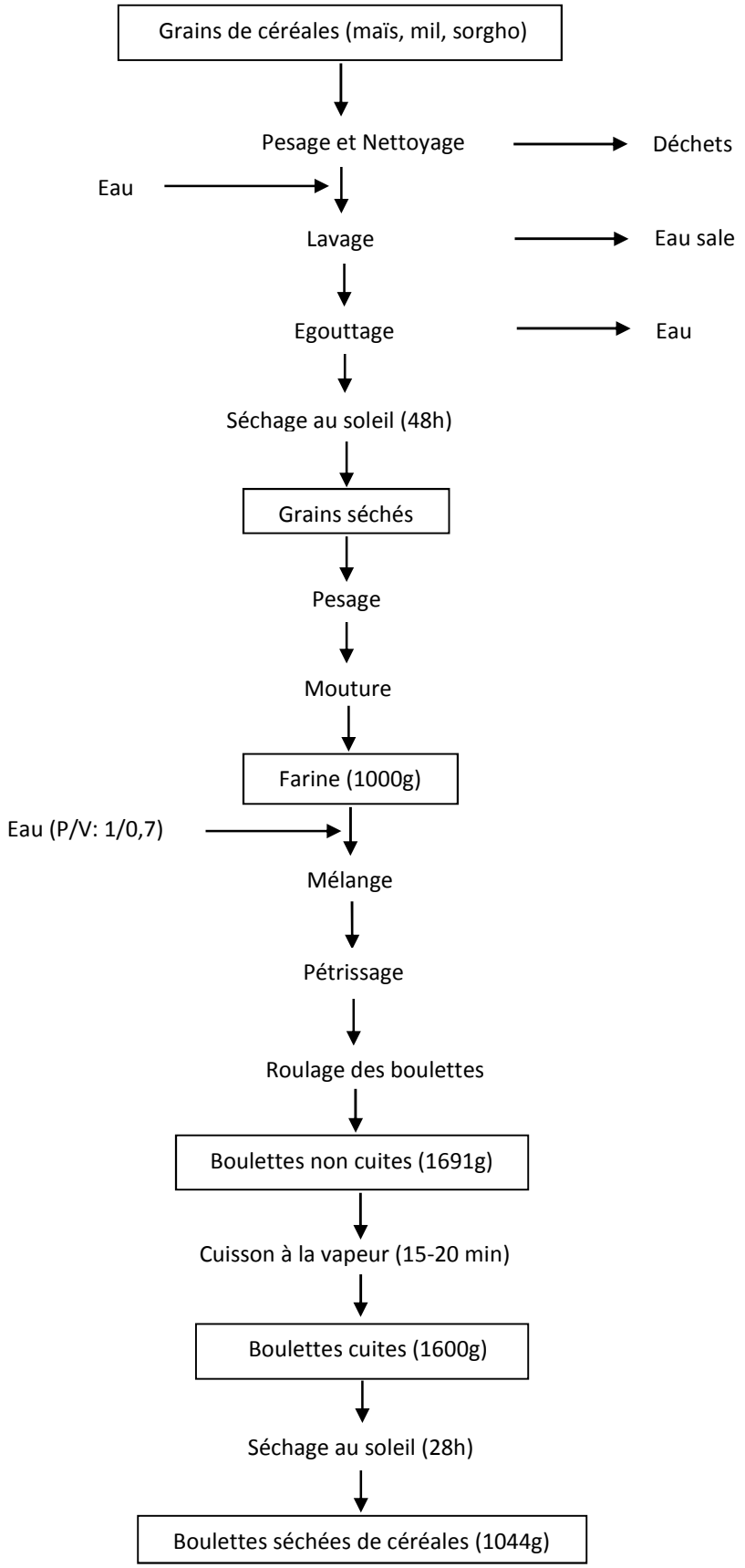

Fig. 7. Diagramme technologique de production des boulettes séchées de céréales

La figue 8 ci-après indique l'évolution de la durée de conservation en fonction de la durée de séchage.

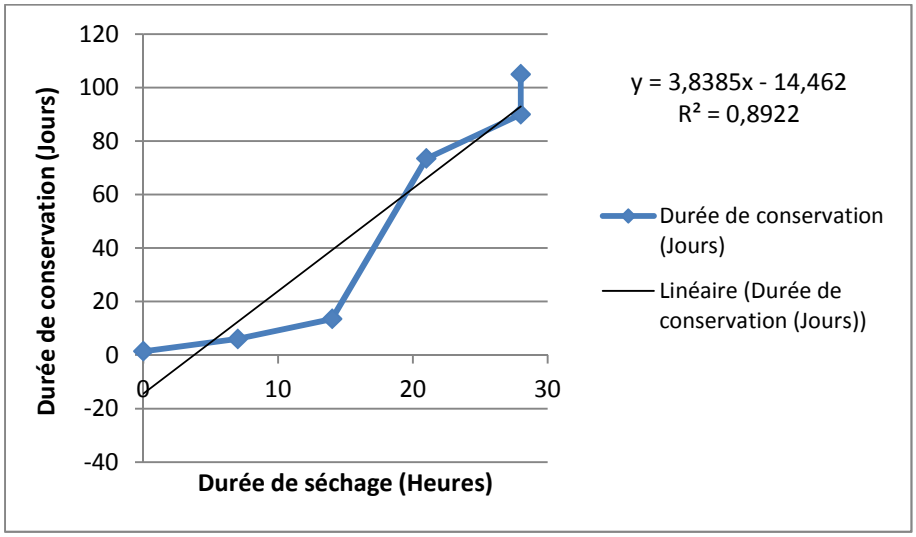

Fig. 8. Evolution de la durée de conservation en fonction de la durée de séchage

L'analyse de cette figure montre que la durée de conservation des boulettes augmente en fonction de la durée de séchage. Les boulettes témoins (0heure de séchage) ont une durée de conservation de 1,375 jour tandis que celles séchées pendant 7heures peuvent être conservées pendant 6,025 jours. Une constante s'observe au niveau de la courbe à partir de la 28ème heure. Ainsi, pour un temps de séchage de 28heures la durée de conservation est de 3mois.

3.7 CARACTERISTIQUES MICROBIOLOGIQUES DES BOULETTES

Les résultats d'analyses microbiologiques sont donnés dans le tableau 3 ci-après.

Tableau 3. Caractéristiques microbiologiques des boulettes

	Microorganismes recherchés Log_{10} UFC/g						
Boulettes	Levures et moisissures	Germes aérobies mésophiles	Bactéries lactiques	Salmonelles	*Staphylococcus aureus*	Coliformes totaux	Coliformes thermotolérants
Maïs	8,07±1,64 [a]	8,12±1,10 [a]	Absent [a]	Absent [a]	Absent [a]	Absent [a]	Absent [a]
Mil	8,40±1,78 [a]	7,98±1,77 [a]	Absent [a]	Absent [a]	Absent [a]	Absent [a]	Absent [a]
Sorgho	6,17±1,4 [a]	8,17±0,00 [a]	Absent [a]	Absent [a]	Absent [a]	Absent [a]	Absent [a]

Les valeurs moyennes portant la même lettre dans la même colonne ne sont pas significativement différentes au seuil de 5%.

3.8 CARACTERISTIQUES PHYSICO-CHIMIQUES DES GRAINS, DES FARINES ET DES BOULETTES DE MAÏS, DE MIL ET DU SORGHO

La teneur en eau des grains et des farines de céréales est présentée dans le tableau 4.

Tableau 4. Teneur en eau des grains et des farines de céréales

Echantillons de Céréales	Taux d'humidité (%)	
	Grains	Farines
Maïs	13,0±0,283[a]	10,3±0,141 [a]
Mil	13,4±1,131[a]	11,2±0,565 [a]
Sorgho	12,6±0 ,001[a]	10,7±2,969 [a]

Les valeurs moyennes portant la même lettre sur la même ligne et dans la même colonne ne sont pas significativement différentes au seuil de 5%.

Le tableau 5 montre les caractéristiques physico-chimiques des boulettes produites.

Tableau 5. Caractéristiques physico-chimiques des boulettes de maïs, de mil et du sorgho

Paramètres	Maïs	Mil	Sorgho
pH	5,31±0,677[a]	5,09±0,638[a]	5,90±0,916[a]
Protéines totaux (%)	8,04±0,144[a]	8,45±0,161[b]	10,10±0,156[c]
Lipides (%)	2,83±0,110[a]	5,85±0,080[b]	9,58±0,160[c]
Sucres totaux (%)	4,17±0,023[a]	3,24±0,023[b]	4,78±0,023[c]
Energies (Kcal/100g)	74,31±1,658[a]	99,41±1,456[b]	145,74±2,790[c]
Fer (mg/100g)	3,61±1,390[a]	13,39±0,17[b]	11,53±0,190[c]
Cendre (%)	0,43±0,018[a]	0,60±0,037[b]	0,49±0,006[c]
Matières sèches (%)	46,27±0,803[a]	51,40±5,315[b]	50,33±3,754[b]

Les valeurs moyennes portant la même lettre sur la même ligne ne sont pas significativement différentes au seuil de 5%.

3.9 ANALYSE SENSORIELLE

Les résultats de l'analyse sensorielle ont montré que 54,2% des dégustateurs préféraient les boulettes de maïs non séchées, pendant que 41,6% ont porté leur choix sur les boulettes de maïs séchées et 4,2% sont restées indifférents. En ce qui concerne les boulettes de mil séchées, 55,1% les ont appréciées, pendant que 29,2% préféraient les boulettes de mil non séchées et 16,7% étaient indifférents. 76,6% des dégustateurs ont préféré les boulettes de sorgho séchées tandis que 16,7% préféraient les boulettes non séchées et 16,7% étaient restés indifférents. D'après ces résultats on retient que les boulettes de maïs non séchées, les boulettes de mil séchées, ainsi que les boulettes de sorgho séchées sont plus appréciées.

4 DISCUSSION

Les résultats d'enquête montrent que la production des boulettes est une activité intégrante dans le processus de préparation d'une boisson traditionnelle qu'est dèguè. Cette activité est exclusivement exercée par les femmes dont la majorité (77%) a un âge supérieur à 25ans (Fig.1). Généralement elles sont des ménagères non scolarisées. En effet, les productrices enquêtées utilisent les revenus issus de cette activité pour subvenir aux besoins élémentaires et faire face aux exigences du foyer. Il faut noter que 56% des productrices de cette boisson sont des musulmanes. Ceci est dû au fait qu'à l'origine dèguè ne se consommait qu'en cas des fêtes religieuses chez les musulmans. Ces résultats sont conformes à ceux de [7] qui indiquent que dèguè est consommé pour la coupure du carême ou pendant la fête de tabaski. Le mil et le riz sont les céréales de bases utilisées par les producteurs de dèguè pour la production des boulettes. Toutes les femmes productrices enquêtées utilisent le mil pour la production des boulettes. Elles estiment que l'appellation dèguè est conférée au produit fini à cause du mil. Cependant on note l'utilisation d'autres céréales telles que : le couscous de blé et parfois le riz mélangé au mil. Par ailleurs remarquons que les productrices choisissent les céréales en fonction de leur origine et de l'odeur des boulettes. On constate commodément que le choix des variétés de boulettes à produire est souvent et surtout fonction de l'origine de la productrice et de l'odeur des boulettes. Toutes ces femmes produisent les boulettes à base de mil non seulement à cause des habitudes alimentaires mais aussi pour son importance nutritif. Les autres variétés sont faiblement produites parce qu'elles ne font pas partie de l'habitude alimentaire des productrices et surtout qu'à l'origine dèguè est un mélange de lait fermenté et des boulettes de mil. Les autres variétés ne sont que des innovations technologiques afin de varier la gamme du produit et de valoriser une fois de plus l'utilisation de ces céréales que sont le sorgho et le maïs. Le petit mil est le seul mil utilisé pour produire des boulettes, 81,4% des productrices affirment qu'il donne un bon dèguè très apprécié à cause de ses vitamines. 10% des productrices ajoutent à ce critère, le goût spécial et l'odeur caractéristique que le petit mil confère au produit fini qu'est dèguè.

Pour un grand nombre de productrices (86,4%) la production des boulettes est une activité journalière malgré que la totalité de celles-ci reconnaissent que la production des boulettes est une activité pénible du processus de préparation du « dèguè ». L'inexistence de technologie de conservation les amène non seulement à produire tous les jours, mais aussi à enregistrer d'énormes pertes en cas de mévente.

La majorité des productrices (77%) ont héritées la technologie des parents. Ainsi, ces dernières confirment aisément que la technologie de production des boulettes est tributaire des connaissances empiriques des productrices. Aucune différence significative au seuil de 5% n'est notée entre les communes d'Abomey-Calavi, de Cotonou et de Porto-Novo en ce qui concerne les paramètres technologiques. De même la comparaison des durées de conservation moyennes entre ces trois communes montre qu'il n'y a aucune différence significative au seuil de 5% entre ces durées de conservation. Cependant la plupart des productrices n'arrivent pas à conserver des boulettes sur plus de trois jours. Par ailleurs l'expérience de séchage

des boulettes respectivement pendant 0h, 7h, 14h, 21h et 28h a montré que le séchage solaire pendant 28h permet de conserver les boulettes sur trois mois. Ce séchage favorise la diminution considérable de la teneur en eau qui passe de plus de 50% à moins de 10%. De plus aucune altération des caractéristiques organoleptiques des boulettes n'est observée. Ces résultats sont conforment à ceux de [22] qui stipule qu'un séchage adéquat conserve le goût et la plupart des éléments nutritifs des aliments et les empêche de se fermenter et de se moisir rapidement.

En ce qui concerne les caractéristiques microbiologiques, on note l'absence totale des germes tels que : Salmonelles, *Staphylococcus aureus*, coliformes totaux et thermotolérants et les bactéries lactiques. Ainsi, d'après les critères microbiologiques du Laboratoire National de Santé de GRAND-DUCHE de Luxembourg, les caractéristiques microbiologiques de ces boulettes ne présentent aucun danger pour la santé humaine.

L'analyse des variances effectuée sur la teneur en eau des grains de céréales et des farines, montre qu'il n'y a aucune différence significative entre les taux d'humidité des grains et des farines au seuil de 5%. Les grains de maïs utilisés pour la production des boulettes ont une teneur en eau de 13%. Ce résultat est conforme à celle obtenu par [23]. Ces teneurs en eau des grains et des farines sont proches de la teneur standard (environ 10%) des aliments séchés. Elles préservent ainsi les grains et les farines des contaminations microbiennes. Par conséquent, ces teneurs obtenues, assurent une bonne conservation des grains et des farines.

L'analyse de variance effectuée sur les paramètres physico-chimiques montre qu'il n'y a pas de différence significative entre les valeurs des pH des trois types de boulettes. Les valeurs obtenues sont proches de celles 5,95 et 6,05 respectivement de semoules (boulettes) de mil et de maïs appelées dackere mis au point par [24] au Cameroun. Par ailleurs, les taux de protéines des trois variétés de boulettes présentent une différence significative au seuil de 5%. Ces résultats se rapprochent de ceux obtenus par [25], [26] sur les grains de maïs, de mil et du sorgho. On note également que le sorgho présente un meilleur taux de protéines suivi du mil puis du maïs. Cette différence au seuil de 5% entre les trois variétés de boulettes se note également en ce qui concerne les taux de sucres totaux. De même ces taux de sucres totaux décroissent successivement du sorgho, maïs puis au mil. Pour les matières sèches, une différence significative s'observe au seuil de 5% entre les boulettes. Les boulettes à base de mil et de sorgho ont une teneur en matières sèches plus élevée que celle des boulettes à base de maïs. Il y a une différence significative au seuil de 5% entre les taux de lipides des trois variétés de céréales. La valeur énergétique des boulettes varie d'une céréale à une autre. Ainsi le sorgho fournit plus d'énergie que le mil qui en fournit plus que le maïs. Cette différence est due à la faible teneur en lipides des boulettes de maïs. Par conséquent du point de vue alimentaire, les boulettes à base de sorgho sont plus énergétiques que celles à base de mil adoptée dès l'origine.

En ce qui concerne les caractéristiques organoleptiques des boulettes séchées, les tests statistiques montrent qu'elles sont globalement acceptées par les dégustateurs et sont plus acceptées que le témoin (boulettes non séchées). Son goût est également meilleur par rapport à celui des boulettes non séchées. D'après ces résultats on retient que les boulettes de maïs non séchées, les boulettes de mil séchées, ainsi que les boulettes de sorgho séchées sont plus appréciées.

5 CONCLUSION

Cette étude montre que la production des boulettes est une activité économiquement rentable. Elle est génératrice de revenus et permet aux productrices de faire face aux besoins quotidiens. La technologie de production rencontrée sur le terrain est tributaire des connaissances empiriques et constitue un patrimoine pour les productrices. Un seul type de boulettes est identifié sur le terrain. Il s'agit des boulettes de farines de mil. Cette étude a aussi permis de mettre au point d'autres types de boulettes à base des farines de sorgho et de maïs. L'épineux problème des productrices est la conservation des boulettes. Ainsi, la technologie de séchage mise au point permet de conserver les boulettes pendant trois mois. Ce qui facilite l'exportation des boulettes et participe à la valorisation de nos produits locaux.

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2D-Ising model for Simulation of Critical Phenomena of $NiOFe_2O_3$ using Monte Carlo Technique

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ABSTRACT: In this work, the critical phenomena of Nickel II Iron III oxide (Ferromagnetic) shall be determined using Monte Carlo simulation technique. The critical temperature (T_c), the magnetization per site (μ), energy per site (E), magnetic susceptibility (χ), specific heat of a $NiOFe_2O_3$ are determined as a function of temperature for two different square lattices 20x20 and 150x150. The analysis of simulation results indicates that the bipolar magnet with strong tetragonal distortion in external magnetic field applied along the axis resembles the behaviour of the two dimensional Ising model on the rectangular lattices. The numerical solution of the model in MATLAB "R2013a" is presented. For the sake of clarity, a Monte Carlo Algorithm known as Metropolis Hastings Algorithm was used to evaluate the behaviour of the lattice and the critical temperature at which the phase transition between $NiOFe_2O_3$ and paramagnetic state occurs was noted. The analysis of the results shows that $T_c = 2.25J/K_B$, in the absence of external magnetic field. It was observed that above (T_c) the material ($NiOFe_2O_3$) becomes a paramagnetic state, and this leads to decreasing in average magnetization and the average Energy increases, while below (T_c) the material is in a ferromagnetic state.

KEYWORDS: Critical temperature, Ferromagnetic, Lattice, Simulation, Susceptibility, Nickel.

INTRODUCTION

One of the most interesting and outstanding problems in modern equilibrium statistical mechanics is the understanding of the physical and mathematical mechanisms of phase transitions. Virtually all substances in nature exhibit cooperatively in one sense or another, some substances display critical phenomena by undergoing a change of phase in configuration space at some critical temperature. Phase transition and critical phenomena are the most universal phenomena in nature. The square-lattice Ising model is the simplest system showing phase transitions (i.e. the transitions between the paramagnetic and ferromagnetic phase) and critical phenomena at finite temperatures. The square lattice Ising model has played a central role in the understanding of phase transitions and critical phenomena [1]. The exact solution of the square- lattice ising model with periodic conditions is well known both in the thermodynamic limit (that is, the infinite size system)[2] and finite size system. However, the exact solution of the square lattice ising model with free boundary conditions is not known for system of arbitrary size.

Analysis of dynamic critical properties is a major problem in statistical physics and theory of phase transition [3],[4]. The substantial progress achieved to date in this field became possible mainly through theoretical and experimental studies. Nevertheless, the development of a rigorous and consistent theory of dynamic critical phenomena based on microscopic Hamiltonians remains a challenging problem in the modern theory of phase transitions and critical phenomena [5],[6]. The critical dynamics of magnetically ordered crystals, especially Gadolinium (Ferromagnetic), is characterized by a great diversity and complexity due to the importance of both exchange interaction and relatively weak relativistic effects (such as

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anisotropy and dipole-dipole interaction). The most essential factor of the latter kind is dipole-dipole interaction, which plays an increasingly important role as the critical point is approached. Note that the aforementioned classification of universal dynamics critical behaviour does not allow for any effect due to dipole –dipole interaction. further analysis [7-9] have shown that theories taking into account dipole-dipole interaction predicts dynamics of two types, normal and stiff, each characterized by a specific set of critical exponents.

It is clear that experimental studies can hardly elucidate the current discrepancy between observations and predictions, because high-precision measurement of critical parameters is a very difficult task. Moreover, since almost any experimental result is due to the combined effects of all factors, their individual strengths and contributions are practically impossible to single out. The problem is also unlikely to be amenable to rigorous theoretical analyses in view of enormous mathematical difficulties.

In recent studies, method of computational physics has played an increasingly important role in dealing with complex issues of this kind. Highly accurate and reliable calculations of critical parameters can be performed by applying these methods, at least, in studies of static critical behaviour [10]. In particular, the advantages of Monte Carlo and molecular theory dynamics simulations include not only rigorous mathematical foundations and error control within their respective frameworks, but also the possibility of evaluating the relative importance of individual parameters.

The approach to ferromagnetism as a function of temperature is described by the Curie –Weiss law [10] which gives the magnetic susceptibility as a function of temperature

$$\chi = \mu - 1 = \frac{C}{T_C} \quad (1)$$

Where $\chi \; and \; \mu$ are the magnetic susceptibility and relative magnetic permeability of the material respectively, C is a constant and T_C is the curie or critical temperature. Equation (1) valid above the Curie temperature. The relative magnetic permeability of the sample can be written as

$$\mu = \frac{L(T)}{L_o} \quad (2)$$

Where L(T) is the inductance of the coil at temperature T and L_o is the inductance of the coil without the sample. This is not exactly the relative permeability since not all the magnetic flux will couple to the sample. From equation (1) and (2)

$$\left(\frac{L(T)}{L_o} - 1\right)^{-1} = \frac{T - T_C}{C} \quad (3)$$

The left hand side of equation (3) is zero when T = Tc.

Several works has been done on 2-D Ising model of feromagnetics by different scholars. Bhanot [11] computed the exact partition functions of the Ising model on L x L square lattices with free boundary conditions up to L = 10 using Cray XMP. Bhanot counted all $2^{L \times L} = 2^{100}$ ($\approx 1.27 \times 10^{30}$) states for L = 10, and began obtaining some useful results.

Stodolsky and Wosiek [12] obtained the exact partition function for L = 13 (corresponding to $2^{169} \approx 7.48 \times 10^{50}$ states) using IBM RISC 6000, and studied phase transitions based on the entropy as a function of the energy.

In this work, for the first time, we evaluate the exact partition function and simulate the critical phenomena of $NiOFe_2O_3$ on L x L square lattices with free boundary conditions for L = 20 and 150.

SIMULATION PROCEDURE

In this work, we consider a two dimensional square lattice of spins. In the absence of external magnetic field, the Hamiltonian of a spins system is written as:

$$H = j \sum_{(i,j)}^{N} \sigma_i \sigma_j \quad (4)$$

Where J is the interaction energy of the two spins, N is the total number of spins [1] and $\sigma_i \; and \; \sigma_j$ is the spin along x and y direction respectively.

we gradually increased the temperature (T) from absolute zero and at some value of T, the magnetization changes its state from high value to a low value (that is, phase transition occurs).

We have ran a number of Monte Carlo simulations for 20 x 20 square lattice $NiOFe_2O_3$ and plotted various graphs to determine critical temperature and critical point exponent of the square lattice used. Here it is assumed that only the nearest neighbors affect each spin (that is, in a 2D square lattice, each spin has four neighbours: up, down, left and right).

MEASUREMENT

Spontaneous magnetization and magnetic susceptibility was measured as follows: for the nth state per spin magnetization

$$m_n = \frac{1}{L^2}\sum_i^{L^2} {\sigma_i}^n \quad (5)$$

L is the size of the lattice that is 20 x 20, S_i is the i^{th} spin. The change in magnetization is given by

$$\Delta M = M_m - M_n = 2{s_k}^n \quad (6)$$

we calculated the magnetization at beginning of the simulation and then use the following equation

$$M_m = M_n + \Delta M = M_n + 2{s_k}^n \quad (7)$$

For every spin, as soon as the magnetization was obtained, we calculate the per spin susceptibility as

$$\chi = \frac{\partial\langle M\rangle}{\partial H} = \frac{\beta}{L^2}(\langle M^2\rangle - \langle M\rangle^2) \quad (8)$$

or, $$\chi = \beta(\langle M^2\rangle - \langle M\rangle^2) \quad (9)$$

where $\beta = \frac{1}{K_B T}$

Energy and specific heat were determined as shown below

$$E_n = -J\sum_{i,j} {\sigma_i}^n {\sigma_j}^n \quad (10)$$

We set the J = 1 and the energy difference in going from state n to m is determined

$$E_m = E_n + \Delta E \quad (11)$$

Knowing the value of E, we then calculated the specific heat per spin as

$$C_V = \frac{\beta^2}{L^2}(\langle E^2\rangle - \langle E\rangle^2) \quad (12)$$

Taking $K_B = 1$

RESULTS

We have started with random spin at the lattice sites and calculated initial magnetization and energy using Ising model. We implemented Hasting Metropolis Monte Carlo simulation of an Ising model in Matlab. All the simulations were of 20 x 20 and 150 x150 square lattices of $NiOFe_2O_3$, we run for temperature of 0.0J/K_B through 5.0 J/K_B. After each temperature increment, the system was allowed to equilibrate for 15,000 steps, and then the averages were performed over the entire grid. The code for the programme is shown in appendix A. (we choose the strength of interaction as J=1 and set the Boltzmann's constant K=1, so temperature becomes dimensionless). in all the four plots, the phase transition from the $NiOFe_2O_3$, ferromagnetic state, where magnetization is maintained even though there is no external magnetic field, and the paramagnetic state, where the temperature is high enough to render the spin-interactions insignificant, it readily observable. Once the critical temperature is reached, the spins have enough energy to overcome the barrier to flipping.

In all plots, the phase transition from the ferromagnetic state, where magnetization is maintained even though there is no external magnetic field, and the paramagnetic state, where the temperature is high enough to render the spin-interactions insignificant, it readily observable. Once the critical temperature is reached, the spins have enough energy to overcome the barrier to flipping. Thus, the magnetization breaks down and oscillates about zero, since each spin is essentially equally likely to be spin up or down.

Further, the plots can be seen exhibit phase transitions right around 2.25J/K_B.

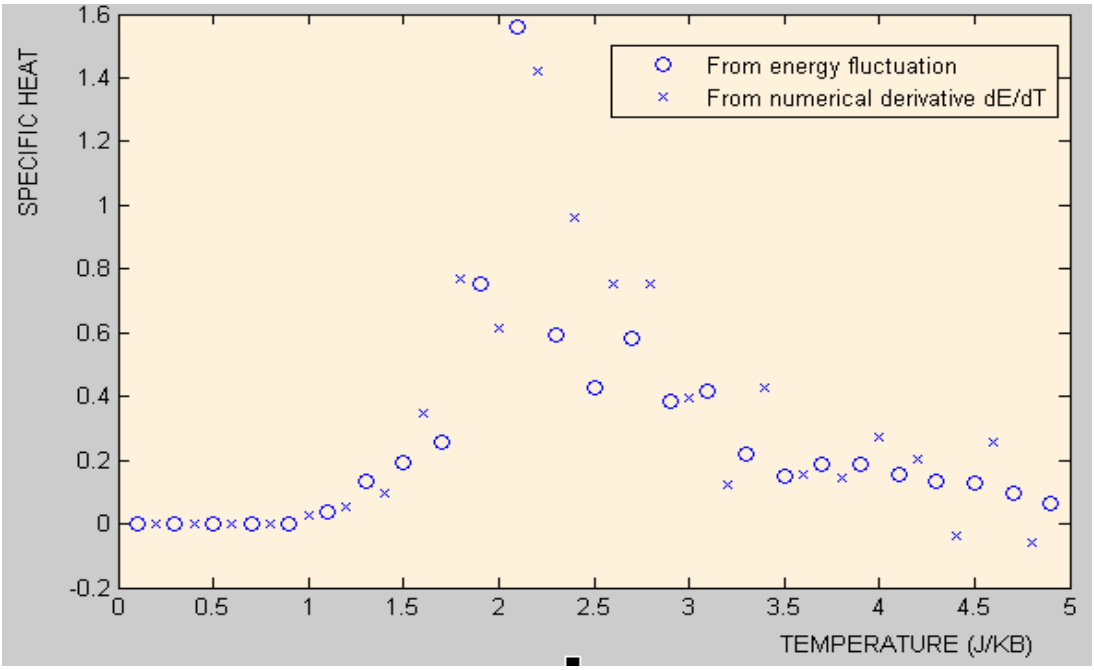

Figure 1: plot of specific heat C against temperature T (in the unit J/K_B) for 20x20 square lattices of $NiOFe_2O_3$

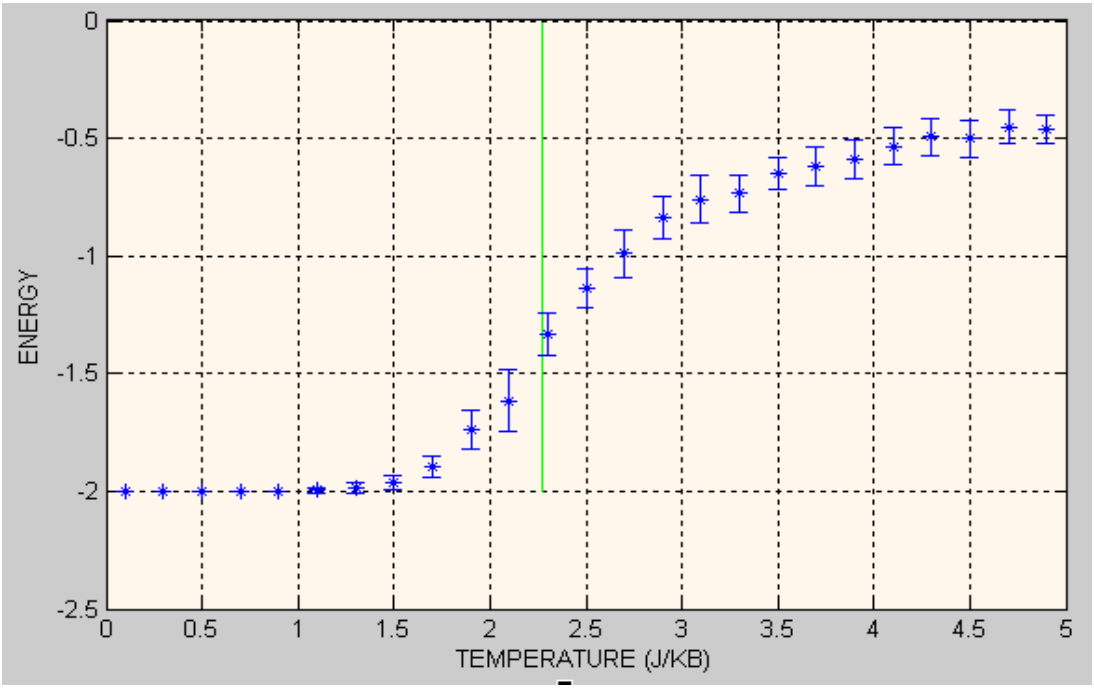

Figure 2: plot of Energy, E against temperature T (in the unit J/K_B) for 20x20 square lattices of $NiOFe_2O_3$

The green vertical line shows the location of the exact critical temperature Tc in the thermodynamical limit. J = 1, L = 20, and B = 0.

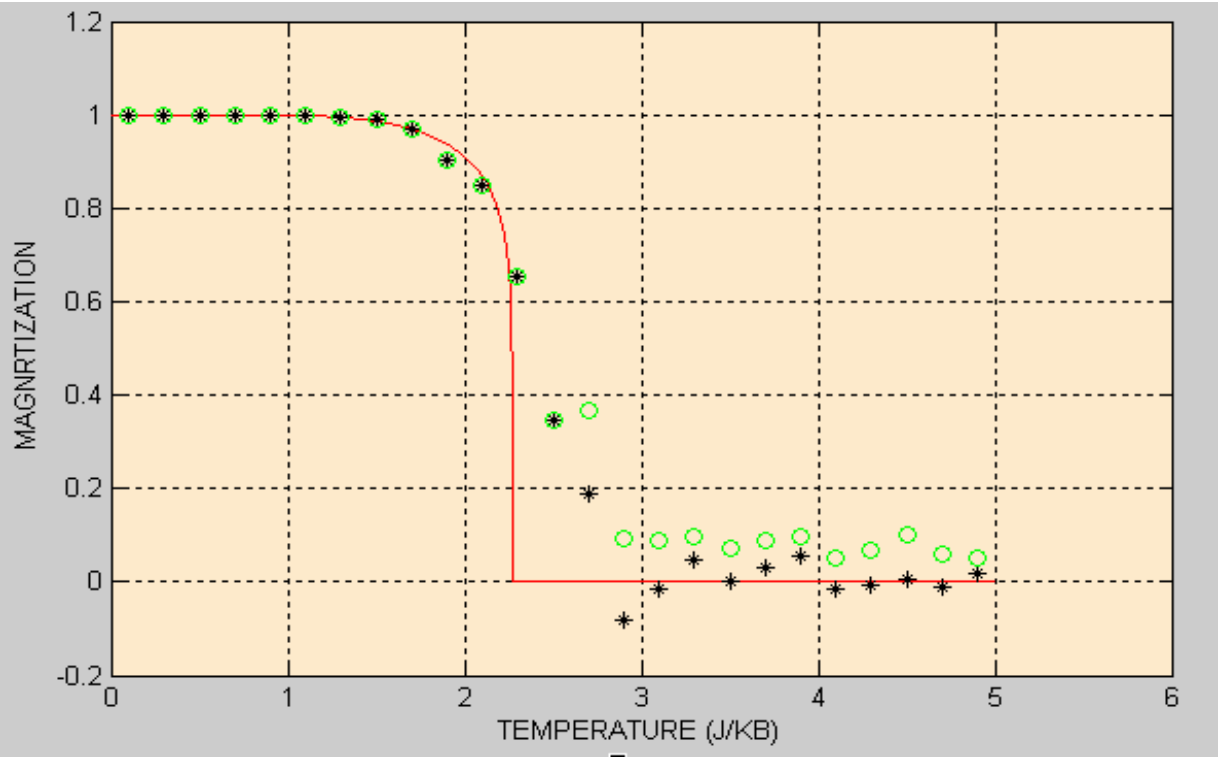

Figure 3: Average magnetization per site of a $NiOFe_2O_3$ as a function of temperature for 20x20 square lattices.

2D ising model magnetization compared with exact B=0 result in the thermo dynamical limit (red line, spin upside).

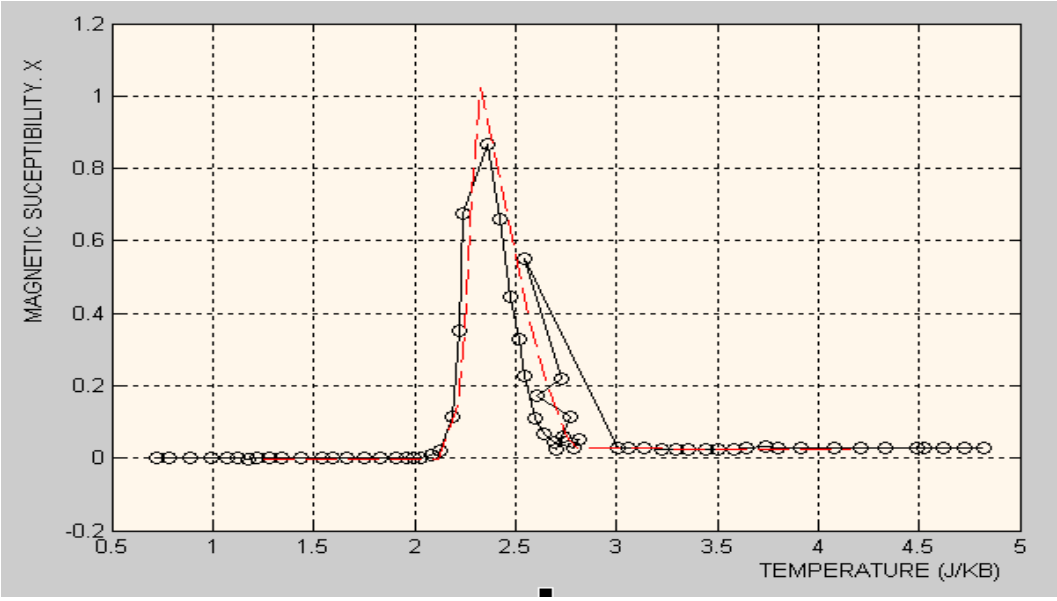

Figure 4: Magnetic susceptibility of a $NiOFe_2O_3$ as a function of temperature for 20x20 square lattices.

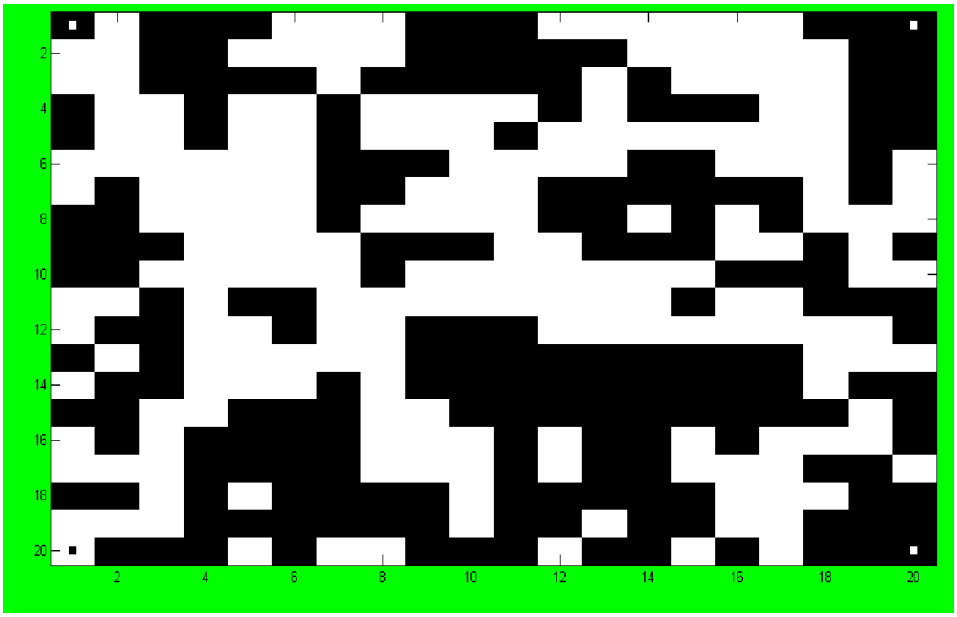

Figure 5: Equilibrium spin configuration at different temperatures around T_c after 15,000 steps for 20x20 square lattices.

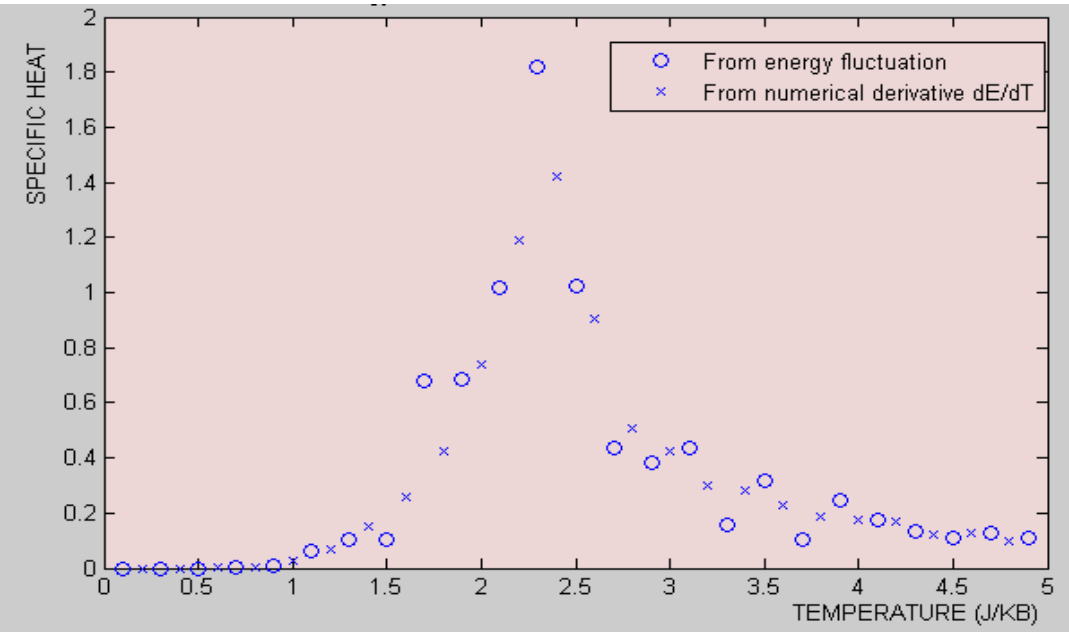

Figure 6: plot of specific heat C against temperature T (in the unit J/K_B) for 150x150 square lattices

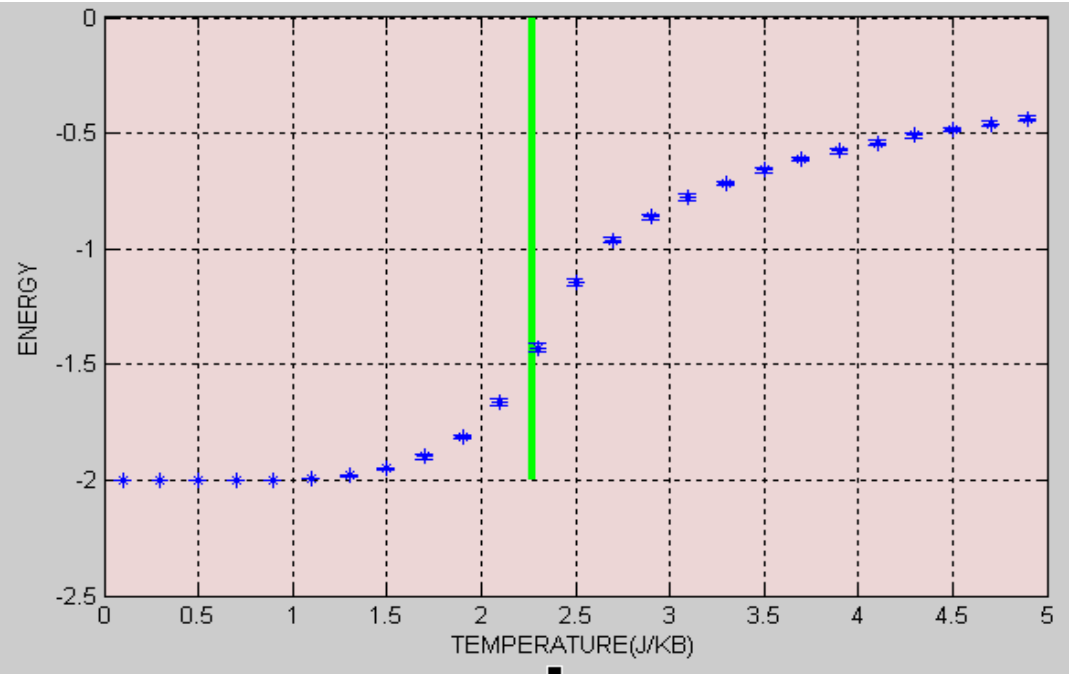

Figure 7: plot of Energy, E against temperature T (in the unit J/K_B) for 150x2150 square lattices $NiOFe_2O_3$

The green vertical line shows the location of the exact critical temperature Tc in the thermodynamical limit. J = 1, L = 20, and B = 0.

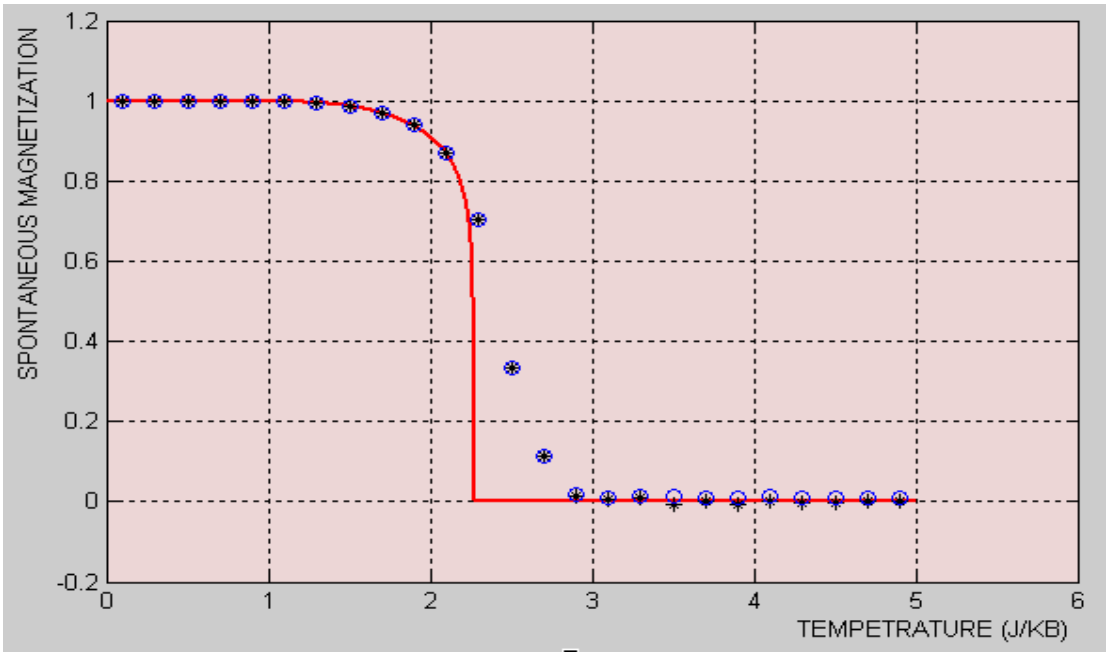

Figure 8: Average magnetization per site of a $NiOFe_2O_3$ as a function of temperature for 150x150 square lattices.

2D ising model magnetization compared with exact B=0 result in the thermodynamical limit (red line, spin upside).

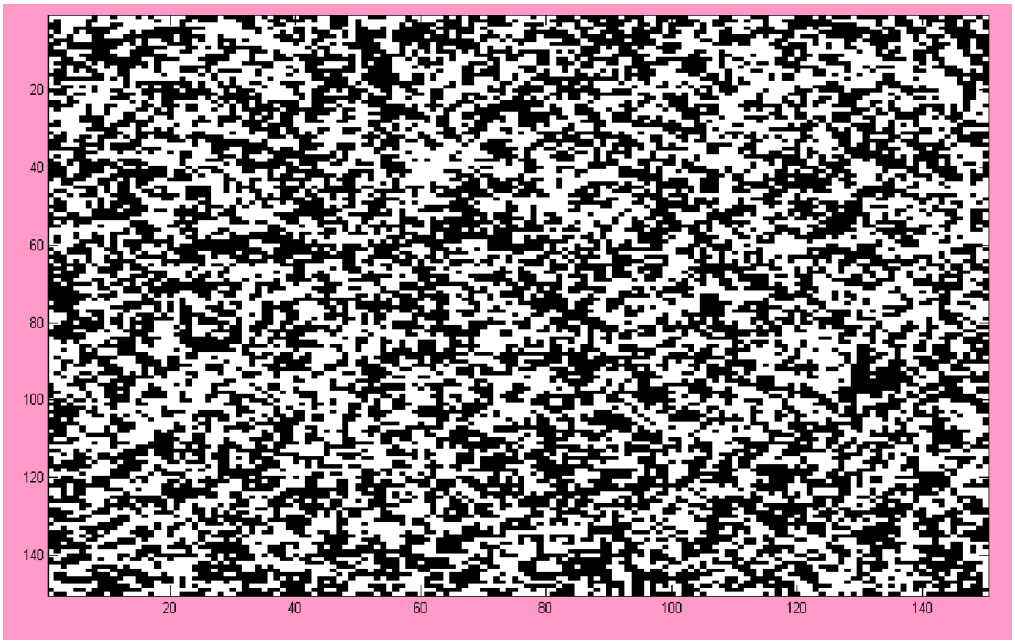

Figure 9: Equilibrium spin configuration at different temperatures around T_c after 15,000 steps for 150x150 square lattices.

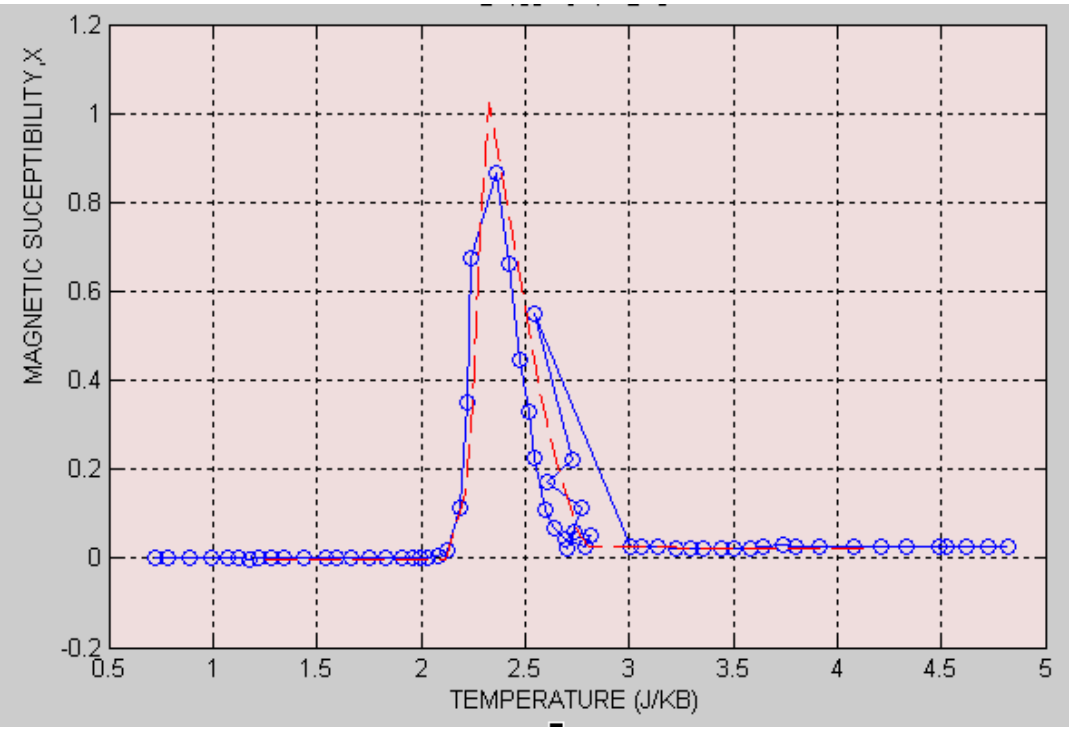

Figure 10: Magnetic susceptibility of a $NiOFe_2O_3$ as a function of temperature for 150x150 square lattices.

CONCLUSION

Phase transitions and critical phenomena are the most universal phenomena in nature. The square-lattice Ising model is the simplest system showing phase transitions and critical phenomena at finite temperatures. The square-lattice Ising model has played a central role in our understanding of phase transitions and critical phenomena. The exact solution of the square lattice Ising model for $NiOFe_2O_3$, a Ferromagnetic with free boundary conditions is not known for systems of arbitrary size. We have obtained the exact solution of the Ising model on the 20 x 20 square lattice and higher square lattice 150x150 with

free boundary conditions configuration. We have also discussed the phase transitions and critical phenomena of the square-lattice Ising model using the exact solution on the square lattice with free boundary conditions.

In this work we verify the existence of kink states, and we study their degree of stability. In our simulation, several systems sizes were considered. The study of the static spin correlation between the initial and final configuration shows there that there exist a finite transition temperature Tc, which is independent of the system size. According to our simulation, at $T < T_c$ the kink state is stable, and the degree of stability increases with system size. Our results shows that the critical temperature of $NiOFe_2O_3$ consider is **2.25J/K_B** which is very close to the literature, **2.20J/K_B** [d]

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Aplasia cutis congenita: a rare extensive bilateral case of extremities

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ABSTRACT: Aplasia cutis congenital is a rare congenital absence of skin, exceptionally involves extremities. Most cases are sporadic but familial autosomal dominant pattern can be found. The etiology remains unclear, both genetic and environmental causes have been implicated. This lesion has primarily a clinical diagnosis. Imaging studies may be used to evaluate underlying tissues and investigate other comorbid abnormalities. Treatment modalities depend upon the extent defect and involvement of underlying tissues. Genetic counseling is useful in cases of hereditary form. We report a new case of extensive bilateral aplasia cutis congenital of extremities in a new born, occurred as an isolated sporadic case without family history, no teratogenic medication and no evidence for an amniotic band or infection in pregnancy.

KEYWORDS: Aplasia cutis congenital, Diagnosis, Etiology, Prognosis, Management.

1 INTRODUCTION

Aplasia cutis congenita (ACC) is a rare congenital absence of skin (1-3/2000-10000), first described as a lesion on an extremity by Cordon in 1767 and after on the scalp by Campbell in 1826. Most cases are sporadic but a familial autosomal dominant pattern of inheritance can occur [1]. Lesions can be multiple on different surfaces of the body but mostly seen on the scalp and rarely on extremities [2]. ACC is primarily a clinical diagnosis, with no specific histologic alterations. In the new born, ACC poses diagnosis, evolutionary and therapeutic difficulties: it could be mistaken by obstetricians for damage inflicted by spiral electrodes or Willet's forceps [3], or associated with other congenital malformations, intrauterine infections, chromosomal anomalies, ectodermal dysplasia or epidermolysis bullosa [4] and expose to risk of mortality in approximately 21 %. Also management is still controversial may be conservative, surgical or combination of both [5].

2 OBSERVATION

A 3 day old mal baby, delivered at term by cesarean section with good extra-uterine life adaptation. He was born of a consanguineous marriage with no family history of congenital anomalies, no history of medications or disease during pregnancy and no birth iatrogenic trauma.

On examination at birth, the baby weighed 3.2 Kg, had normal neonatal reflexes and was found to have a left extensive lower limb defect characterized by a well demarcated erythematous superficially eroded skin lesion extended from the thigh

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to the foot, dotted with ulcerative hemorrhagic closets, sometimes covered by a thin, translucent oozing membrane and associated with an epidermolysis more pronounced at the foot, while surrounding skin was normal (figure 1). Symmetric lesions were seen but less marked on right lower limb (figure 2). Systemic examination was unremarkable with no clinical stigmata of any other congenital abnormality. A clinical diagnosis of ACC was made. No X-ray defects had been found. Laboratory examinations including complete blood count, biochemistry, parameters for liver and kidney functions were all within normal limits. Echocardiography and abdominal ultrasonography didn't show any other abnormalities.

Local wound care was provided based on gentle cleansing of the denuded area with saline-diluted bovidine iodine lotion and then covering it with antibiotic-impregnated non-adherent dressing to promote healing in a moist environment. After two weeks, new born was transferred to pediatric plastic surgeon for plastic reconstructive surgery because of his extensive lesions. The parents were informed of recurrence risk in future pregnancy if a hereditary form is involved following an autosomal dominant pattern.

Figure 1: left lower limb aplasia cutis congenita extended from the thigh to the foot

Figure 2: right lower limb less marked lesion of aplasia cutis congenita

3 DISCUSSION

3.1 DEFINITION

ACC is a heterogeneous group of disorders characterized by well circumscribed focal absence of epidermis, dermis and occasionally subcutis at birth. Non-scalp lesions may involve the trunk and/or extremities and are usually bilaterally symmetric [6]. The lesion is non-inflammatory and well demarcated, may be round, oval, linear or stellate [7], involving less commonly underlying periosteum defect [8], it can be superficially eroded, deeply ulcerated, completely scarred or covered with a membranous epithelium filled with serous fluid resembling a blister such us our case [9].

3.2 DIAGNOSIS

Antenatal diagnosis can be suspected in presence of raised α fetoprotein level in amniotic fluid and maternal blood or a positive acetyl - cholinesterase test [10]. However, the diagnosis is usually made at birth based on clinical criteria [1]. Histopathological features include absent thin epidermis, weak dermis consisting of loosely arranged collagen bundles and thin sub-cutis. Dermal papillae and elastic fibers are absent and blood vessels are mal-developed [10]. Imaging studies may be used to evaluate underlying tissues, to investigate other comorbid abnormalities and help to establish pre-surgical planning [8].

Our case presented bilateral symmetric defect of extremities occurred as an isolated sporadic case without family history, no teratogenic medication and no evidence for an amniotic band or infection in pregnancy.

3.3 ETIOLOGY

The etiology remains unclear; both genetic and environmental causes have been implicated: Vascular abnormalities, including disruption of vascular blood supply, arrest of midline embryological development, defects in closure of the neural tube, viral infections, involution of an intrauterine hemangioma, amniotic adherence have been attributed as the cause [7], [8].

A few case reports are linked to certain teratogens such as Methimazole, carbimazole, misoprostol, valproic acid, diclofenac, angiotensin-converting enzyme inhibitors, benzodiazepines, low molecular weight heparin [9], [10], [11]. ACC can also be associated with other physical anomalies [2]. The most common are limb anomalies: amelia, syndactyly, limb reduction defects, polydactytly, Volkmann's ischemic contracture and clubbing of the hands and feet. Bowel atresia may also be associated. Other less common associations include cleft lip and palate, porencephaly, hydrocephalus, neural tube defects, epidermolysis bullosa, ectodermal dyplasias and chromosomal anomalies such as trisomy.

3.4 DIFFERENTIAL DIAGNOSES

Differential diagnoses include epidermolysis bullosa, focal dermal hypoplasia syndrome, neonatal herpes, fetal varicella, transient bullous dermolysis of the newborn and lesions attributed to birth trauma secondary to vacuum extraction, forceps or fetal scalp monitor electrodes [6], [10].

3.5 PROGNOSTIC

Early death during pregnancy is usually associated with ischemic complications manifesting as absence of structure, whereas late mortality in the second or third trimester tends to be associated with embolic phenomena and coagulopathy, leading to neurological problems in the survivor [1]. At born, large lesions cause death secondary to infection or hemorrhage which can lead to mortality of 20-30% [2], [10]

3.6 MANAGEMENT

Management necessitates interdisciplinary cooperation. Treatment modalities depend upon the extent and involvement of underlying tissues defect: small isolated cutaneous involvement can decrease in size via secondary epithelialization from surrounding healthy tissue, requiring a conservative approach avoiding potential operative risk to the infant. However, the possible complications of conservative management are: wound infection, fatal hemorrhage and biochemical abnormalities due to sulphadiazine dressings who may lead to increased potassium absorption and cause hyperkalemia [3], [5], [6], [8], [12]. Therefore, involvement of vital organs would warrant early surgery [11], the same as large lesions who may necessitate surgical interference with skin grafts or local skin flaps [6]. Genetic counseling is useful when ACC is inherited [12].

4 CONCLUSION

Aplasia cutis is a rare dermatological disorder of neonates which may rarely have an extensive bilaterally symmetrical presentation of extremities. Medical history, physical examination, imaging and genetic study should be made to rule out any other associated anomalies. The management involves a multidisciplinary approach including both conservative and surgical treatment in order to minimize complications and optimize outcomes.

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Le Syndrome de Kasabach-Merritt: à propos d'un cas

[Kasabach-Merritt syndrome: a case report]

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ABSTRACT: Kasabach Merritt syndrome is defined by clinical and biological association of a purplish-red vascular tumor rapidly extensive, thrombocytopenia, a variable degree of disseminated intravascular coagulation and sometimes anemia. It usually occurs in neonates and infants less than 6 months, sometimes in utero. The imaging can confirm the diagnosis and search for deep locations. This syndrome can be life-threatening by the risk of bleeding, coagulopathy, thrombosis, compression and heart failure. The therapeutic management should be early, multidisciplinary adapting therapeutic benefits to risks in order to improve the prognosis. We report a case of Kasabach Merritt syndrome, we insist through a literature review of diagnostic, therapeutic and evolutionary difficulties.

KEYWORDS: Kasabach Merritt syndrome, physiopathology, diagnosis, complications, treatment.

RESUME: Le syndrome de Kasabach Merritt est un syndrome clinico-biologique défini par l'association d'une tumeur vasculaire rouge-violacée, rapidement extensive, d'une thrombopénie, d'un degré variable de coagulation intra-vasculaire disséminée et parfois d'une anémie. Il survient habituellement chez le nouveau-né et nourrisson de moins de 6 mois, parfois in utero. L'imagerie permet de confirmer le diagnostic et de rechercher des localisations profondes. Ce syndrome peut menacer le pronostic vital par le risque d'hémorragie, coagulopathie, thrombose, compression et défaillance cardiaque. La prise en charge thérapeutique doit être précoce, multidisciplinaire adaptant les bénéfices aux risques thérapeutiques afin d'améliorer le pronostic. Nous rapportons un nouveau cas de syndrome de Kasabach Merritt, nous insisterons à travers une revue de littérature sur les difficultés diagnostiques, thérapeutiques et évolutives.

MOTS-CLEFS: Syndrome de Kasabach-Merritt, Physiopathologie, Diagnostic, Complications, Traitement.

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1 INTRODUCTION

Le syndrome de Kasabach Merritt (SKM) se définit par l'association d'une tumeur vasculaire rouge-violacée, rapidement extensive, d'une thrombopénie, d'un degré variable de coagulation intra-vasculaire disséminée (CIVD) et parfois d'une anémie. Il survient habituellement chez le nouveau-né et nourrisson de moins de 6 mois, parfois même in utero [1]. Ce syndrome mérite une attention particulière du fait de sa gravité clinique, thérapeutique et pronostique puisqu'il met en jeux le pronostic vital avec une forte mortalité [2], [3]. Nous rapportons un nouveau cas de syndrome de Kasabach-Merritt, nous insisterons à travers une revue de littérature sur ses différentes difficultés diagnostiques, thérapeutiques et évolutives.

2 OBSERVATION

Il s'agit d'un nouveau-né de sexe masculin de Parents consanguins, issu d'un accouchement par voie basse à terme d'une grossesse bien suivie avec bonne adaptation à la vie extra-utérine, présentant une énorme tuméfaction cutanée rouge-pourpre, chaude, sensible, à base indurée et surface lisse brillante parsemée de quelques ecchymoses et pétéchies, s'entendant de la région fessière jusqu'au pied droit(Figures 1 et 2) . Le reste de l'examen somatique était sans particularité. Le bilan biologique a objectivé une anémie (hémoglobine : 5g/dl) avec thrombopénie (80.000/ mm3) et un TP effondré. L'écho-doppler des membres inférieurs a confirmé la nature tissulaire et hyper vasculaire de la tumeur. L'échographie abdominale, la TDM cérébrale et la radiographie pulmonaire n'ont pas révélé d'autres anomalies associées. Le nouveau-né a été alors transfusé par des culots globulaires, culots plaquettaires et plasma frais congelé, puis mis sous corticothérapie à raison de 3 mg/kg/j pendant 4 semaines avec dégression sur 6 mois et acide acétylsalicylique à 10mg/kg/j associée à une compression par bandage intermittent, il fut adressé par la suite pour un traitement Laser avec évolution favorable.

Figure1: Vue dorsale du syndrome de Kasabach-Merritt

Figure2: Vue ventrale du syndrome de Kasabach-Merritt

3 DISCUSSION

3.1 DÉFINITION

Depuis la première description en 1940, le SKM désignait l'association d'une thrombopénie et d'un volumineux hémangiome. Jusqu'en 1997, il était considéré comme une complication des hémangiomes infantiles classiques [1], [2]. Actuellement, il se caractérise par une tumeur qui fait le lit de phénomène biologique parfois létal associant une thrombopénie, une CIVD et parfois une anémie [1], [2]. L'hémangiome peut être cutané parfois associé à des hémangiomes viscéraux occultes de différentes localisations souvent abdomino-pelviennes (hépatique, splénique, rétro péritonéal), cervico-thoracique, médiastinales et osseuses [1], [3], [4], [9].

3.2 PHYSIOPATHOLOGIE

Grace aux avancées clinico-pathologiques, biologiques et génétiques, la physiopathologie de ce syndrome est actuellement mieux élucidée [2], [3]. En effet, l'hypothèse principale est une séquestration plaquettaire au sein des vaisseaux, liée à un endothélium anormal et proliférant exposant les éléments sous-endothéliaux à l'hémangiome ce qui entraînerait une agrégation et activation plaquettaire avec consommation secondaire des facteurs de coagulation à l'origine de la CIVD. Celle-ci pourrait favoriser la survenue de thromboses et des hémorragies. Différents marqueurs immunohistochimiques des plaquettes ont été utilisés pour confirmer cette séquestration, en particulier l'anticorps anti- CD 61 [1], [8], [9].

3.3 DIAGNOSTICS DIFFÉRENTIELS

Le SKM doit être individualisé de : l'hémangiome infantile**,** Rapidily involuting congenital hemangioma,

Les malformations veineuses, les angiosarcomes et les sarcomes de Kaposi [2].

3.4 DIAGNOSTIC

3.4.1 CLINIQUE

L'aspect clinique de la tumeur vasculaire est très variable : ecchymotique, purpurique, inflammatoire, ou hémorragique. Sa surface est lisse et brillante, parfois très fragile à la limite de la rupture. À la palpation, la tumeur est indurée et sensible. Autour et à distance, des pétéchies et ecchymoses peuvent être présentes [1].

3.4.2 BIOLOGIE

La thrombopénie est constante, souvent profonde et associée à une diminution du taux du fibrinogène, une augmentation importante des D-Dimères et des produits de dégradation de la fibrine, parfois à une anémie ferriprive en rapport avec le syndrome hémorragique ou hémolytique de la microangiopathie [1], [2].

3.4.3 IMAGERIE

Un bilan échographique est utile pour établir le diagnostic de masse souvent hyper échogène. Le doppler couleur permet de confirmer le diagnostic avec une sensibilité de 84 % et une spécificité de 98%. Quant à la TDM et IRM, elles permettent de mieux définir ces lésions notamment pour les localisations profondes [5], [7]. En IRM, ces tumeurs apparaissaient mal limitées, en isosignal T1, en hypersignal T2, rehaussées de façon diffuse après injection de gadolinium et infiltrant les tissus sous-cutanés [1]. D'autres explorations peuvent aider au diagnostic tel que l'angiographie par soustraction numérique, la scintigraphie osseuse et la radiologie standard à la recherche d'une ostéolyse régionale [1]. La biopsie écho guidée permet de différencier le SKM des autres néoplasies malignes, toutefois sa réalisation est controversée, du fait du risque hémorragique et infectieux important sur ce terrain [1], [7].

3.5 COMPLICATIONS

Bien que l'histoire naturelle des hémangiomes est caractérisée par leur régression spontanée au cours des deux premières années avec une résolution complète de 50% à l'âge de 5 ans et plus de 70 % à l'âge de 7 ans [6], le SKM peut se

compliquer lors de l'augmentation rapide du volume tumoral à l'origine d'un envahissement ou d'une compression des organes adjacents voir même une défaillance cardiaque [1]. D'autre part, la coagulopathie peut menacer le pronostic vital par le risque d'hémorragies locales, viscérales, péritonéales, pleurales ou ventriculaires cérébrales augmentant ainsi le taux de mortalité jusqu'à 40 à 80 % [1], [6]. De plus, les localisations hépatiques exposent au risque d'insuffisance cardiaque fœtale avec anasarque et hydramnios [5]. Alors qu'au niveau splénique le risque est lié aux infections sévères et à l'hémorragie létale par rupture splénique [4], [7].

Par ailleurs, des complications thrombotiques peuvent survenir avec risque d'insuffisance rénale aigue par thrombose des capillaires glomérulaires, occlusion artério-veineuses des extrémités avec risque de gangrène et embolie pulmonaire [6].

3.6 TRAITEMENT

Le but du traitement est d'arrêter la croissance tumorale et favoriser son involution rapide tout en préservant la fonction des organes atteints [8], [11]. L'approche thérapeutique doit être multidisciplinaire impliquant : dermatologue, chirurgien pédiatre, chirurgien plasticien, radiologue interventionnel et psychiatre, dans le but de rationaliser, de manière consensuelle, les décisions thérapeutiques. Différentes modalités thérapeutiques ont été essayées, mais avec un succès limité [8], [9], [10] :

Le traitement d'urgence : vise à corriger les anomalies hématologiques notamment lorsqu'un geste invasif est envisagé ou en cas d'hémorragie [1].

L'exérèse chirurgicale est discutée en fonction de la taille de la tumeur, son invasion des structures anatomiques adjacentes, devrait être envisagée dans une zone non vitale lorsqu'elle est réséquable en totalité [1].

Par ailleurs, la prise en charge anesthésique représente un véritable challenge du fait de l'anémie sévère, la thrombopénie et la coagulopathie nécessitant une mise en condition préalable [8], [9].

La cryothérapie : trouve son application principale dans le traitement des petites lésions superficielles et bien délimitées en phase proliférative.

Le Laser : plusieurs séances sont habituellement nécessaire pour obtenir un arrêt de croissance voire un début d'involution. [11]

L'embolisation de la tumeur vasculaire peut être proposée si des vaisseaux nourriciers sont visualisés à l'artériographie. Elle expose cependant aux risques de migration d'emboles, ischémie d'un organe vital, exacerbation des anomalies hématologiques, formation de vaisseaux collatéraux et rechute [1].

Radiothérapie : est encore utilisée dans le traitement du SKM [8]. Toutefois, elle ne doit pas être proposée en première intention chez l'enfant en raison des effets iatrogènes à long terme (troubles de la croissance, néoplasies secondaires…) [1].

Corticothérapie par voie générale peut être bénéfique bien que son mécanisme exact est inconnu [11], elle est souvent utilisée à la phase initiale du SKM à posologies élevées (2 à 5 mg/kg/jour) maintenues au moins 6 semaines en cas de bonne réponse, avec décroissance progressive sur plusieurs mois [1].

Interféron alpha-2a ou 2b est un agent anti-proliférant des cellules endothéliales et inhibiteur de l'angiogénèse, recommandé en cas d'échec des corticostéroïdes ou en combinaison à deux ou plusieurs moyens thérapeutiques [1], [8].

Vincristine : présente une activité anti-mitotique, et anti-angiogénèse. Elle s'administre par voie intraveineuse à la posologie de 1 à 2 mg/m2/semaine, peut s'associer à une Polychimiothérapie en cas d'échec à la monochimiothérapie ou de risque vital [1].

Antiagrégants plaquettaires : associant l'aspirine et la ticlopidine à la posologie de 10 mg/kg/j chacune [1].

Anti-fibrinolytiques *:* acide aminocaproique, acide tranexamique ont été utilisés, dans le but de réduire les thromboses et la vascularisation tumorale [1], [6].

Héparine de bas poids moléculaire associée aux facteurs de coagulation permettraient de contrôler la coagulopathie de consommation [4].

4 CONCLUSION

Le Syndrome de Kasabach-Merritt est un syndrome clinico-biologique qui peut menacer le pronostic vital du nouveau-né. Sa prise en charge thérapeutique doit être précoce et multidisciplinaire, mettant en balance le pronostic vital à court terme et les effets indésirables des traitements utilisés à long terme afin d'améliorer la survie et de limiter les séquelles.

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Tuberculose péritonéale pseudo tumorale mimant un cancer ovarien

[Pseudo tumoral peritoneal tuberculosis mimicking advanced ovarian carcinoma]

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ABSTRACT: Pseudo tumoral peritoneal tuberculosis is a rare clinical form witch clinical and para clinical aspects can mimic advanced ovarian cancer leading to unjustified radical surgery, with high risk of morbidities, often in a young woman. We report a new case of pseudo tumoral peritoneal tuberculosis in a girl of 21 years old in which diagnosis of ovarian cancer with ascitis and peritoneal carcinomatosis was suspected clinically, radiologically and biologically by rising CA125. Exploratory laparotomy with extemporaneous histological examination has confirmed tuberculosis diagnosis.

KEYWORDS: Peritoneal Tuberculosis, Pseudo Tumoral Form, Diagnosis, Treatment, Prognosis.

RÉSUMÉ: La tuberculose péritonéale pseudo tumorale est une forme clinique rare dont les aspects cliniques et paracliniques peuvent mimer un cancer ovarien avancé conduisant ainsi à une chirurgie radicale non justifiée, hautement à risque de morbidité, souvent chez une femme jeune. Nous rapportons un nouveau cas de tuberculose péritonéale pseudo tumorale chez une jeune fille de 21 ans chez qui le diagnostic de cancer ovarien avec ascite et carcinose péritonéale avait été suspecté cliniquement, radiologiquement et biologiquement par l'élévation du CA125. La laparotomie exploratrice avec examen histologique extemporané ont permis de confirmer le diagnostic de tuberculose.

MOTS-CLEFS: Tuberculose Péritonéale, Forme Pseudo Tumorale, Diagnostic, Traitement, Pronostic.

1 INTRODUCTION

La tuberculose constitue encore un problème de santé publique aussi bien dans les pays en voie de développement que dans les pays développés du fait de l'éclosion mondiale de l'infection par le virus de l'immunodéficience humaine (VIH) [1], la précarité, l'immigration et la résistance aux anti-bacillaires [2]. Dans les formes pseudo-tumorales, la symptomatologie non spécifique, l'existence d'une masse abdominale et l'altération de l'état général peuvent orienter à tort vers une pathologie

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tumorale maligne [3], ce qui peut conduire à une chirurgie radicale non justifiée le plus souvent chez une femme en activité génitale [2]. Nous rapportons un nouveau cas de tuberculose péritonéale colligé au Service de Gynécologie Obstétrique à l'Hôpital Instructif Mohamed V Rabat simulant un cancer ovarien évolué. Nous discutons, à travers une revue de littérature, les différents aspects cliniques, biologiques, radiologiques, thérapeutiques et évolutifs de cette pathologie

2 OBSERVATION

Jeune fille de 21 ans, sans antécédents pathologiques notables présentant depuis 3 mois une augmentation progressive du volume abdominal avec douleurs abdomino-pelviennes chroniques associées à des signes de compression urinaire et digestive, évoluant dans un contexte d'apyrexie et d'amaigrissement chiffré à 8 kg en 2 mois ce qui a motivé sa consultation. L'examen a retrouvé un abdomen distendu avec matité diffuse et masse abdominale arrivant à deux travers de doigts au-dessus de l'ombilic. L'échographie pelvienne a confirmé la présence d'une énorme masse étendue du pelvis au flanc gauche, d'aspect hétérogène, à contenu mixte avec des zones échogènes et hypo échogènes multiloculaires, arrivant au contact intime de l'utérus et des vaisseaux iliaques avec épaississement péritonéal en regard (figure1). L'utérus était de taille normale d'écho structure homogène avec un endomètre fin, tandis que le cul de sac de douglas était occupé par une ascite multi cloisonnée (figure2). Par ailleurs, les ovaires étaient difficiles à explorer. Le complément tomodensitométrique a objectivé la présence d'une masse kystique péritonéale développée en sus utérin et s'étendant dans le flanc gauche mesurant 20 x 14 x 8 cm, à paroi épaissie régulière, rehaussée après injection et contenant un bourgeon charnu mesurant 36 x 26 mm. L'utérus était de morphologie normale, alors que les ovaires étaient augmentés de volume siégeaient de multiples images kystiques (Figures 3 et 4). Par ailleurs, l'épanchement péritonéal était cloisonné par endroit avec infiltration des feuillets péritonéaux, du grand épiploon et du mésentère, associé à une uétérohydronéphrose gauche modérée secondaire à l'infiltration de l'uretère gauche au niveau du croisement avec les vaisseaux iliaques (Figure 5). La radio thorax n'a pas montré d'anomalie pleuro-pulmonaire en faveur d'une tuberculose évolutive ou séquellaire. Le CA125 était augmenté à 468 UI/ml, alors que les autres marqueurs tumoraux (ACE, αFP, βHCG) et la sérologie hydatique étaient normaux, le reste du bilan était sans particularité notamment la fonction rénale. Ce tableau faisait évoquer en premier une tuberculose péritonéale sans exclure un cancer ovarien. Une laparotomie médiane exploratrice a été alors réalisée a mis en évidence la présence d'une énorme masse kystique blindée au pelvis et adhérente à la paroi abdominale antérieure avec inflammation péritonéale diffuse et présence de multiples formations blanchâtres au niveau du péritoine, épiploon et intestin grêle (Figures 6 et 7). Un prélèvement du liquide d'ascite a été réalisé de même qu'une biopsie péritonéale. L'examen extemporané a mis en évidence un granulome épithélioide et giganto cellulaire avec nécrose caséeuse sans signe de malignité, en faveur d'une tuberculose péritonéale (Figure 8). Les suites post opératoires ont été simples, la patiente a été mise alors sous traitement anti-bacillaire.

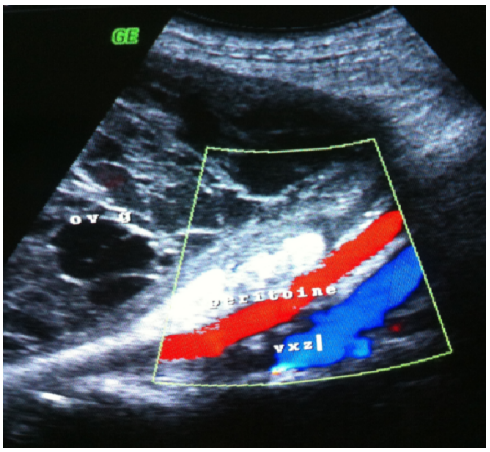

Figure 1 : Echographie pelvienne montrant une énorme masse d'aspect hétérogène à contenu mixte arrivant au contact intime de l'utérus et des vaisseaux iliaques avec épaississement péritonéal en regard.

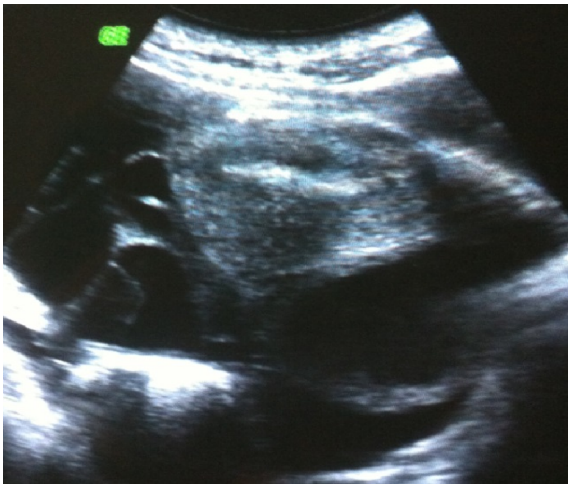

Figure 2 : Echographie pelvienne montrant un utérus de taille normale d'écho structure homogène avec un endomètre fin et ascite multi cloisonnée

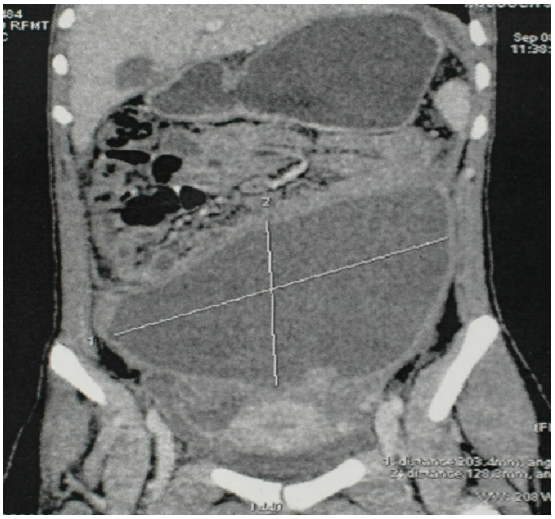

Figure3 : TDM abdominopelvienne en coupe frontale objectivant une masse kystique péritonéale sus utérine étendue dans le flanc gauche mesurant 20 x 14 x 8 cm, à paroi épaissie régulière, rehaussée après injection et contenant un bourgeon charnu mesurant 36 x 26 mm avec des ovaires augmentés de volume multikystiques

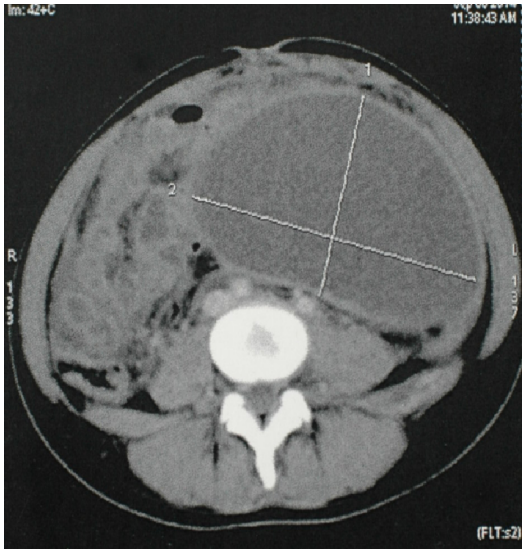

Figure 4 : TDM abdominale en coupe transversale montrant une masse kystique péritonéale étendue au flanc gauche à paroi épaissie régulière avec ascite cloisonnée et aspect infiltré du péritoine, du grand épiploon et du mésentère.

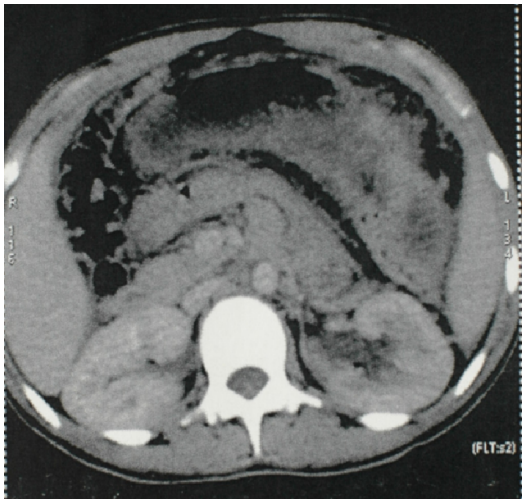

Figure 5 : TDM abdominale en coupe transversale montrant une uétérohydronéphrose gauche modérée secondaire à l'infiltration de l'uretère gauche au niveau du croisement avec les vaisseaux iliaques

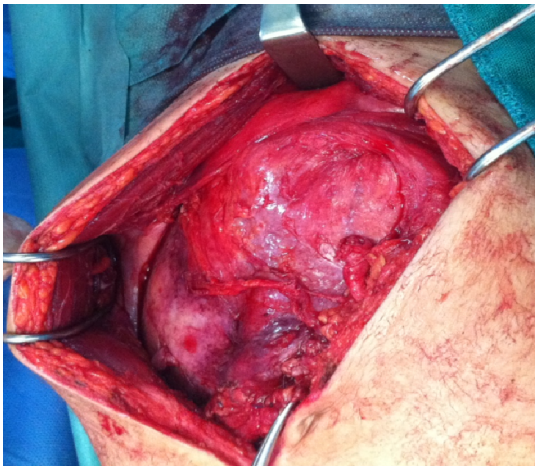

Figure 6 : Aspect peropératoire montrant une masse kystique adhérente à la paroi abdominale antérieure avec inflammation péritonéale diffuse

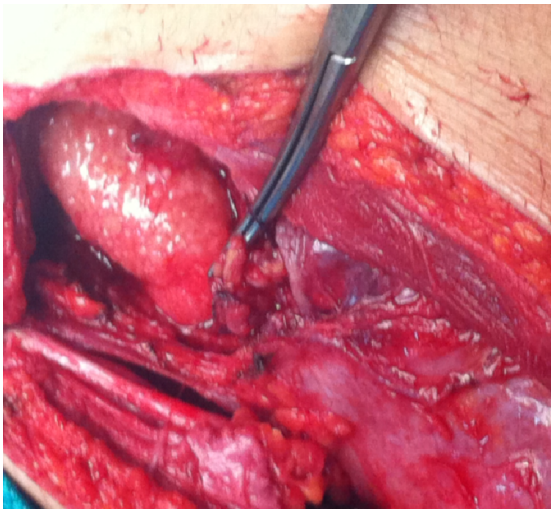

Figure 7 : Exploration per opératoire objectivant la présence de multiples formations blanchâtres au niveau du péritoine, épiploon et intestin grêle

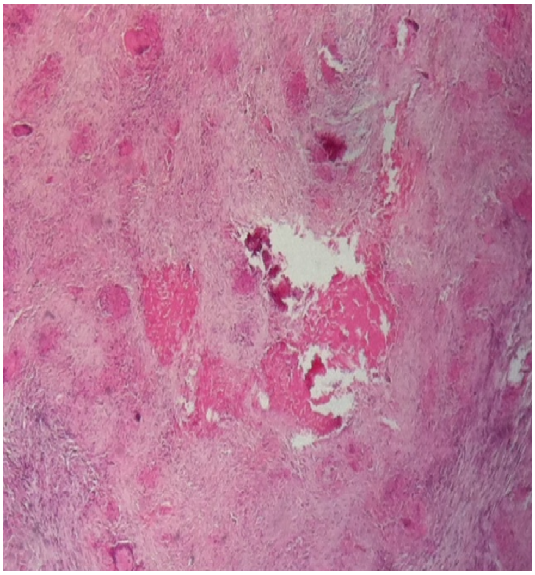

Figure 8 : Aspect Histologique montrant des granulomes épithélioides et gigantocellaires de taille variable parfois centrés d'une nécrose caséiforme (HEx40).

3 DISCUSSION

La tuberculose péritonéale pseudo tumorale, est une forme clinique rare (1 à 3%), mais qui reste fréquente dans les pays d'endémie [4]. Elle peut toucher toutes les femmes avec prédilection chez les jeunes femmes entre 20 et 30 ans [5]. C'est une affection grave, caractérisée par sa difficulté diagnostique souvent réalisée rétrospectivement à un stade tardif [6], son polymorphisme clinico-radiologique et par la sévérité des lésions engendrées par l'infection au Bacille de Koch (BK) persistantes même après le traitement anti bacillaire [7].

3.1 DIAGNOSTIC

3.1.1 CLINIQUE

Si autrefois les formes classiques étaient représentées par les formes ascitiques et les pelvipéritonites, les formes actuelles sont plutôt pauci symptomatiques [1], caractérisées la faible spécificité des manifestations cliniques et la rareté des signes d'imprégnation tuberculeuse ce qui explique le retard diagnostic [8]. Ainsi, la recherche de localisations extra-génitales est primordiale au diagnostic dans certains cas [1].

D'autre part, La forme pseudo tumorale peut orienter à tort à une tumeur maligne de l'ovaire devant les douleurs pelviennes, les masses pelviennes, l´ascite, l´amaigrissement, les troubles menstruels, troubles digestifs, et les signes urinaires [2], [5].

3.1.2 BIOLOGIE

L'élévation du CA 125 fait conforter à tort le diagnostic de cancer ovarien, c'est le cas de notre patiente. En effet, son taux augmenté dans 80% des cancers ovariens, peut se rencontrer dans des conditions normales (menstruation, grossesse) ou au cours des affections inflammatoires chroniques (tuberculose, endométriose, pancréatite, hépatite..) et en période post opératoire [2]. Par conséquent, sa valeur réside surtout pour la surveillance des patientes sous traitement anti bacillaire [5].

Les autres perturbations biologiques ne sont pas spécifiques notamment : l'anémie, le syndrome inflammatoire, de même que l'intradermo-réaction à la tuberculine [3]. L'analyse du liquide d'ascite tuberculeuse montre un liquide exsudatif, de couleur jaune paille avec lymphocytose [9]. Le diagnostic de certitude ne se fait qu'après la mise en évidence de Mycobacterium Tuberculosis soit à l'examen direct ou après culture [6]. Plus récemment décrite, la recherche du BK par « polymerase chain reaction » (PCR) sur biopsies augmente la sensibilité diagnostique (75 à 80 %) et la spécificité (85 à 95 %) [3].

3.1.3 IMAGERIE

Les techniques d'imagerie ne sont pas spécifiques [6], mais constituent toutefois une étape décisive quant au diagnostic des formes pseudo-tumorales [3]. En effet, l'échographie montre la présence d'une masse pelvienne hétérogène à double composante, associée à une ascite, avec épaississement et rehaussement péritonéal. La lésion peut infiltrer la graisse de voisinage voire même l'envahir et se fistuliser aux organes avoisinants.

D'autre part, les anomalies scanographiques du péritoine pariétal peuvent aider au diagnostic [2]. En effet, L'épaississement péritonéal, son rehaussement hétérogène et l'existence de foyers hypodenses en rapport avec la nécrose caséeuse suggèrent l'origine tuberculeuse [3].

La radiographie pulmonaire peut montrer des séquelles pleuro-parenchymateuses, moins souvent des lésions évolutives. Quant à l´urographie intraveineuse, elle peut être utile à la recherche d'une atteinte urinaire associée [10].

3.1.4 ANATOMOPATHOLOGIE

L'étude histologique de la pièce opératoire et des biopsies écho ou scano guidées transvaginales ou transabdominales voire même laparoscopiques représente l'examen clé pour confirmer le diagnostic.

Il s'agit d'une lésion granulomatose gigantocellulaire avec une nécrose caséeuse spécifique du BK (aspect macroscopique de lait caillé et microscopique de nécrose acidophile) [1], [2], [5]. Cependant, ces aspects peuvent varier avec l'évolution de la maladie et l'état immunitaire de l'hôte : la fibroses et calcification peuvent survenir sur des lésions anciennes, alors que la liquéfication puriforme et l'aspect purement folliculaire sans nécrose de même que les réactions inflammatoires mineures se voient chez le sujet immunodéprimé [11].

3.2 TRAITEMENT

3.2.1 TRAITEMENT MÉDICAL

La prise en charge thérapeutique standard est actuellement bien codifiée [6]**,** repose sur l'administration quotidienne pendant 6 mois d'Isoniazide, de Rifampicine, associée pendant les 2 premiers mois au Pyrazinamide et Éthambutol. Toutefois, elle devrait être précédée d'un bilan biologique pré thérapeutique incluant une créatininémie, un dosage des transaminases et un examen ophtalmologique. D'autre part, le diagnostic de tuberculose doit toujours faire dépister une co-infection par le VIH de même que les hépatites B et C. L'efficacité du traitement s'appréciera devant l'amélioration clinique et paraclinique [11].

3.2.2 TRAITEMENT CHIRURGICAL

Le traitement chirurgical n'est pas standardisé, dépend d'abord du motif de l'indication opératoire et des lésions constatées à l'exploration chirurgicale. Ainsi, une levée d'obstacle en cas d'occlusion ou un procédé d'hémostase en cas d'hémorragie massive vont rendre habituellement nécessaire une résection. De plus, 20 à 40% des malades subiront une laparotomie, soit en urgence devant une complication (sténose, occlusion, masse compressive, mise à plat de certaines cavités caséifiées, perforation et fistule), soit dans un but diagnostique notamment en cas de négativité de la ponction écho ou scano-guidée. D'où l'intérêt de l'examen histologique extemporané qui permet d'établir le diagnostic en per opératoire évitant ainsi une chirurgie large inutile et à risque [2], [3]**.** Dans tous les cas, le traitement chirurgical devrait être réalisé au moins 6 semaines après le début du traitement anti bacillaire pour réduire le risque de complications et faciliter le geste opératoire [10].

3.2.3 TRAITEMENT PRÉVENTIF

La vaccination au BCG, le dépistage des formes asymptomatique, la chimioprophylaxie des sujets contacts et l'amélioration de l'hygiène de vie des populations à risque représentent les meilleurs moyens pour prévenir la tuberculose [7], [11].

3.3 PRONOSTIC

Le pronostic de la tuberculose péritonéale est favorable sous poly chimiothérapie anti tuberculeuse [4]. Toutefois, il reste réservé notamment dans les formes de découverte tardive au stade de séquelles urologiques et/ou génitales menaçant la patiente d'insuffisance rénale et d'infertilité tubo-ovarienne estimée à 39 % des cas chez les femmes jeunes [2], [8].

4 CONCLUSION

La tuberculose péritonéale pseudo tumorale pose au clinicien un problème diagnostic en l'absence de tests diagnostiques spécifiques permettant de la différencier d'une carcinose. Un problème thérapeutique, car elle simule le tableau de cancer ovarien avancé pouvant indiquer à tort une chirurgie radicale non justifiée et un problème évolutif, par le risque d'infertilité tubo-ovarienne chez la femme jeune.

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Density functional theory study of Reactive Violet 5R azo dye

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ABSTRACT: The destructive oxidation of dyes and textile effluents has recently received considerable attention since colored aromatic compounds have proven to be degraded effectively by a variety of AOPs. We calculated its electronic and optical properties by using DFT and TD-DFT methods at B3LYP/6-311+G(,p) level in solvent (IEF-PCM model) To determine the reactivity and the active sites of azo dye reactive violet5R (V5R). The results showed that V5R is polar and high soluble in water. A good correlation was obtained between the predicted and experimental absorption bands of V5R (R2=97%).

KEYWORDS: Reactive violet 5R, DFT, TD-DFT, UV/vis, PCM.

1 INTRODUCTION

Several industries, such as textile, ceramic, paper, printing and plastic use dyes in order to color their product. In the coloring process, these industries also consume substantial volumes of water, and as a result, large amount of colored wastewater are generated. The present of dyes in water is undesirable since even a very small amount of these coloring agents is highly visible and may be toxic to aquatic environment [1–5]. Azo dyes, characterized by nitrogen to nitrogen double bonds (–N=N–), account for up to 70% of all textile dyestuffs produced, and are the most common chromophore in reactive dyes [6].

Many physical and chemical methods including adsorption, coagulation, precipitation, filtration, and oxidation have been used for the treatment of azo dye-contaminated effluents [7]. Jain et *al.* studied the degradation of Violet 5R (V5R) in a mixture of bacterial strains and they proved the potency of bioremediation strategy in decolorizing and degrading VR5 [8]. Density functional theory (DFT) is a convenient method to determine the electronic properties and reactivity of azo dyes.

Time dependent density functional theory (TDDFT) appears the most reliable method to predict UV/vis spectra of azo dyes with an intermediate size[9-10]. Jacquemin et *al.*reported the methodology choice and reproduction of the UV/visible spectra of a large series of dyes by using PBE0 and B3LYP hybrid functionals in polarisable continuum model (PCM) [9, 11, 12,13].

In this paper, focus is on determining the electronic and optical properties of V5R azo dyes by using DFT and TDDFT methods.

MATERIALS AND METHODS

Materials

- Violet 5R azo dye was obtained from hight school of textiles, Casablanca, Morocco.

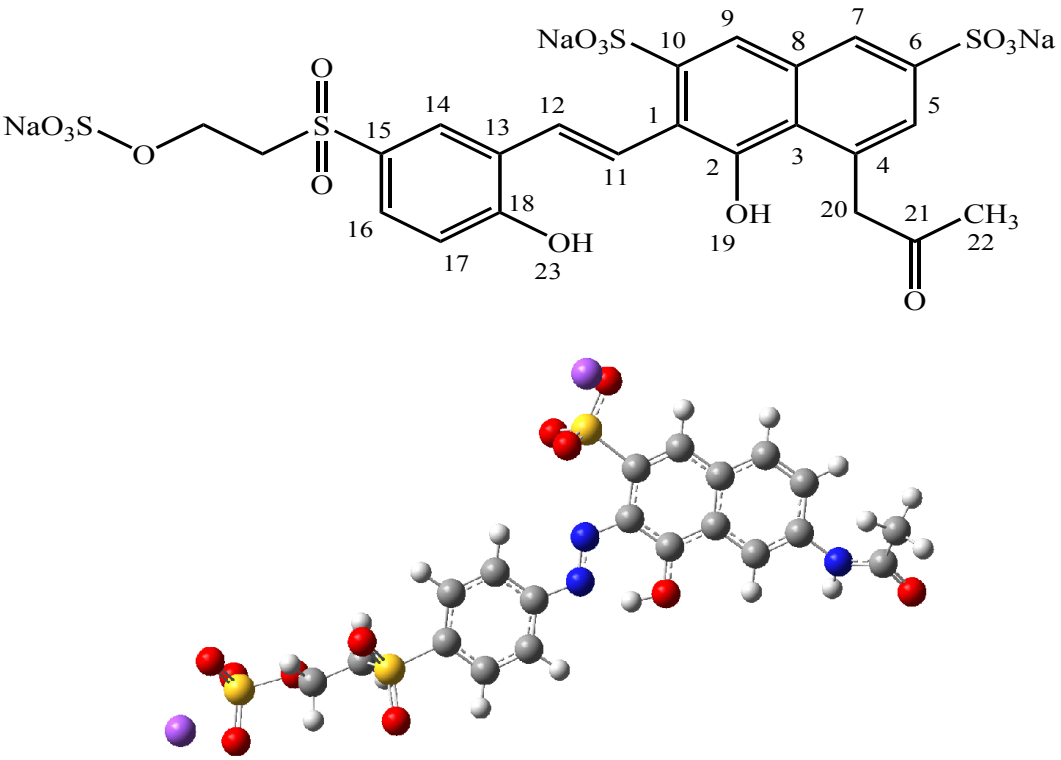


Fig.1. Chemical and optimized structures of violet 5R obtained at B3LYP/6-31+G(d,p) level

Table.1 Violet 5R molecul

Name	Reactive Violet 5R	
Synonyms	2,7-naphthalenedisulfonic acid	
Molecular Structure	Molecular Formula:	C20H16N3Na3O15S4
	Molecular Weight:	735.58
	CAS Registry Number:	**12226-38-9**

- Experimental UV/visible spectra for reactive Violet 5R azo dye was recorded on a *spectrometer in our laboratory* in water solvent.

THEORETICAL DETAILS

Geometry optimization and frequency calculations for colorant V5R have been carried out at B3LYP/6-31+G(d,p) level (DFT method) as implemented in Gaussian 09 [14]. To determine the reactivity of violet5R , the electronic properties were calculated at the same level of theory (B3LYP/6-31+G(d,p)).

The condensed Fukui functions were computed using Mulliken population analysis method [15].

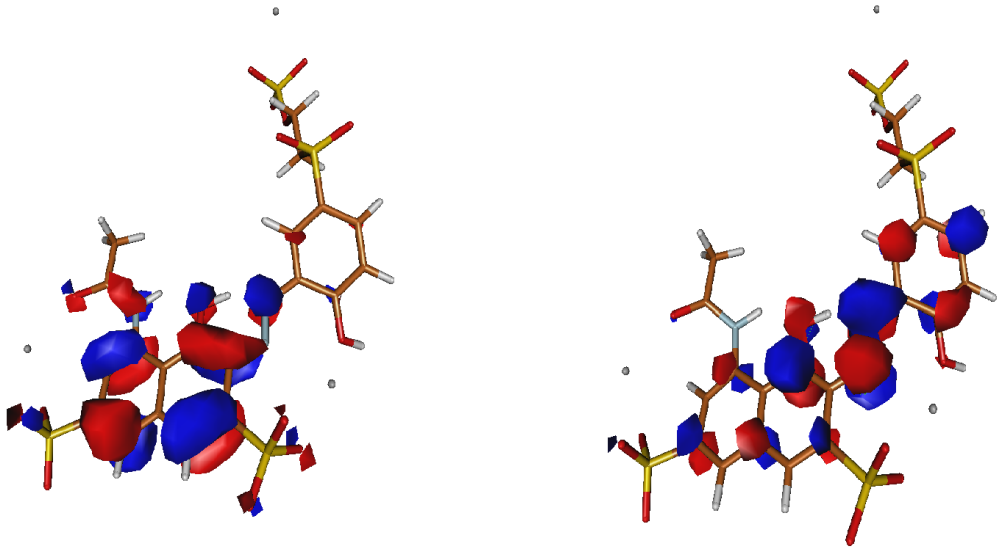
Excited singlet state (ES) energies were calculated from the optimized geometries at B3LYP/6-31+G(d,p)level (TDDFT method)[16]. In PCM model, the solute is embedded into a cavity surrounded by a dielectric continuum characterized by its dielectric constant (ε_{CH3OH}=32.613)[17]. The molecular orbitals and the optimized geometries were visualized by using Molden software (http://www.cmbi.ru.nl/molden/) and Gaussian View 5, respectively.

RESULTS AND DISCUSSION

ELECTRONIC PROPERTIES OF VIOLET 5R

The free solvation energie for V5R is -109 kcal/mol. It's highly soluble in water. its chemical structure containing hydrophobic (phenyl rings) and hydrophilic (hydroxyl groups) parts. The high polarity of V5R is corroborated by the high

values of permanent dipole moments of V5R 34 Debye, it's an important parameter to determine the reactivity in molecular systems it represents a measurement of charge distribution in a molecule (Fig.2).



HOMO ***LUMO***

Fig.2. HOMO and LUMO charge distribution of V5R obtained at B3LYP/6-31+G(d,p) level.

Violet 5R has the capacity to polarize other systems because of the high polarisability values of this reactive dye: 665 Boh^3 . The low energy of the LUMO orbital indicates that this azo dye can behave as soft electrophiles. The ionization potential (IP) is the energy required to remove an electron from the outer shell of a molecule system. High IP values indicate that the molecular system does not lose its electrons with facility. While, adding an electron to a molecular system is defined as electronic affinity (EA). High E.A values indicate that molecular systems tend to take electrons easily.

Violet 5R, azo dye has small gap energie (2.94 eV), which indicates that the azo dye is less stable and more reactive systems. Table 2 reports the electronic properties associated with the chemical potential for V5R.

To determine the active sites through Fukui indices for V5R, two types of charge distribution are calculated (i) electrostatic potential(ESP) and (ii) natural population (NPA) charges. In accordance with Fukui indices showed in Table 2, nitrogen atom N11 of the double N11=N12 for V5R is suggested to be a site for nucleophilic attack. This result is confirmed by the charge distribution in the LUMO orbitals of V5R (Fig.2), in which a high electronic density in nitrogen atoms of the double N11=N12 is present. In a recent study, Tizaoui and Grima reported that the oxidation of azo dyes by ozone proceed through electrophilic attack, and the attack occurs on sites possessing high negative charge density including multiply bonded species such –C=C- or –N=N- double bonds [18].

Table.2. Fukui indices of V5R calculated at IEF-PCM/B3LYP/6-31+G(d,p) level.

	Violet5R		
	Nucleophilic Attack	Electrophilic Attack	Radical Attack
C1	-0.045	-0.166	-0.106
C2	0.003	0.005	0.004
C3	-0.076	-0.035	-0.056
C4	0.044	-0.007	0.019
C5	-0.069	-0.151	-0.110
C6	0.000	0.061	0.030
C7	-0.041	-0.187	-0.114
C8	-0.008	0.097	0.045
C9	-0.061	-0.179	-0.120
C10	0.031	0.043	0.037
N11	-0.122	0.051	-0.036
N12	-0.182	-0.065	-0.123
C13	0.061	-0.031	0.015
C14	-0.073	0.001	-0.036
C15	0.012	-0.018	-0.003
C16	-0.102	-0.042	-0.072
C17	-0.002	0.001	0.000
C18	-0.053	-0.017	-0.035
O19	-0.092	-0.055	-0.074
N20	-0.041	-0.065	-0.053
C21	0.014	0.034	0.024
C22	0.007	-0.013	-0.003
O23	-0.002	-0.008	-0.005

Electrophilic attack can be in different sites e.g. C1, C5, C7 and C9 for V5R. The charges distribution in HOMO orbitals for V5R confirmed that the mentioned positions are sites of electrophilic attack (Fig.3). Hihara et *al,* showed that C1=C2, C4=C5, C6=C7, C13=C14, C13=C18 and N11=N12 are almost all possible double bonds that can react with the single oxygen ($^1O_2$)[19]. The C9 and N12 are the favoured sites for radical attack in V5R i.e RO16 [20]. The authors excluded the reactivity of C3=C4 and N11=N12 with the $^1O_2$ due to the low electron density, d_{HOMO} of the HOMO orbitals (See Fig. 2). The electrophilic site obtained by using NPA or ESP are in good agreement with the results obtained by Hihara et al [19].

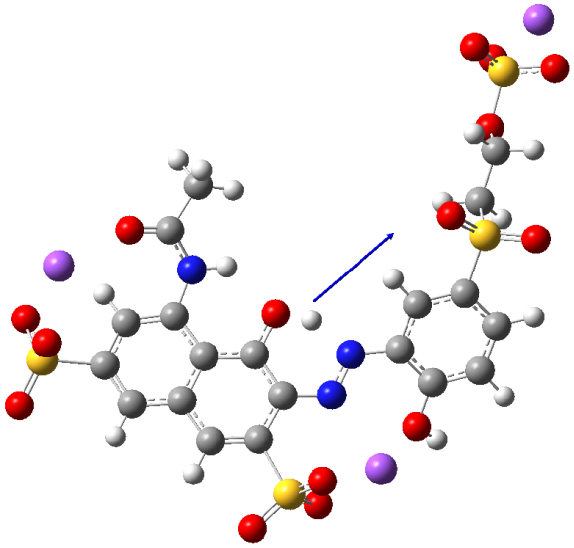


Fig.3. Dipole moment orientations of V5R obtained at B3LYP/6-31+G(d,p) level.

UV/VIS SPECTRA OF V5R

The experimental UV/vis spectra of V5R were obtained in water solvent. The calculated electronic excited states are performed in gas and in PCM by using TD-DFT method at B3LYP/6-31+G(d,p) level (Table 3). The maximum absorption bands at 565 nm for V5R. The high absorption band obtained for V5R (565 nm) compared to RO16 (490 nm) [20] can be explained by increasing the conjugation in V5R with respect to RO16 (see HOMO orbitals of RO16 [20]). The maximum absorption band at 565 nm of V5R was obtained by using the equation of the linear correlation between gas and PCM values of V5R(Fig 4).

Table.3. Electronic properties of V5R calculated at IEF-PCM/B3LYP/6-31+G(d,p) level.

	IA (eV)	EA (eV)	χ (eV)	η (eV)	S (eV)	ω (eV)	α (Bohr^3)	μ' (Debye)
Orbital consideration	6.20	3.25	4.72	2.94	0.17	3.79	665.27	34.19
Energy consideration	6.20	3.25	4.72	2.94	0.17	3.79	665.27	34.19

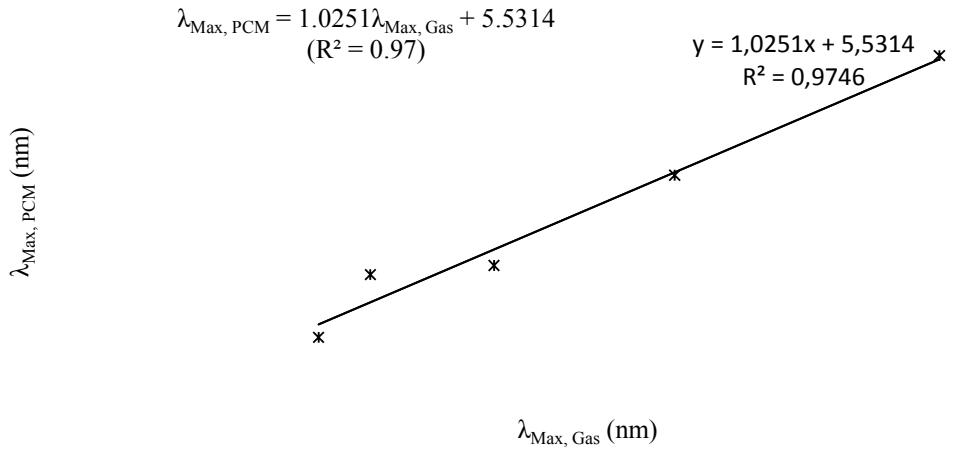


Fig.4 . Linear correlation between calculated and experimental absorption bands for V5R obtained at B3LYP/6-31+G(d,p) level.

The calculated absorption bands were underestimated in the gas phase. The PCM solvent induces a bathochromic shift of the absorption bands. A good correlation was obtained between the calculated and experimental absorption band values of V5R (R^2= 97 %).

CONCLUSION

Using DFT method we showed that V5R is polar and high soluble azo dye in water, and N11 is the most active site involved in the degradation process . The UV/vis spectra of V5R is well reproduced using TDDFT method (R^2=97%) and the high maximum absorption band observed in V5R with respect to RO16 is mainly due to the extent of HOMO delocalization in V5R.

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Dégradation du colorant réactif azoïque violet 5R par adsorption sur charbon actif en poudre

[Removal of violet 5R azo dye by adsorption on powdered activated carbon]

Hayat Anouar[1], Abderrahim Elhourch[1], Kacem Elkacemi[1], and Abdelmajid Zouahri[2]

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ABSTRACT: The objective of this work is to study the removal of violet 5R azo dye by adsorption on powdered activated carbon. Following for kinetics adsorption showed that the best results were obtained after 10 minutes of agitation of a solution of 100 ml of violet 5R 10^{-4}M with 10 mg/l of PAC. The initial amount of the dye and the pH of the medium influence greatly the rate of retention.

KEYWORDS: violet 5R, Dye, Powdered activated carbon, Adsorption.

RESUME: L'objectif de ce travail est d'étudier l'élimination de violet 5R colorant azoïque par adsorption sur charbon actif en poudre. Le suivi de la cinétique d'adsorption a montré que les meilleurs résultats ont été obtenus après 10minutes d'agitation d'une solution de 100ml de violet 5R 10^{-4}M avec 10 mg/l de CAP. La masse du charbon introduite, la teneur initiale du colorant et le pH du milieu influent considérablement sur le taux de rétention.

MOTS-CLEFS: violet 5R, Colorant, Charbon actif en poudre, Adsorption.

1 INTRODUCTION

Les colorants azoïques constituent la famille la plus importante sur le plan de l'application, puisqu'ils représentent plus de 50% de la production mondiale de matières colorantes [1,2]. Ces rejets organiques sont toxiques et nécessitent une technique de dépollution adaptée [3-4-5].

Ces composés organiques cancérigènes sont réfractaires aux procèdes de traitement habituellement mis en œuvre et sont très résistants à la biodégradation [6].

Plusieurs procédés ont été utilisés entre autres la coagulation- floculation [7], l'électrocoagulation et l'adsorption sur charbon actif [8] ; seuls les cationiques, colorant à mordant, dispersés ou dit de cuve et réactifs sont éliminés par cette technique [9].

Corresponding Author: Hayat Anouar

2 MATÉRIEL ET MÉTHODES

2.1 COMPOSÉ ORGANIQUE UTILISÉ : VIOLET 5R

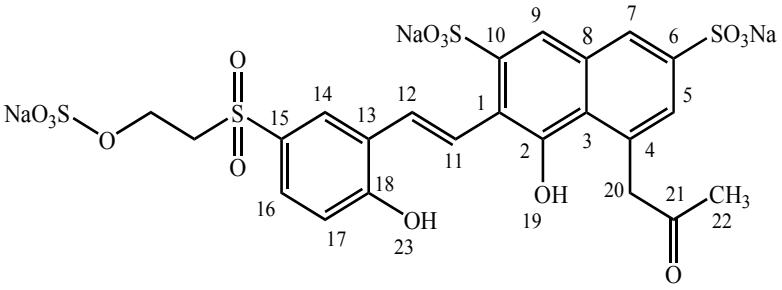

Fig.1. Structure chimique de violet 5R.

L'orange 16 utilisée est un colorant azoïque dont les caractéristiques sont les suivantes :

- Formule chimique : $C_{20}H_{16}N_3Na_3O_{15}S_4$
- Masse molaire : 735.58 g/mol.

Une solution mère de violet 5R de 10^{-4}M a été préparée dans l'eau distillée et conservée à l'abri de la lumière. Ensuite, nous diluons dans des proportions différentes pour préparer des solutions de concentrations plus faibles utilisées dans le cadre des essais.

2.2 ADSORBANT

Le charbon actif utilisé dans cette étude, nous a été fourni par le laboratoire régional de l'Office Nationale de l'Eau potable (ONEP) de Fès(MAROC) et il est produit par la société Fluka Guarantee « sigma-Aldrich Chemie Gmbh », c'est un charbon actif mésoporeux de 50 nm de granulométrie et de 911 m2 /g de surface spécifique.

2.3 MÉTHODE DE DOSAGE

La concentration de violet 5R est déterminée à partir de l'absorbance en U.V, sur un spectrophotomètre de type (JENWAY 6305 UV/VIS) à une longueur d'onde de λ = 565 nm. L'étalonnage de l'appareil est répété avant chaque série de mesure. La figure 2 présente un exemple d'étalonnage pour le violet5R dans l'eau distillée.

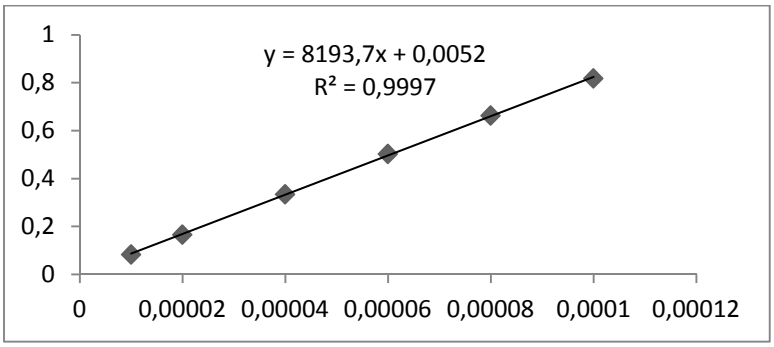

Fig.2 . Courbe d'étalonnage de violet 5R dans l'eau distillée à pH=7,06

2.4 DESCRIPTION DES ESSAIS D'ADSORPTION

Lors de notre étude, les essais d'adsorption sont réalisés en réacteur statique par mise en contact de 1 litre d'une solution de violet5R avec une masse bien déterminée de CAP à tester. Chaque échantillon prélevé est filtré sous vide à l'aide d'une membrane à 0,45µm de porosité. La teneur résiduelle en violet5R est ensuite déterminée par spectrophotométrie. Le rendement d'élimination R(%) est défini par :

$$R\% = 100\times (C_0 - C) / C_0$$

C_0 : Concentration initiale deviolet5R.

C : Concentration résiduelle de violet5R en solution.

Différents paramètres réactionnels ont été variés. Nous avons commencé par l'étude de la cinétique d'adsorption en faisant agiter une solution synthétique de violet5R de 10^{-4}M avec une dose de 0,01 g/l de CAP pendant 3 heures. Les prélèvements au cours du temps, ainsi que le dosage de la teneur résiduelle du composé organique permet de suivre la cinétique de sa rétention sur l'adsorbant utilisé. L'influence de la masse du CAP (3 à100 mg /l). L'effet du pH de traitement a été étudié en tamponnant le milieu par utilisation des solutions HCl (0,1 N) et NaOH (0,1 N) durant l'essai. Le pH a été varié de 2 à 10.

3 RESULTATS ET DISCUSSION

3.1 CINÉTIQUE D'ADSORPTION

L'étude de l'influence du temps d'agitation sur l'élimination de violet 5R (10^{-4}M) sur CAP (0,01 g/l) a été effectuée pendant 3 heures d'agitation. Les résultats obtenus (figure3) montrent que le rendement d'élimination de violet5R augmente avec le temps d'agitation, et qu'il y'a apparition d'un palier correspondant à un maximum d'efficacité à partir de 10minutes d'agitation. En effet, la valeur maximale d'élimination de violet 5R correspondant à ce temps est de 99%.

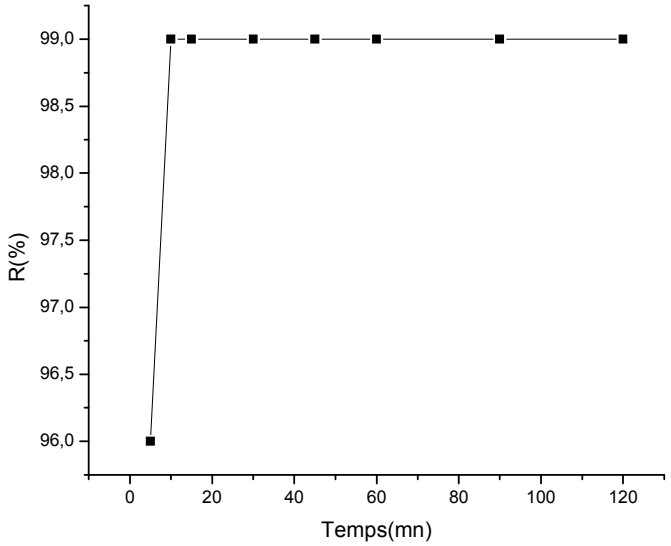

Fig.3 .Cinétique d'adsorption du violet5R (10^{-4}M) sur CAP (0,01 g/l).

3.2 EFFET DE LA MASSE DU CA

Au cours de cette étape, on a fait varier la masse du charbon actif en poudre introduite (3 à 100 mg /l), pour une teneur initiale constante en violet 5R (10^{-4}M) et pendant 3 heures d'agitation. Les résultats obtenus montrent que l'élimination de ce colorant augmente avec la masse du charbon actif en poudre introduite (figure 4).

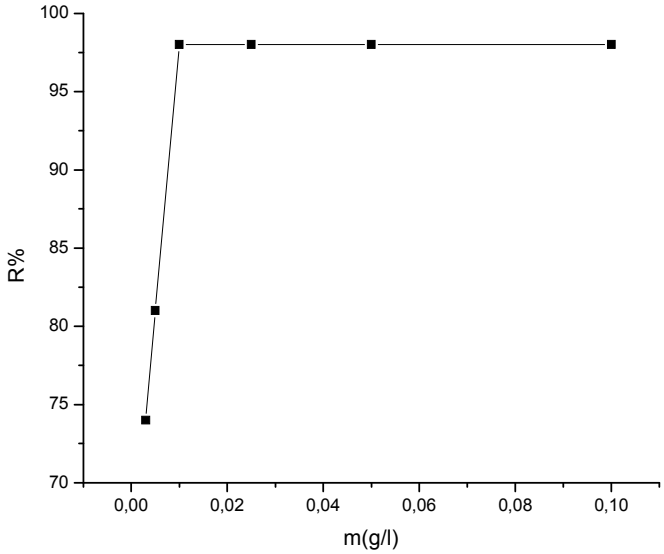

Fig.4. Effet de la masse du CAP sur l'adsorption du violet 5R (10^{-4}M)

Nous pouvons remarquer que pour une masse de 10mg du charbon actif en poudre, le maximum d'élimination de violet 5R atteint une valeur de 98%.

3.3 INFLUENCE DU PH

Pour cette étude des échantillons de solutions de colorant V5R (10^{-4}M) en contact avec une masse de 10mg/l de CA à différentes pH variant de 2 à 10, ont été prises et agitées jusqu'au au temps d'équilibre ensuite filtrées et dosées. Les résultats sont présentés si dessous.

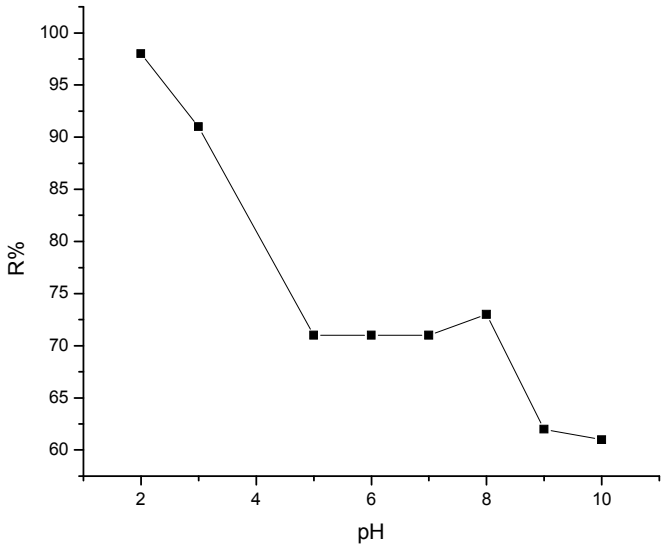

Fig.5. Effet du pH sur l'élimination du violet 5R (10^{-4}M) par adsorption sur CAP (0,01g/l)

Les résultats peuvent être interprétés de la façon suivante : La charge superficielle négative du charbon actif devient de plus en plus grande au pH acide (pH=2), la force d'attraction augmente et par conséquent l'adsorption augmente (98**%**), alors qu'elle diminue au pH basique (pH=10).

4 CONCLUSION

Le but de ce travail est l'élimination, par adsorption sur le charbon actif en poudre, de violet 5R en eau distillée et la détermination de l'effet des paramètres réactionnels sur la rétention de ce colorant. On a pu conclure sur la base des résultats que :

- L'équilibre d'adsorption est atteint au bout de 10 minutes d'agitation.
- L'adsorption était maximale et atteint 98**%** pour une concentration en violet 5R de10^{-4}M et une masse du charbon actif de 0,01g/l
- L'adsorption de violet 5R sur CAP est maximum pour une valeur du pH égale à 2.
- Le charbon actif en poudre présente un pouvoir adsorbant très important pour l'élimination de violet 5R.

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Elimination de l'orange 16 colorant azoique par adsorption sur charbon actif en poudre

[Removal of orange 16 azo dye by adsorption on powdered activated carbon]

Hayat Anouar[1], Abderrahim Elhourch[1], Kacem Elkacemi[1], and Abdelmajid Zouahri[2]

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ABSTRACT: The objective of this work is to study the possibility of removal of orange 16 azo dye by adsorption on powdered activated carbon and the effect of different reaction parameters. During the experimental study, adsorption tests were carried out in reactor static solutions of this compound in distilled water. Following for kinetics adsorption showed that the best results were obtained after 15 minutes of agitation of a solution of 100 ml of orange 16 10^{-4}M with 10 mg of PAC. The initial amount of the dye and the pH of the medium influence greatly the rate of retention.

KEYWORDS: Orange 16, Dye, Powdered activated carbon, Adsorption.

RESUME: L'objectif de ce travail est d'étudier la possibilité de l'élimination de l'orange 16 colorant azoïque par adsorption sur charbon actif en poudre et l'effet de différents paramètres réactionnels. Les essais d'adsorption sont réalisés en réacteur statique sur des solutions de ce composé en eau distillée. Le suivi de la cinétique d'adsorption a montré que les meilleurs résultats ont été obtenus après 15minutes d'agitation d'une solution de 100ml de l'orange 16 10^{-4}M avec 10 mg/l de CAP. La masse du charbon introduite, la teneur initiale du colorant et le pH du milieu influent considérablement sur le taux de rétention.

MOTS-CLEFS: Orange 16, Colorant, Charbon actif en poudre, Adsorption.

1 INTRODUCTION

Les colorants sont des composés non dégradables par les micro-organismes, ces rejets toxiques et nocifs pour les eaux superficielles et de profondeur, présentent un danger certain pour l'homme et l'animal. Les colorants synthétiques ont presque complètement supplantés les colorants naturels [1]. Les colorants azoïques constituent la famille la plus importante sur le plan de l'application, puisqu'ils représentent plus de 50% de la production mondiale de matières colorantes [2,3]

Plusieurs procédés ont été utilisés entre autres la coagulation- floculation [4], l'électrocoagulation et l'adsorption sur charbon actif [5]. Ce procédé d'adsorption sur charbon actif est le procédé le plus utilisé et recommandé pour le traitement des eaux résiduaires dans les industries textiles [6].

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2 MATERIEL ET METHODES

2.1 COMPOSE ORGANIQUE UTILISE : ORANGE 16

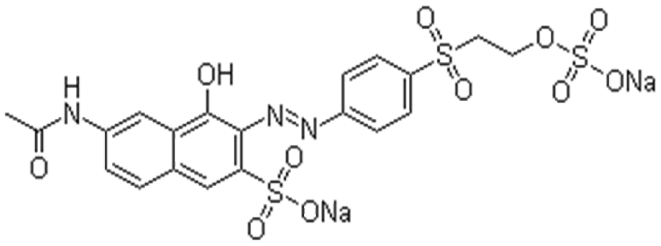

Fig.1. Structure chimique de l'orange 16.

L'orange 16 utilisée est un colorant azoïque dont les caractéristiques sont les suivantes :

• Formule chimique : $C_{20}H_{17}N_3O_{11}S_3$ 2N

• Masse molaire : 617.53 g/mol.

Une solution mère de l'orange 16 de 10^{-4}M a été préparée dans l'eau distillée et conservée à l'abri de la lumière. Ensuite, nous diluons dans des proportions différentes pour préparer des solutions de concentrations plus faibles utilisées dans le cadre des essais.

2.2 ADSORBANT

Le charbon actif utilisé dans cette étude, nous a été fourni par le laboratoire régional de l'Office Nationale de l'Eau potable (ONEP) de Fès(MAROC) et il est produit par la société Fluka Guarantee « sigma-Aldrich Chemie Gmbh », c'est un charbon actif mésoporeux de 50 nm de granulométrie et de 911 m2 /g de surface spécifique.

2.3 MÉTHODE DE DOSAGE

La concentration de l'orange 16 est déterminée à partir de l'absorbance en U.V, sur un spectrophotomètre de type (JENWAY 6305 UV/VIS) à une longueur d'onde de λ = 494 nm. L'étalonnage de l'appareil est répété avant chaque série de mesure. La figure 2 présente un exemple d'étalonnage pour l'Orange 16 dans l'eau distillée.

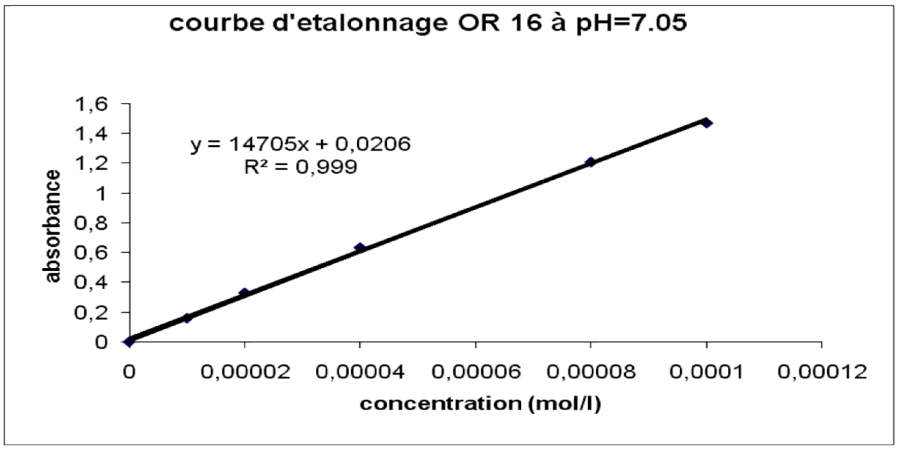

Fig.2 . Courbe d'étalonnage de l'Orange 16 dans l'eau distillée à pH=7,05

2.4 DESCRIPTION DES ESSAIS D'ADSORPTION

Lors de notre étude, les essais d'adsorption sont réalisés en réacteur statique par mise en contact de 1 litre d'une solution de l'orange16 avec une masse bien déterminée de CAP à tester. Chaque échantillon prélevé est filtré sous vide à l'aide d'une membrane à 0,45µm de porosité. La teneur résiduelle en orange 16 est ensuite déterminée par spéctrophotométrie. Le rendement d'élimination R(%) est défini par :

$$R\% = 100\times (C_0 - C) / C_0$$

C0 : Concentration initiale de l'orange 16.
C : Concentration résiduelle de l'orange 16 en solution.

Différents paramètres réactionnels ont été variés. Nous avons commencé par l'étude de la cinétique d'adsorption en faisant agiter une solution synthétique de l'orange 16 de 10^{-4}M avec une dose de 0,01 g/l de CAP pendant 3 heures. Les prélèvements au cours du temps, ainsi que le dosage de la teneur résiduelle du composé organique permet de suivre la cinétique de sa rétention sur l'adsorbant utilisé. L'influence de la masse du CAP (2à25mg /l). L'effet du pH de traitement a été étudié en tamponnant le milieu par utilisation des solutions HCl (0,1 N) et NaOH (0,1 N) durant l'essai. Le pH a été varié de 2 à 9.

3 RESULTATS ET DISCUSSION

3.1 CINÉTIQUE D'ADSORPTION

L'étude de l'influence du temps d'agitation sur l'élimination de l'orange 16 (10^{-4}M) sur CAP (0,01 g/l) a été effectuée pendant 3 heures d'agitation. Les résultats obtenus (figure3) montrent que le rendement d'élimination de l'orange16 augmente avec le temps d'agitation, et qu'il y'a apparition d'un palier correspondant à un maximum d'efficacité à partir de 15minutes d'agitation. En effet, la valeur maximale d'élimination de l'orange 16 correspondant à ce temps est de 88%. Nous pouvons distinguer deux étapes au cours de la cinétique d'adsorption de l'orange16 sur le charbon actif en poudre. Au cours de la première étape, une augmentation rapide jusqu'à environ 15 minutes, ceci s'explique par une fixation rapide des molécules de l'orange16 sur la surface du charbon actif en poudre, c'est l'étape de transfert de masse externe.

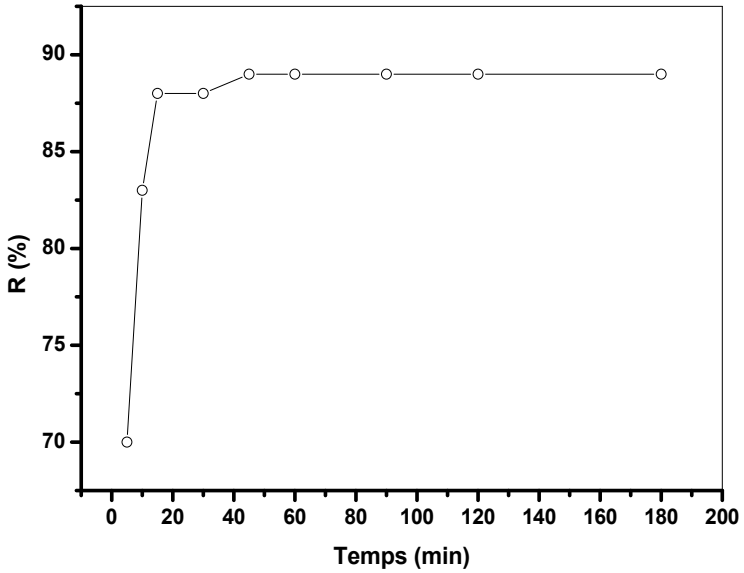

Fig.3 .Cinétique d'adsorption de l'orange 16(10^{-4}M) sur CAP (0,01 g/l).

La deuxième étape de la cinétique montre une augmentation plus lente du rendement d'élimination jusqu'au temps d'équilibre, qui est de 45minutes. Au-delà de ce temps, la concentration résiduelle de l'orange16 en solution reste pratiquement stable.

3.2 EFFET DE LA MASSE DU CA

Au cours de cette étape, on a fait varier la masse du charbon actif en poudre introduite (2 à 25 mg /l), pour une teneur initiale constante en orange16 (10^{-4}M) et pendant 3 heures d'agitation. Les résultats obtenus montrent que l'élimination de ce colorant augmente avec la masse du charbon actif en poudre introduite (figure 4).

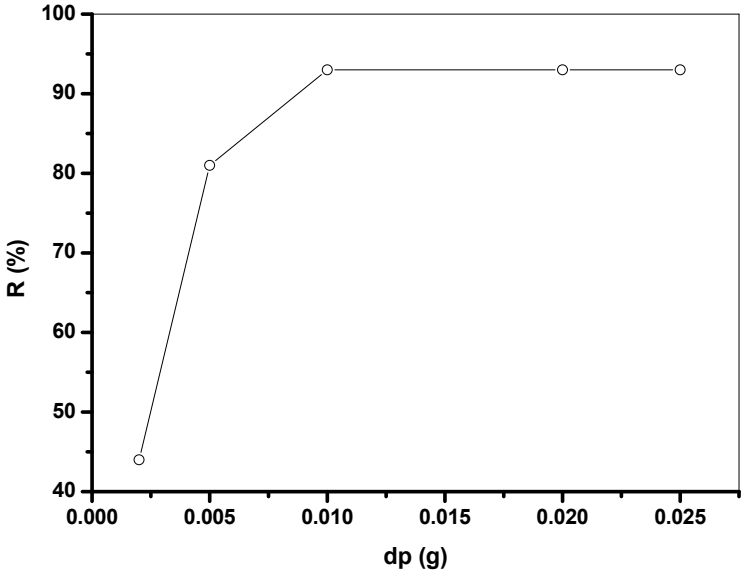

Fig.4. Effet de la masse du CAP sur l'adsorption de l'orange 16 (10^{-4}M)

Nous pouvons remarquer que de bons rendements sont obtenus à partir d'une dose de charbon actif en poudre de 5 (mg/l). Pour une masse de 10mg du charbon actif en poudre, le maximum d'élimination de l'orange16 atteint une valeur de 93%.

3.3 INFLUENCE DU PH

Pour cette étude des échantillons de solutions de colorant OR16 (10^{-4}M) en contact avec une masse de 10mg/l de CA à différentes pH variant de 2 à 9, ont été prises et agitées jusqu'au au temps d'équilibre ensuite filtrées et dosées. Les résultats sont présentés si dessous.

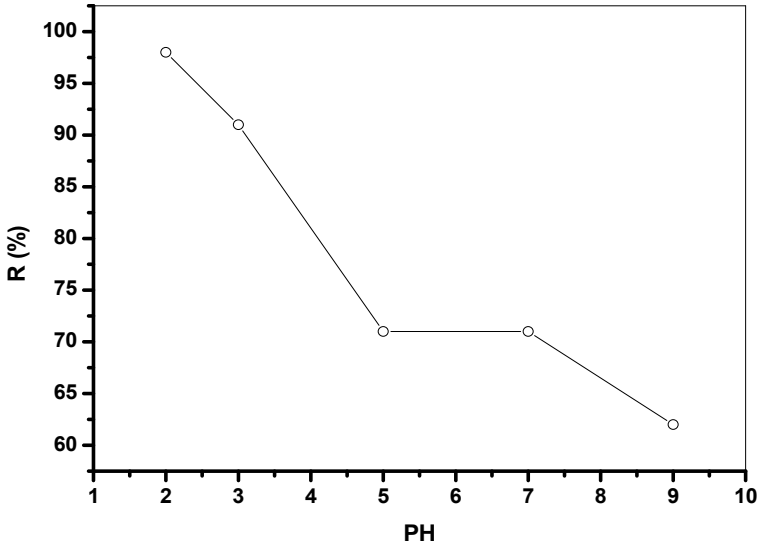

Fig.5 . Effet du pH sur l'élimination de l'orange16 (10^{-4}M) par adsorption sur CAP (0,01g/l)

Les résultats peuvent être interprétés de la façon suivante : La charge superficielle négative du charbon actif devient de plus en plus grande au pH acide (pH=2), la force d'attraction augmente et par conséquent l'adsorption augmente, alors qu'elle diminue au pH basique (pH=9).

4 CONCLUSION

L'étude expérimentale que nous avons menée a été consacrée à l'élimination, par adsorption sur le charbon actif en poudre, de l'orange16 en eau distillée et la détermination de l'effet des paramètres réactionnels sur la rétention de ce colorant. De l'ensemble des résultats obtenus, on a pu conclure que :

- L'équilibre d'adsorption est atteint au bout de 45minutes d'agitation.
- La rétention de l'orange16 augmente avec l'augmentation de la masse du charbon actif en poudre introduite.
- L'adsorption était maximale et atteint 93**%** pour une concentration en orange16 de10^{-4}M et une masse du charbon actif de 0,01g/l
- L'adsorption de l'orange16 sur CAP est maximum pour une valeur du pH égale à 2.

Les résultats obtenus dans ce travail ont montré que, sur le plan scientifique, le charbon actif en poudre présente un pouvoir adsorbant très important pour l'élimination de l'orange 16.

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Carcinome neuroendocrine du col utérin : A propos de deux cas et revue de la littérature

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ABSTRACT: Neuroendocrine tumors with small cell cervical represent less than 2% of cervical cancers, and if their evolution depends on the volume and tumor stage, prognosis is generally dark Morphological characteristics and clinical features of these tumors are comparable with neuroendocrine tumors of the lung. This tumor can also be found in other sites such as the skin, gastrointestinal tract, pancreas and cervical region.
We report two new cases of neuroendocrine carcinoma of the cervix small cell and through the literature data we review the different aspects of this rare entity.

KEYWORDS: Small cell carcinoma Neuroendocrine Uterine, cervix, Radiotherapy Chemotherapy, Surgery.

RESUME: Les tumeurs neuroendocrines à petites cellules du col de l'utérus représentent moins de 2 % des cancers du col et, si leur évolution dépend du volume et du stade tumoral, leur pronostic est globalement sombre Les caractéristiques morphologiques et les aspects cliniques de ces tumeurs sont comparables aux tumeurs neuroendocrines du poumon. Cette tumeur peut aussi être trouvée dans d'autres sites comme la peau, le tractus gastro-intestinal, la région cervicale et le pancréas.
Nous rapportons deux nouveaux cas de carcinome neuroendocrine du col à petites cellules et à travers les données de la littérature nous mettons le point sur les différents aspects de cette entité rare.

MOTS-CLEFS: Carcinome à petites cellules Neuroendocrine, Col utérin, Radiothérapie Chimiothérapie, Chirurgie.

1 INTRODUCTION

Les carcinomes neuroendocrines à petites cellules du col utérin sont des tumeurs rares, représentant moins de 3 % des tumeurs cervicales [1–2]. Ils présentent des caractéristiques communes aux carcinomes épidermoïdes du col utérin, notamment une agressivité locale et l'association à l'infection aux papillomavirus humains (HPV), mais également des caractéristiques propres aux carcinomes neuroendocrines à petites cellules, à savoir une perte d'hétérozygotie, un envahissement ganglionnaire précoce, une invasion vasculaire importante, une chimio sensibilité initiale et un taux élevé de récidives précoces [1,3,4].la prise en charge diagnostique et thérapeutique de ces tumeurs est difficile et est essentiellement calquée sur celle des tumeurs neuroendocrines pulmonaires. À l'instar de ces dernières, et malgré un traitement multimodal, leur pronostic reste défavorable. Avec une survie par rapport aux carcinomes épidermoïdes reste loin inferieure.

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2 OBSERVATIONS

OBSERVATION1

Madame E.Z, âgée de 52ans, 2ème geste 2ème pare, ménopausée depuis sept ans sans antécédents pathologiques particuliers médicaux ni chirurgicaux notamment une infection à HPV ; Le début de sa maladie remonte à un mois avant sa consultation par des métrorragies post coïtales, sans signes digestifs ou urinaires le tout évoluait dans un contexte de conservation de l'état général. L'examen clinique trouve une patiente en bon état général. L'examen au speculum révèle un processus bourgeonnant au niveau de la lèvre antérieur faisant 1,5 cm de grand axe saignant au contact. Aux touchers pelviens l'utérus est légèrement augmenté de taille et les paramètres sont libres.

L'étude histologique du matériel biopsique a révélé un carcinome indifférencié du col nécrosé (figure N 1) . L'immuno-marquage a conclut à un carcinome neuro-endocrine peu différencié avec positivité des anti-corps anti-Pan-cytokératine, des anticorps anti-CK7 et des anticorps anti-chromogranine.

La résonance magnétique nucléaire (RMN) pelvienne a montré un processus tumoral siégeant au niveau du col de l'utérus étendu à l'isthme et en partie au niveau du corps de l'utérus, sans extension endovaginale, sans envahissement des paramètres et sans adénopathies pelviennes (figure 1 et 2). Le bilan d'extension était négatif.

Une colpohystérectomie élargie avec lymphadénectomie ilio-obturatrice sont réalisées. L'étude histologique de la pièce d'hystérectomie a confirmé le diagnostic de carcinome neuroendocrine peu différencié à petites cellules, les paramètres sont indemnes, avec absence d'atteinte ganglionnaire.

La patiente a bénéficié d'une chimiothérapie 4 cures à base de CISPLATINE et ETOPOSIDE Une cure suivie ou concomitante à la radiothérapie 66 Gry étalée sur six Séances et suivie de curiethérapie sur tranche vaginale 15 Gry L'évolution est sans anomalies avec un recul de 6mois.

OBSÉRVATION2

Madame J.Z âgée de 39 ans, 3eme geste 3eme pare ;ayant comme antécédent un diabète type II sous insuline ;le début de la symptomatologie remonte a un an par des métrorragies post coïtales avec des dyspareunies ;l'examen physique trouve une patiente en bon état général pesant 75 kg ;l'examen du col trouve un processus tumoral ulcéro bourgeonnant faisant 2 cm du grand axe au dépend de la lèvre postérieure saignant au contact , les cul de sacs vaginaux ainsi que les paramètres sont souples. L'étude histologique du matériel biopsié a révélé : Un carcinome neuroendocrine à petite cellule du col utérin qui exprime fortement la CKAE1/AE3 ; le CD56 et la synaptophysine ; et focalement la chromogranine.

L'imagerie par résonance magnétique (IRM) a objectivé un processus hétérogène de la lèvre postérieure du col utérin bien limitée de 19 mm de grand axe, ce processus est limité à l'endocol sans signe d'extension vaginale ni au corps utérin ni aux paramètres ; avec l'individualisation des ganglions inguinaux infra centimétriques, le bilan d'extension n'a pas révélé d'anomalie.

Une colpohystérectomie élargie avec lymphadénectomie ilio-obturatrice ont été réalisées (Figure 3).

L'étude histologique a confirmé le diagnostic de carcinome neuroendocrinien sans atteinte parametriale ni extension ganglionnaire (Figure 4 et 5).

Les suites post opératoires ont été simples, la patiente a bénéficié également d'une chimiothérapie 4 cures à base de CISPLATINE et ETOPOSIDE Une cure suivie ou concomitante à la radiothérapie 70 Gry étalée sur six Séances et suivie de curiethérapie sur tranche vaginale 15 Gry.

L'évolution a été marquée par une récidive pelvienne pour laquelle la patiente a bénéficié d'une chimiothérapie palliative, décédée après 11 mois.

3 DISCUSSION

Le carcinome neuroendocrine est une tumeur maligne rare et agressive, se développant principalement aux dépens Du poumon et du tractus digestif. Il ne représente que 3 % des tumeurs du col utérin qui sont majoritairement des carcinomes épidermoïdes (1,2).

Identifié pour la première fois en 1957 (5), son incidence réelle est probablement sous-estimée car décrit sous différentes terminologies telles que tumeur carcinoïde, carcinome à cellules argyrophile ,apudome, carcinome à cellules en « grain

d'avoine », carcinome neuroendocrine, carcinoïde atypique, carcinome à petites cellules indifférenciées ou carcinome à cellules intermédiaires [1,2,5]. En1997 et dans un souci d'homogénéisation, Albores-Saavedra et al.ont proposé une classification des tumeurs neuroendocrines en quatre sous-types, à savoir les carcinomes neuroendocrines à petites cellules, les plus fréquents caractérisés par une activité mitotique élevée, une nécrose extensive, une invasion vasculaire et qui sont fréquemment associées aux papillomavirus humains. Les autres sous-types sont les carcinomes neuroendocrines à grandes cellules et les tumeurs neuroendocrines différenciées que sont les tumeurs carcinoïdes typiques et atypiques [4]. Durant les deux dernières décennies, et contrairement aux carcinomes épidermoïdes du col utérin, une augmentation de l'incidence des carcinomes neuroendocrines à petites cellules a pu être observée reflétant l'utilisation de cette terminologie commune,ce qui a par ailleurs permis, grâce à la publication de séries rétrospectives, de mettre en évidence plusieurs caractéristiques qui leurs sont propres.

Ces tumeurs surviennent à un âge médian de 42ans (20-87) (2-6) ,ce qui semble plus jeune que pour les carcinomes épidermoïdes du col utérin , nos patientes sont âgées respectivement de 52 ans et 39 ans.la symptomatologie clinique est non spécifique le plus souvent la patiente consule pour des métrorragies provoquées des leucorrhées récidivante ,et une masse pelvienne retrouvée à l'examen ,rarement les patients présentent les caractéristiques cliniques et biochimiques d'une sécrétion hormonale (syndrome de cushing ,syndrome carcinoïde, hypoglycemie,syndrome de sécrétion inappropriée d'hormone antidiurétique ,hypocalcémie).

A la différence des carcinomes épidermoïdes du col utérin, les carcinomes neuroendocrines sont souvent diagnostiquées tardivement du fait de l'inefficacité des frottis cervico vaginaux dans les dépistage des carcinomes neuroendocrines à petites cellules (7-8).

Le diagnostic repose sur l'étude histologique est surtout immunohistochimique par la mise en évidence d'au moins un marqueur neuroendocrine (synaptophysine, chromogranine, A énolase neurone spécifique) qui permet le diagnostic.

Macroscopiquement la tumeur est volontiers endocervicale. Deux formes principales s'observent : La forme nodulaire massive peu rattachée à la muqueuse cylindrique et la tumeur basaloide multi micronodulaire.

A l'examen histologique les carcinomes neuroendocrines montrent un spectre histologique allant d'une tumeur carcinoïde typique ou atypique à un carcinome à petites cellules. Les cellules endocrines possèdent une diversité considérable de taille, d'argyrophilie, de colorations immunocytochimiques et de l'ultrastructure. Elles peuvent être identifiées en histochimie (coloration de Grimelius) en ultrastructure par la mise en évidence de granulations argyrophiles ou neurosecretoires, en immunocytochimie par une positivité à la NSE, à la chromogranine, à la synaptophysine et aux anticorps pour la gastrine, l'insuline ou par la production ectopique d'ACTH, de βMSH, de sérotonine, d'histamine, d'amylose.

Mannion et al ont comparé les caractéristiques microscopiques et le taux de survie des quatre catégories ; les carcinomes à petites cellules étaient de plus mauvais pronostic présentant des similitudes avec les carcinomes à petites cellules du poumon. Ils sont caractérisés par un index mitotique élevé, une nécrose étendue, et une invasion lymphatique et vasculaire massive avec une forte association à l'HPV18 [3].

Vu la forte tendance à la dissémination régionale et à distance, le bilan doit comprendre une imagerie abdomino pelvienne de préférence une imagerie par résonnance magnétique.

Actuellement, et dans le but d'améliorer le staging ganglionnaire la TEP (tomographie par émission de positon a montré une supériorité dans cette indication tant au niveau pelvien que lombo aortique ; elle est considérée comme un examen standard dans le bilan d'extension des carcinomes épidermoïdes du col utérin de stade supérieur au et IB2 et parfois pour des tumeurs moins évoluées(9).

La stadification suit celle de toutes les tumeurs cervicales. Cependant il est important de reconnaitre le risque accru d'invasion lymphatique et vasculaire et le taux élevé de récurrences extra pelviennes. Par exemple l'invasion lymphatique précoce des adénopathies locorégionales était objectivée dans 40% des stades IB des tumeurs à petites cellules de moins de 3 cm de diamètre. Dans 60% de ces tumeurs l'invasion vasculaire et lymphatique était constatée au moment du diagnostic. Le délai de récurrence est de 19.9 mois [10].

Les métastases sont plus communément osseuses, supra-claviculaires et pulmonaire.

Le traitement des carcinomes neuroendocrines du col utérin est calqué sur celui des carcinomes épidermoïdes en prenant en considération les caractéristiques des tumeurs neuroendocrines du poumon.

Pour les tumeurs localisées stade I-IIA, le traitement locale ne suffit pas, deux auteurs ont rapporté des résultats décevants, Sheet et al, les premiers, ont retrouvé un taux de survie globale à trois ans de 16 %et un taux de survie sans progression à cinq ans de 0 % [11]. Pour Sevin et al., ce dernier était de 36 % [12].Des rechutes principalement hématogènes

(67 à 90 % des cas) et ganglionnaires (34 % des cas), une incidence élevée d'adénopathies au diagnostic (40–60 %), et une invasion vasculaire fréquente, sont autant de facteurs qui ont incité la majorité des auteurs à associer un traitement systémique au traitement local [17] ,Zivanovic et al. ont comparé rétrospectivement un traitement local seul (chirurgie) et un traitement local associé à une chimiothérapie adjuvante. Ils ont retrouvé un taux de survie sans récidive à trois ans de 83 % pour les patientes ayant reçu une chimiothérapie à base de cisplatine et d'étoposide contre 0 % en cas de traitement local seul.

Pour les tumeurs à un stade avancé, les métastases sont traitées par chimiothérapie combinée à base de platines. Alors que le taux de réponse initial est assez élevé (50-79%) la récurrence ou la chimiorésistance se développe. Alors une thérapie 2ème ligne est mise en route par vincristine /doxorubicin/cyclophosphamide et topotecan.

Du fait du taux de dissémination métastatique précoce, certains auteurs ont préféré utiliser une chimiothérapie néo adjuvante, Chang a démontré une réponse complète de 6 sur 7 patientes ayant reçu le VAC /PE avant l'hystérectomie ; cependant des résidus microscopiques étaient présents dans tous les cas. Une chimiothérapie adjuvante était nécessaire. Par conséquent 3 patientes étaient indemnes à 16,45 et 56 mois de suivi. Lee et al n'ont par contre pas objectivé de bénéfice sur les 6 patientes ayant reçu une thérapie néo adjuvante [13].

En l'absence d'essais comparant radiothérapie et chirurgie, certains auteurs ont préféré les intégrer dans le cadre d'un traitement multimodal. En associant chirurgie, radiothérapie et chimiothérapie, Chan et al. ont réussi à obtenir un taux de survie à cinq ans de 32 %, ce qui est nettement supérieur à ceux rapportés dans les différentes séries. Les patientes survivantes à long terme étaient celles atteintes de tumeur de moins de 2 cm et ayant bénéficié d'une chirurgie radicale [14].

Pour les tumeurs localement évoluées (stades IIb–IV) et pour les patientes inopérables, une association de radiothérapie et de chimiothérapie est préconisée, selon le protocole d'Hoskins et al.[10,20]. À ces stades, une chimiothérapie comportant au moins cinq cures de cisplatine et d'étoposide est associée à une meilleure probabilité de survie sans récidive et spécifique [15].

En cas de maladie métastatique ou de récidive, une chimiothérapie, comportant soit du cisplatine et de l'étoposide seuls, soit en alternance avec une chimiothérapie de type VAC (vincristine, adriamycine et cyclophosphamide) est indiquée [10].

Chez nos deux patientes la première a bien évolué sous traitement multimodal associant la chirurgie et la radio chimiothérapie à l'instar de la deuxième qui a présenté une récidive.

Les facteurs pronostic sont le stade clinique, la taille tumorale, la présence et le nombre d'adénopathies métastatiques, l'histologie à petites cellules, et le tabac.

Le stade clinique était le seul facteur prédictif de survie, 80% au stade I/II, et 38% au stade III/IV. Les sites de rechute à distance les plus communs sont l'os et le poumon (28%) plutôt que la rechute locale (13%) [18].

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Performance d'un dispositif amélioré de fumage (four Chorkor) sur la qualité du poisson fumé dans la commune d'Aplahoué (Sud-est du Bénin)

[Performance of an improved smoking device (Chorkor furnace) on the quality of smoked fish in the municipality of Aplahoue (Southeast Benin)]

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ABSTRACT: This work is a contribution to food security in Benin, especially in the municipality of Aplahoué (south-east). An investigation was done to deepen knowledge on actors of fish smoking in this locality. To assess the effect of Chorkor furnace on the microbiological quality and protein content of smoked fish, we conducted sampling and analysis of two species of fish (*Sardina pilchardus* and *Trachurus trachurus*) widely consumed in the locality. Fresh and smoked (in traditional furnace and Chorkor furnace) samples were investigated. Microbiological analyzes were performed by standard methods and the protein content by the Kjeldahl method. Inspections revealed a lack of good hygiene and manufacturing practices. The traditional method of smoking exposes producers to smoking which has consequences on their health. On 40 fish smokers surveyed, 95% were illiterate and none of them have received training on hygiene. The results also revealed that smoked fish by improved furnace (Chorkor) are microbiological and nutritional better than smoked fish by traditional furnace. All products subject to analysis were free of potentially pathogenic bacteria (*Staphylococcus aureus* and Salmonella).

KEYWORDS: Smoked fish, Chorkor furnace, microbiological quality, proteins.

RESUME: Ce travail est une contribution à la sécurité alimentaire au Bénin, particulièrement dans la commune d'Aplahoué (au Sud-est). Une enquête a permis d'approfondir les connaissances sur les acteurs du fumage de poisson dans la commune. Afin d'évaluer l'effet du four Chorkor sur la qualité microbiologique et la teneur en protéines des poissons fumés, nous avons procédé à l'échantillonnage et à l'analyse de deux espèces de poisson (*Sardina pilchardus et Trachurus* trachurus) de grande consommation dans la localité. Ces échantillons ont été prélevés à l'état frais et fumés (au four traditionnel et au four Chorkor). Les analyses microbiologiques ont été effectuées par les méthodes standards et la teneur en protéine par la méthode de Kjeldahl. L'inspection des sites de fumage a révélé une insuffisance des bonnes pratiques d'hygiène et de fabrication. La méthode traditionnelle de fumage expose les productrices à la fumée qui engendre des conséquences sur leur santé. Sur 40 fumeuses de poisson interrogées, 95% sont analphabètes et aucune d'entre elles n'a reçu une formation

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sur les règles d'hygiène. Les résultats ont également révélé que les poissons fumés au four amélioré (Chorkor) sont de qualité microbiologique et nutritionnelle meilleure que ceux fumés au four traditionnel. Tous les produits soumis aux analyses sont exempts des germes potentiellement pathogènes (Staphylococcus aureus et les Salmonelles).

MOTS-CLEFS: Poissons fumés, four Chorkor, qualité microbiologique, protéines.

1 INTRODUCTION

La faim et la malnutrition demeurent des fléaux dans le monde et touche près de huit cent millions de personnes dont la majorité se trouve dans les pays en développement. Dans ces derniers, la notion de sécurité alimentaire reste un luxe [1]. Pour contribuer à la lutte contre l'insécurité alimentaire, on devrait accroître la production aquacole et valoriser les produits locaux grâce à l'utilisation judicieuse des connaissances techniques [2]. Le poisson est une source importante de protéines de bonne valeur biologique, des minéraux et des acides gras essentiels. Sa consommation est bénéfique à la protection contre les maladies cardio-vasculaires et d'autres maladies nutritionnelles [3]. Il constitue une source unique, accessible aux ménages à faibles revenus, surtout dans les pays en voie de développement où le prix de la viande demeure hors de portée du consommateur moyen [4]. Plusieurs techniques parmi lesquelles on retrouve le salage, séchage et fumage sont utilisées pour sa transformation et sa conservation [5]. Le fumage est une opération de transformation pratiquée depuis des générations dans de nombreuses régions du monde, pour la conservation de produits (viandes, poissons ou fromages) et la diversification alimentaire [6]. Il est souvent associé à une cuisson, un séchage et/ou un salage. Particulièrement en Afrique de l'Ouest, le fumage permet de stabiliser des denrées alimentaires périssables avant de les acheminer des sites de capture ou d'élevage vers des zones de consommation. Les fonctions préservatrices, d'aromatisation et de coloration sont bien corrélées à l'apport de fumée mais on sait également que la fumée véhicule des hydrocarbures polycycliques aromatiques (HAP), connus depuis plusieurs décennies pour leur pouvoir cancérogène sur l'homme [7]. Le fumage du poisson demeure encore traditionnel au Bénin à l'instar des pays africains, particulièrement dans la commune d'Aplahoué (au Sud-est) où le procédé utilisé, pose d'innombrables problèmes notamment la faible quantité de poissons à fumer, la dissipation rapide de la fumée, la consommation importante des combustibles, un revenu très faible. Cette technique aboutit à un produit de qualité sanitaire médiocre [8]. A ces problèmes s'ajoutent les contraintes sanitaires (des maux de tête, des maux de hanche, brûlures sur le corps) auxquelles les productrices sont confrontées. Diverses versions améliorées des foyers traditionnels du fumage de poisson ont été mises au point et expérimentées dans plusieurs communautés de pêche en Afrique. Il s'agit notamment du four bidon, du four Altona, du four Parpaing, du four Chorkor etc. [9]. Le four Chorkor s'est répandu parmi les communautés de pêcheurs en Afrique à cause de son utilisation facile et sans danger et de sa vaste capacité de transformation. Il nécessite peu de bois de chauffe, réduit les temps de fumage et permet de réaliser un poisson fumé de grande qualité. Au contraire, les fours cylindriques traditionnels en boue , couverts de chaume et les fours en acier à tambour sont hors d'usage après une ou deux saisons, pleins de fumée pour travailler, ils ont une faible capacité et produisent du poisson fumé inégalement. D'autres types de fours en métal coûtent cher, d'entretien difficile et ont été utilisés de façon expérimentale dans de nombreux projets africains sans grand succès. Des fours rectangulaires sans plateaux qui utilisent des filets métalliques ou des bâtons de bois sont inefficaces parce qu'ils ne gardent pas la chaleur et leurs supports sont difficiles à manier. Les fours modernes ne sont pas pratiques car ils requièrent un apport sérieux d'électricité et de gaz puis ils sont difficiles et coûteux à réparer. L'objectif de ce travail est d'évaluer les performances au fumage du four Chorkor sur la qualité microbiologique et la teneur en protéines de deux espèces de poissons de grande consommation : la sardinelle (*Sardina pilchardus*) et le chinchard (*Trachurus trachurus*) dans la commune d'Aplahoué.

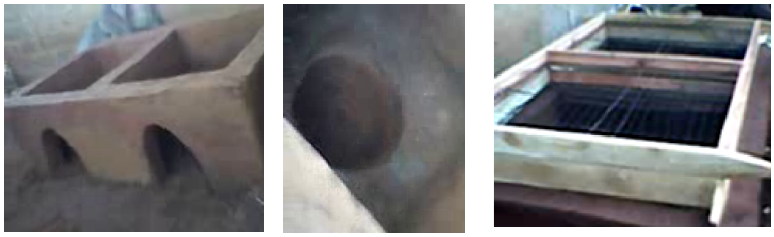
2 MATERIEL ET METHODES

2.1 ENQUÊTE

L'enquête effectuée dans la commune d'Aplahoué avait pour objectif de répertorier les caractéristiques des acteurs de la filière, les conditions de production à l'origine des contraintes sanitaires et le mode de consommation préférentiel (frais ou fumé). Les critères du choix de ces personnes se définissent comme suit : être une fumeuse de poisson et propriétaire de son fumoir depuis au moins dix (10) ans dans la commune d'Aplahoué, avoir une meilleure connaissance des activités de transformation et de commercialisation du poisson, être vendeur de poissons congelés, être un consommateur de poisson, être membre du service de développement local dans la commune d'Aplahoué. Au total, 260 personnes ont été enquêtées dont : 40 transformatrices et vendeuses de poisson fumé, 200 consommateurs de poisson, 15 personnes ressources, 05 vendeurs de poissons frais (05 grands centres de poissonnerie).

2.2 CONSTRUCTION DU FOUR CHORKOR

Le dispositif construit est un fumoir constitué d'une chambre de forme rectangulaire, environ deux fois plus long que large. Des trous d'alimentation sont ouverts sur la face frontale. De préférence, des fondations dans le sol et un mur de séparation au milieu sont construits. La construction d'un mur médian renforce la solidité du four, empêche la latte médiane de la première claie de brûler, procure un appui supplémentaire aux claies chargées de poissons et donne une possibilité de fumer de petites quantités de poisson sur un seul côté en utilisant moins de combustibles. Deux claies doubles de fumage et un couvercle servant de recouvrement des claies contre le gaspillage de la fumée et de la chaleur pendant le fumage ont été construits (voir figure 1). Ces claies sont constituées de cadres et de grillages respectivement confectionnés par un menuisier et un ferrailleur suivant des indications spécifiques (voir caractéristiques). Les cadres sont réalisés avec des bois durs pour sa durabilité et pour éviter qu'ils brûlent lors du fumage. Les caractéristiques de ce four sont consignées dans les Tableaux 1 et 2 suivants :



Fumoir Chorkor Creux du feu Claies doubles

Fig. 1. Les dispositifs du four Chorkor

Tableau 1. Caractéristiques du four Chorkor.

Paramètres	Mesure (en cm)
Longueur des murs	220
Largeur des murs	110
Epaisseur des murs	15
Hauteur	60
Foyer de combustion (longeur /largeur)	85/80
Ouverture des foyers demi-circulaires (diamètre /hauteur)	40/40
Creux de combustion (diamètre/profondeur) ou de feu	40/15

Tableau 2. Caractéristiques des claies doubles.

Claies doubles	Mesures (en cm)
Longueur totale des claies	208
Largeur totale des claies	113
Poignets	18
Face des bois	9,5
Epaisseur des sous-lattes	3
Grillages carrés	90
Maille des grillages de fil de fer	2
Grosseur du fil de fer des grillages	0,8
Surface de recouvrement	190 / 95

2.3 COLLECTE ET TRAITEMENT DES ECHANTILLONS DE POISSON

Les prélèvements ont été faits sur le site de fumage où le nouveau dispositif est mis en place. Vingt (20) poissons frais sont prélevés au retour des femmes des poissonneries. Juste après le fumage, vingt (20) poissons fumés (au four traditionnel) et vingt (20) poissons fumés (four Chorkor) sont prélevés. Les prélèvements ont été effectués avec des gants

stériles dans des sachets STOMACHER et transportés à l'aide de deux (02) glacières isothermes lavées et nettoyées avec du coton imbibé d'éthanol à 96% vers le Laboratoire Central de Contrôle de la Sécurité Sanitaire des Aliments (LCSSA) à Cotonou pour les analyses.

2.4 EVALUATION DE L'EFFET DU FOUR CHORKOR SUR LA QUALITE DES ECHANTILLONS

L'efficacité du four dans l'amélioration des caractéristiques microbiologiques et la teneur en protéine du poison a été évaluée en comparant les résultats obtenus au niveau des fours traditionnels à ceux obtenus au niveau du four amélioré. Ces résultats ont été comparés à ceux obtenus pour le poisson frais.

2.4.1 CARACTÉRISATION MICROBIOLOGIQUE DES ÉCHANTILLONS

Les échantillons prélevés ont été évalués en recherchant par des méthodes standards, les paramètres microbiologiques de qualité. Il s'agit de :

- la flore aérobie mésophile totale par ensemencement sur le milieu Plate Count Agar (PCA) et incubation à 30ºC pendant 24-48 h [10];
- des coliformes totaux, thermotolérants et *E. coli* [11] sur le milieu Violet Red Bile Lactose (VRBL) avec incubation à 30 et 44ºC respectivement pendant 24 h ;
- de *Staphylococcus aureus*, sur le milieu Baird Parker et incubation à 37°C pendant 24-48 [12];
- des levures et moisissures sur milieu Sabouraud au chloramphénicol [13] puis incubation à 25°C pendant 3 à 5 jours ;
- des Salmonelles par un pré enrichissement de la solution mère à 37°C pendant 19 h. L'enrichissement a été fait sur les milieux RV, KM et l'isolement sur les milieux XLD et Hektoen [14].

2.4.2 TENEUR EN PROTÉINE DES ÉCHANTILLONS

La détermination de la teneur en protéines a été effectuée suivant la méthode Kjeldhal. L'azote total a été obtenu par minéralisation à l'aide d'un excès d'acide sulfurique concentré à chaud, en présence d'un mélange de catalyseurs (K2S04 et CuSO4). Il est ensuite dosé par une solution acide (5.10^{-3}M) Le facteur de conversion utilisé pour obtenir la teneur en protéine est 6.25 [15].

2.5 ANALYSES STATISTIQUES

Les résultats ont été organisés à l'aide du classeur Microsoft Excel 2007 et traités avec le logiciel Minitab 16. Ces derniers ont servi à l'analyse des données pour la comparaison des moyennes. Le test a été considéré statistiquement significatif si $p<0, 05$.

3 RÉSULTATS

3.1 3.1 ENQUÊTE

La figure 2, 3 et 4 présentent respectivement le mode de consommation préférentiel du poisson, les caractéristiques des acteurs du fumage de poisson et la distribution des effets sanitaires chez ces derniers dans la commune.

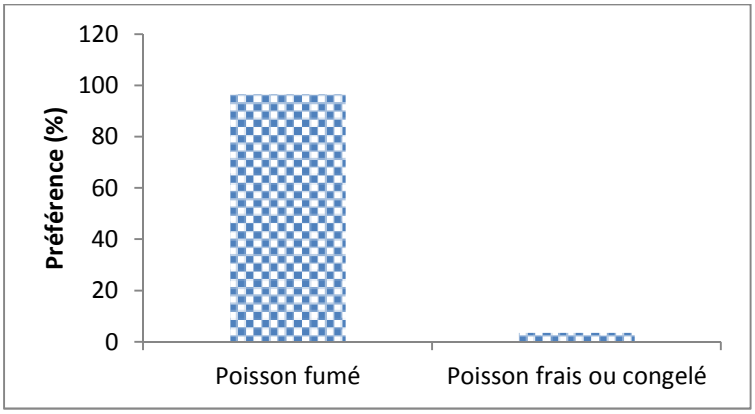


Fig. 2. Niveau de préférence du poisson congelé et du poisson fumé

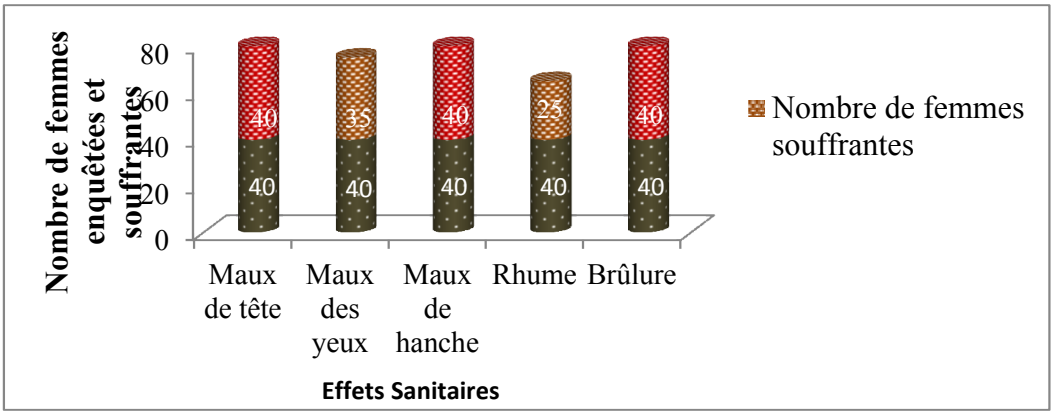


Fig.3. Distribution des effets sanitaires chez les productrices de poisson fumé

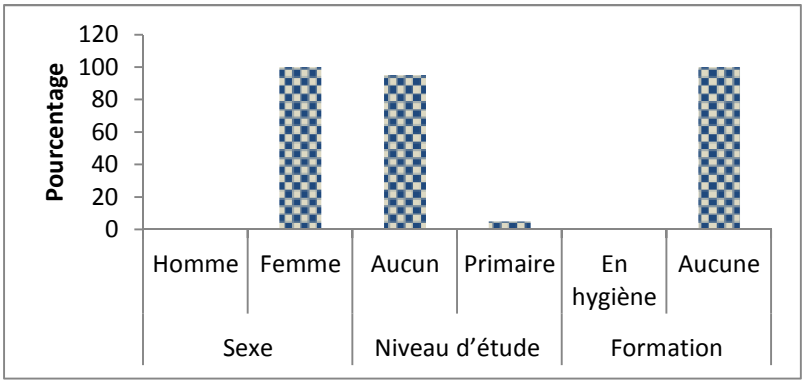
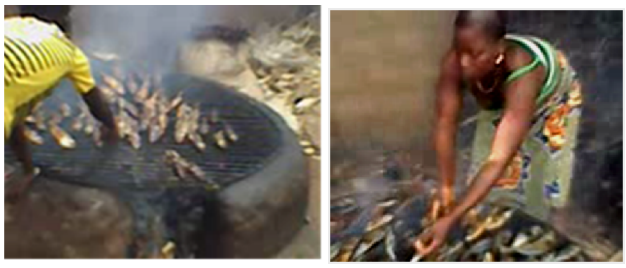


Fig.4. Distribution des acteurs en fonction du sexe, du niveau d'étude et de formation en hygiène.

D'après le tableau, 96,5% de la population préfèrent acheter et consommer du poisson sous forme fumée. 3,5% le préfèrent frais. Trente-huit (38) sur 40 des femmes enquêtées sont analphabètes, 02 d'entre elles ont fait le cours primaire. Aucune des femmes interrogées n'a reçu une formation sur les règles d'hygiène. L'inspection des sites de fumage montre que l'hygiène de production faisait défaut. Les activités de fumage de poisson telles que pratiquées dans la commune d'Aplahoué exercent plusieurs effets négatifs à court et à long terme sur la santé des femmes. Ces effets sont relevés après entretien avec chaque femme. Toutes les femmes enquêtées souffrent à chaque séance de production, des maux de tête, des maux de hanche et sentent des brûlures sur le corps. Sur les 40 femmes enquêtées, 25 souffrent de rhume tandis que 35 souffrent des maux d'yeux. Certaines de ces femmes souffrant des maux d'yeux sont obligées de porter des verres avant de voir. Les photos suivantes montrent la cause des effets sanitaires :

Exposition et l'inhalation de la fumée



Exposition la chaleur

Fig.5. Exposition des productrices aux causes des effets sanitaires

3.2 EFFET DU FOUR SUR LA QUALITE DES ECHANTILLONS

3.2.1 EFFET SUR LES CARACTERISTIQUES MICROBIOLOGIQUES DES ECHANTILLONS

Le tableau suivant présente les résultats issus de la caractérisation microbiologiques des échantillons

Tableau 3. Caractéristiques microbiologiques des échantillons.

Echantillons / Paramètres (UFC/g)	Poisson frais		Poisson fumé				Critères
			Four traditionnel		Four Chorkor		
	S. pilchardus	*T. trachurus*	*S. pilchardus*	*T. trachurus*	*S. pilchardus*	*T. trachurus*	
Flore totale	$62.\ 10^1$	$45.\ 10^2$	$31.\ 10^1$	$14.\ 10^3$	$17.\ 10^1$	$41.\ 10^1$	$< 10^5$ UFC/g
Coliformes totaux	< 10	$20.\ 10^2$	< 40	$3.\ 10^2$	< 10	< 10	$< 10^2$ UFC/g
Coliformes fécaux	< 10	$14.\ 10^2$	< 10	$15.\ 10^1$	< 10	< 10	< 10 UFC/g
E. Coli	< 10	< 10	< 10	< 10	< 10	< 10	< 10 UFC/g
Levures/moisissures	< 10	< 10	< 10	< 10	< 10	< 10	< 10 UFC/g
S. aureus	<10	< 10	< 10	< 10	< 10	< 10	$< 10^2$ UFC/g
Salmonelles/25g	Absence	Absence	Absence	Absence	Absence	Absence	Absence

L'analyse de ce tableau révèle des niveaux de contamination (flore totale) plus élevés pour les poissons frais ; viennent ensuite ceux fumés au four traditionnel et ceux fumés au four Chorkor. Aucune souche d'E. *coli*, de levures, de moisissures, de *Staphylococcus aureus* et de Salmonelles n'a été dénombrée.

3.2.2 EFFET SUR LA TENEUR EN PROTEINE DES ECHANTILLONS

La figure 6 ci-dessous présente la teneur en protéine des différents échantillons de poisson.

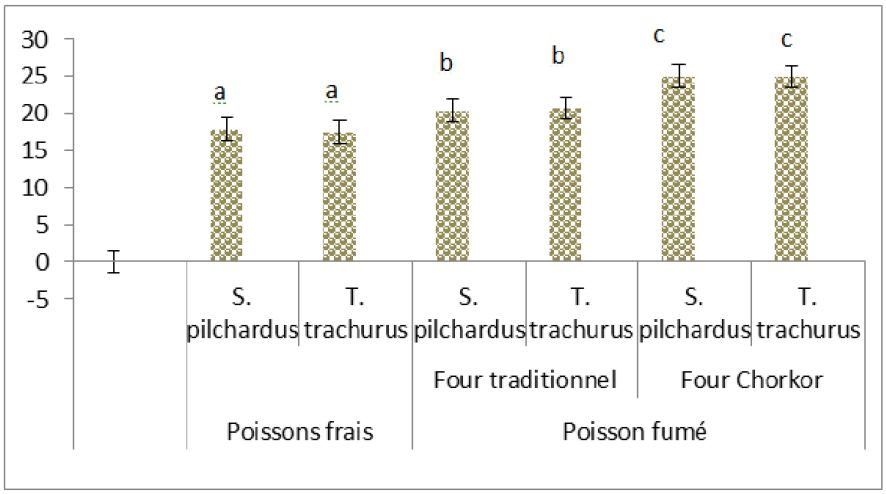


Fig.6 Teneur en protéine des échantillons

Les résultats portant la même lettre ne sont pas significativement différents au seuil de 5% ($p<0,05$)

4 DISCUSSION

Au terme de l'enquête, 96,5% de la population préfèrent consommer du poisson sous forme fumée. Ceci serait dû au fait que le poisson fumé confère un goût particulier à toutes les préparations dans lesquelles il est incorporé. Cent pour cent (100%) des personnes interrogées sont des femmes. Le même pourcentage a été observé par les références [16] et [17] au cours de travaux similaires respectivement au Togo et en Côte d'Ivoire. Il est par contre différent de celui obtenu par Baryeh et al. cité par [17] qui ont rapporté que 11,2% des producteurs étaient des femmes contre 88,8% des hommes. Le secteur du fumage traditionnel de poisson dans la commune d'Aplahoué est exclusivement occupé par les femmes parmi lesquelles 95% sont analphabètes. Ce pourcentage est différent de celui publié par [18] qui était de 85%. Aucune des femmes interrogées n'observent véritablement les règles d'hygiène en matière de sécurité des aliments dans les activités de fumage. D'après les études de la référence [16], 5,77% des femmes interrogées ont reçu une formation en hygiène. D'autre part, les conditions de fumage (exposition à la chaleur et à la fumé provoquent au niveau de ces femmes diverses pathologies. En effet, Les hydrocarbures aromatiques polycycliques sont synthétisés au cours des combustions et de la pyrolyse (la décomposition par la chaleur) des composés organiques. On sait notamment que les produits ligneux, l'amidon, les sucres, les acides aminés, les acides gras, fortement chauffés, conduisent à des hydrocarbures aromatiques polycycliques cancérogènes, tels le 3-4 benzopyrène ou benzo(a)pyrène. Tous les charbons sont cancérigènes à cause du carbone qui se dépose sur les aliments lors du fumage et/ou des grillades. La fumée dégagée provoque des difficultés respiratoires et des baisses de la vue au niveau des ménagères selon un rapport de l'Agence nationale de sécurité alimentaire ivoirien. Qu'il soit électrique, à gaz ou à charbon de bois, une cuisson trop forte entraîne la carbonisation du matériel et des aliments. Ces éléments tout comme les Hydrocarbures aromatiques polycycliques sont reconnus comme cancérigènes par l'Organisation mondiale de la santé (OMS) [19].

Après les analyses, on constate qu'au départ, la moyenne de germes dénombrés dans les poissons Sardinelles frais est de 62.10^1 UFC/g. A la fin du fumage, elle est réduite à 31.10^1UFC/g sur le four traditionnel et à 17.10^1UFC/g sur le four Chorkor (réduction de de 45.10^2 UFC/g à 14.10^3 UFC/g pour le poisson Chinchard). Cette différence de réduction pour ces deux fours serait due au fait que les poissons placés dans un courant d'air chaud (four Chorkor) ont beaucoup plus subi les effets antibactériens de la fumée que ceux placés à l'air libre (four traditionnel) où le vent réduit l'action antibactérienne de la fumée. Nos résultats par rapport à la diminution des germes en fin de fumage sont conformes à ceux de [18] qui ont trouvé que pour 80 échantillons, la flore totale initiale de $9,4.10^6$ UFC/g est diminuée à $6,7.10^6$ UFC/g après les opérations de prétraitement, puis à $5,4.10^6$ UFC/g après le fumage proprement dit. Cette contamination globale témoigne du non respect des bonnes pratiques d'hygiène de certaines transformatrices. Une autre irrégularité qui pourrait être aussi la source de contamination des poissons fumés est le fait d'éteindre le feu avec l'eau qui a servi à laver les poissons frais. Les coliformes totaux étaient absents au départ (< 10 UFC/g) dans les poissons Sardinelles frais. Après le fumage, ils sont présents dans les poissons fumés (< 40 UFC/g) sur le four traditionnel mais demeurent toujours absents dans les poissons fumés sur le four Chorkor (< 10 UFC/g). Cette contamination lors du fumage des poissons sur le four traditionnel révèle le manque de respect des règles d'hygiène par certaines transformatrices. Ils sont de 20.10^2 UFC/g dans les poissons Chinchards frais, réduits à

3.10^2 UFC/g sur le four traditionnel et à < 10 UFC/g sur le four Chorkor. Ces résultats obtenus avec le four Chorkor sont conformes à ceux de [18] qui ont trouvé qu'ils sont de $1,5.10^1$ UFC/g à 0,0 UFC/g après le fumage. Au vu des critères microbiologiques (< 10^1 UFC/g), les Sardinelles fumés sont de qualité microbiologique satisfaisante et ne causeraient pas de dommages aux consommateurs. Le fumage des Chinchards au four traditionnel conduit à un produit de qualité microbiologique non satisfaisante car leur charge microbienne pour les coliformes thermotholérants (3.10^2 UFC/g) est supérieure aux critères microbiologiques (< 10^2 UFC/g). Le four Chorkor permet donc de mieux préserver (ou améliorer) la qualité microbiologique des poissons fumés.

Les poissons Sardinelles et Chinchards frais ont une teneur respective en protéines de 17,86 % et de 17,51 %. Après le fumage sur le four traditionnel, la teneur en protéines est passée de 17,86 % à 20,36 % pour les Sardinelles et de 17,51% à 20,65 % pour les Chinchards. Quant au fumage sur le four Chorkor, la teneur en protéines est passée de 17,86 % à 25,04 % pour les Sardinelles et de 17,51 % à 24,94 % pour les Chinchards. Apparemment, cette tendance à une augmentation de la teneur en protéines dans les poissons fumés serait due à l'action de la fumée et de la chaleur ; ce qui ferait diminuer la teneur en eau et induire une élévation des protéines sur les poissons lors du fumage. Ces résultats sont conformes à ceux de [8] qui après ses travaux, a trouvé de l'état frais à l'état fumé une teneur en protéines de 18,4 % à 68,6 % pour l'Anchois ; de 22,6 % à 33,9 % pour le Chinchard et de 16,6 % à 67,5% pour le Tilapia. De façon comparative, nos résultats sont inférieurs à ceux de [8]. La référence [7] a également observé une augmentation de la teneur en protéine ($50,57 \pm 0,05$ à $53,09 \pm 0,11$) Pour un dispositif amélioré de séchage du poisson. Les analyses statistiques ont révèlent que le four Chorkor augmenté significativement la teneur en protéine que celle du four traditionnel.

5 CONCLUSION

Il ressort de cette étude que le poisson fumé au four Chorkor bénéficie d'une hygiène plus prononcée que celui issu de four traditionnel. Par conséquent, sa consommation et sa conservation seraient plus rassurantes. En outre, ce dispositif amélioré de fumage diminue les risques d'exposition aux causes des effets sanitaires observés chez les productrices. Il urge d'intensifier la formation des productrices pour les convaincre des avantages de ce four afin de faciliter son acquisition et son appropriation.

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Offres promotionnelles et sensibilité du consommateur à la promotion des ventes

[Promotional offers and the sensitivity of the consumer to sales promotion]

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ABSTRACT: On the one hand, this study expresses itself on the characteristics of the sensitivity of the consumer to sales promotion and promotion techniques. On the other hand, it reveals the relationship that exists between the promotional offers of firms and the response of consumers to these promotions. An analysis of variance and linear correlation analysis on data from a convenience sample of 1072 consumers of drinks reveals that the sensitivity of the consumer to sales promotion is a one-dimensional concept of the promotional techniques used and a category of goods. However, the complexity of the promotional mechanism can negatively and significantly affect the sensitivity of the consumer to sales promotion. Going from this finding, we recommend that managers should better focus their efforts on the techniques preferred by consumers (take away gifts, sale of two products at the price of one, winning crown corks and price reductions) presented in simple or easily understood forms that reduce supplementary participation effort from consumers and brings them to react favourably.

KEYWORDS: Sensitivity, Games/plays, Price reductions, Premium sales, promotional mechanism.

RESUME: Cette étude tend à se prononcer d'une part sur les caractéristiques de la sensibilité du consommateur à la promotion des ventes par rapport aux techniques promotionnelles. D'autre part, elle met en évidence la relation qui existe entre les offres promotionnelles des entreprises et les réponses des consommateurs. A l'issue d'une étude menée auprès d'un échantillon de convenance de 1072 consommateurs de boissons, nous avons obtenu des données qui nous ont permis d'effectuer des analyses de la variance et de la corrélation linéaire. Au terme de celles-ci, nous avons pu constater que la sensibilité du consommateur à la promotion des ventes est un concept unidimensionnel selon les techniques promotionnelles utilisées dans une catégorie de produit. Toutefois, la complexité du mécanisme promotionnel peut affecter négativement et de façon significative la sensibilité du consommateur à la promotion des ventes. De ce constat, nous avons suggéré aux managers de se focaliser davantage sur des techniques promotionnelles préférées par les consommateurs (cadeau, vente de deux produits au prix d'un, capsule gagnante, réduction de prix) présentées sous des formes simples ou faciles à comprendre afin de minimiser l'effort supplémentaire de participation et les amener à réagir favorablement.

MOTS-CLEFS: Sensibilité, jeux/concours, réductions de prix, ventes avec primes, mécanisme promotionnel.

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1 INTRODUCTION

Le souci de développement des ventes à court terme au vu de la turbulence sans cesse croissante de l'environnement commercial amènent les entreprises à développer des actions promotionnelles pour booster leur chiffre d'affaires. On note près de 200 000 opérations promotionnelles organisées chaque année, ce qui représente près de 16% des dépenses de communication [1]. En parallèle, le phénomène de la vie chère couplé à la baisse du pouvoir d'achat, contraignent davantage les consommateurs à rechercher des offres leur permettant de réaliser les bonnes affaires ou à s'intéresser aux campagnes promotionnelles des entreprises. En réalité, s'il y'a recrudescence des promotions de ventes au sein des entreprises, cela signifie qu'en aval ces actions ont des effets avérés sur les réactions des consommateurs ; d'où l'intérêt de se pencher sur la relation entre les différentes offres proposées par les entreprises et les réponses des consommateurs.

L'offre promotionnelle au sein d'une entreprise se matérialise par les choix en termes de techniques promotionnelles et mécanisme promotionnel. En utilisant les techniques promotionnelles telles que les jeux/concours, les réductions de prix et les ventes avec prime ayant très peu fait l'objet des recherches antérieures sur la compréhension de la promotion des ventes ([2],[3]), et en menant une analyse approfondie dans une catégorie de produit (les boissons), il sera question de déterminer la nature du lien entre la définition de l'offre promotionnelle par les entreprises et la réaction des consommateurs.

Les travaux antérieurs sur le sujet montrent une controverse en matière de réaction des consommateurs face aux différentes techniques promotionnelles utilisées par les entreprises ([4], [1], [5], [6]). Pour [4], la sensibilité dépend des techniques promotionnelles utilisées si bien qu'elle a abouti à des échelles de mesure différentes de la sensibilité de l'enfant aux promotions des ventes en fonction des techniques promotionnelles utilisées. Cette approche rejoint l'idée de [6] selon laquelle « Les consommateurs sont plus ou moins sensibles à certaines techniques promotionnelles ». Enfin, pour [2], les techniques destinées à la même cible comme les coupons ou les jeux ne suscitent pas de réactions comparables de la part des consommateurs. En général, ces auteurs soutiennent l'existence des réactions différentes de la part des consommateurs en fonction des techniques promotionnelles étudiées. Toutefois, on note que ces appréciations restent très générales car elles ne s'appuient pas sur une catégorie de produit. D'un autre coté, [5] montre qu'un consommateur sensible aux lots est certainement sensible aux primes car ces techniques reposent sur le même principe : « donner plus » et non « demander moins » qui est le mécanisme de la réduction de prix. Face à ces contradictions, nous souhaitons, en spécifiant un type de produit, nous prononcer sur la relation entre les techniques promotionnelles et la sensibilité du consommateur face à la promotion des ventes.

Le mécanisme promotionnel est un concept qui, à notre connaissance, a fait l'objet de très peu de recherche. Sans toute fois établir une liaison avec la sensibilité du consommateur à la promotion des ventes, [7] estiment qu'une promotion multi mécanisme est perçue comme plus complexe qu'une promotion mono mécanisme. Ces auteurs appréhendent le multi mécanisme promotionnel comme le fait d'associer dans la même communication plusieurs mécanismes promotionnels (jeux-concours et tombola, couplage produit en plus et tombola etc….). Or, nous analysons le mécanisme promotionnel comme le mode de fonctionnement de la promotion des ventes et cherchons ainsi à évaluer son influence sur la réaction du consommateur.

Dans cet article, nous présenterons d'abord la démarche méthodologique adoptée, puis nous terminerons par la présentation des résultats.

2 MÉTHODOLOGIE

2.1 HYPOTHÈSES DE L'ÉTUDE

Il existe une controverse en matière de définitions de la sensibilité du consommateur à la promotion des ventes. A cet effet, deux courants de pensées s'opposent : l'approche comportementale selon laquelle la notion de sensibilité est assimilée à celle du comportement ([8], [9], [10]) et l'approche psychologique qui met exclusivement en avant l'état d'esprit du consommateur face à la promotion des ventes ([11], [12], [4]). Puis, un troisième courant tente de lier les deux approches. Nous nous rattacherons dans cette recherche à ce dernier courant de pensée, car il prend soin de préciser ce qui se passe dans la tête du consommateur et spécifie sa réaction face à l'action promotionnelle. A cet effet, nous retiendrons la définition de [13] selon laquelle la sensibilité du consommateur à la promotion des ventes représente «le degré selon lequel un consommateur est influencé par la promotion au niveau de son rythme d'achat, de son choix d'une marque, d'un magasin, de la quantité achetée en promotion ou encore de sa recherche de promotion ».

A la suite de cette appréhension de définition, les hypothèses sur les déterminants de la sensibilité du consommateur à la promotion des ventes relatifs à l'offre promotionnelle (techniques promotionnelles et mécanisme promotionnel) sont développées.

2.1.1 LIEN ENTRE TECHNIQUES PROMOTIONNELLES ET SENSIBILITE DU CONSOMMATEUR A LA PROMOTION DES VENTES

Relativement aux techniques promotionnelles, la sensibilité à la promotion des ventes est un concept qui mobilise deux approches de conception, l'une unidimensionnelle et l'autre multidimensionnelle.

Selon l'approche unidimensionnelle, [14] cherchent à évaluer si les consommateurs sont sensibles aux offres en général et/ou à une offre en particulier. Pour y répondre, ils réalisent une classification inductive à partir de huit techniques promotionnelles et démontrent que les consommateurs sont soit prédisposés à répondre aux offres en général, soit insensibles à la promotion en général. Les travaux de [15], [16], [17] estiment que la sensibilité à la promotion peut être considérée comme un construit unidimensionnel c'est-à-dire qu'un individu qui modifie son comportement pour certaines promotions est enclin à le modifier également en présence d'autres promotions. Suivant cette dernière approche, la sensibilité est perçue comme un concept généralisé.

En ce qui concerne l'approche multidimensionnelle, [18] pensent qu'un consommateur ne réagit pas de la même façon si la promotion à laquelle il est confronté lui demande un effort important ou non. [19] suggèrent que les différents types de promotions provoquent des effets différents sur les ventes à long terme.

La théorie des perspectives appliquée à la compréhension de la perception des techiques promotionnelles suppose une fonction d'utilité qui est concave sur les gains et prédit que les individus préfèrent un coupon de 50 cents plutôt qu'un prix réduit passant de 5 dollars à 4.5 dollars [20]. A cet effet, on peut dire que l'efficacité des techniques promotionnelles varie selon leur cadrage comme gain ou comme perte. Sur cette base, il a été montré que les promotions non monétaires sont plus efficaces que les réductions de prix, car elles ont tendance à ne pas être agrégées avec le prix normal du produit comme le sont les réductions [21]. Dans ce même ordre d'idée, Selon Chandon [2], les techniques destinées à la même cible comme les coupons ou les jeux ne suscitent pas des réactions comparables. Partant d'une définition de la sensibilité du consommateur à la promotion des ventes offerte [6], il se deduit qu'en fonction des techniques utilisées, on peut enregistrer les degrés de sensibilité différents. Ces travaux démontrent que les consommateurs réagissent différemment face à une promotion des ventes en fonction de la technique promotionnelle mise en oeuvre.

A coté de ces courants de pensées qui semblent adopter la posture selon laquelle les consommateurs réagiraient de façon homogène ou différemment en fonction des techniques promotionnelles qui leurs sont proposées, [23] montre que seule une faible partie de consommateurs est sensible à toutes les techniques, une majorité d'individus n'est sensible à aucune technique, alors qu'environ 25% sont sensibles à une technique mais pas à l'autre. Dans notre contexte, nous pensons que la préférence du consommateur pour une technique promotionnelle ou une autre pourrait avoir des répercussions sur sa sensibilité à la promotion des ventes. Ce raisonnement nous conduit à avancer l'hypothèse suivante :

Hypothèse 1 : La sensibilité du consommateur à la promotion des ventes dépend de la technique promotionnelle utilisée

H 1 a : Plus le consommateur préfère les jeux / concours, plus il est sensible à la promotion des ventes ;

H1 b : Plus le consommateur préfère les réductions de prix, plus il est sensible à la promotion des ventes ;

H1 c : Plus le consommateur préfère les ventes avec primes, plus il est sensible à la promotion des ventes.

2.1.2 LIEN ENTRE LA COMPLEXITE DU MECANISME PROMOTIONNEL ET LA SENSIBILITE DU CONSOMMATEUR A LA PROMOTION DES VENTES

Les auteurs de la reference [24] sont les premiers à considérer que le taux de réponse aux offres est fortement influencé par la valeur informationnelle de l'offre. La valeur informationnelle correspond à l'apport d'informations nouvelles pour le consommateur, mais surtout elle est associée à plusieurs indicateurs explicatifs tels que le moyen de distribution utilisé et la période de temps écoulée entre le lancement de l'offre et la réponse, l'effort à engager pour répondre à l'offre. Cet effort peut être relatif au degré de complexité du mécanisme promotionnel.

Le mécanisme d'une promotion de ventes renvoie au mode de fonctionnement de la promotion des ventes. Les promotions monomécanismes se caractérisent par la mise en œuvre d'un seul mode de fonctionnement où l'individu ne fait face qu'à un seul procédé (achat de deux produits au prix d'un, ou capsule gagnante) pour découvrir l'avantage promotionnel offert. Les promotions multimécanismes quant à elles, ont pour particularités, la mise en œuvre de plusieurs mécanismes promotionnels sur une même offre (couplage de produit en plus, de coupons à valoir sur de prochains achats et d'une

réduction réservée aux porteurs de la carte de fidélité du magasin ; couplage d'un lot, d'une réduction immédiate et d'un jeu-concours, etc.) [7]. Au Cameroun en général et dans le secteur brassicole en particulier, les promotions multimécanismes sont quasi inéxistantes raison pour laquelle nous nous interesserons dans le cadre de ce travail, aux promotions mono mécanismes qui présentent une certaine complexité.

Selon [25], le terme complexe signifie « *Qui contient, qui réunit plusieurs éléments différents* ». Intégré dans le cas du mécanisme promotionnel, on dira qu'un mécanisme est complexe lorsqu'il réunit plusieurs modes de fonctionnements différents, plusieurs étapes pour rentrer en possession du gain ou de façon globale lorsqu'il recommande un effort de participation de la part du consommateur. Cet effort de participation peut se traduire en :

- effort dans le recueil des informations : le cumul de mécanismes promotionnels semblent en effet nécessiter une certaine agilité cognitive de la part des consommateurs pour qu'ils puissent les appréhender et les décoder [26]. Dans ce cas, l'individu doit chercher à se renseigner auprès de ses proches, du vendeur, des médias ou de l'entreprise pour être au parfum du processus de gain ;
- effort financier : il doit supporter les frais d'envoi de SMS (au cas où dans la promotion on demande de renvoyer le code lu sous le joint de la capsule), ou de déplacement (lorsqu'il va dans un centre de distribution pour changer ses capsules contre un ticket tombola).
- effort temporel lié à la contrainte d'attente un tirage au sort de la tombola au cours d'une émission télévisée ou alors à la contrainte d'attente dans le point de vente qu'il y'ait le maximum de tickets de tombola dans l'urne pour effectuer le tirage.

Selon un pan de la littérature, les recherches montrent que la manière de présenter une offre influence l'attitude du consommateur et que le fractionnement des bénéfices perçus conduit à une appréciation plus favorable [27]. Pour d'autres chercheurs, les promotions multimécanismes augmentent plutôt la complexité de la tâche d'évaluation de la promotion pour le consommateur et peuvent le faire douter de sa capacité à faire un bon choix [28]. La promotion multi-mécanismes est ainsi plus complexe à traiter car il est difficile pour un consommateur d'évaluer une offre qui comprend plusieurs éléments [28]. Plusieurs recherches en marketing soutiennent un tel postulat pour la présentation multidimensionnelle du prix ([29], [30]). A valeur monétaire constante, une promotion multi-mécanismes sera donc perçue comme plus complexe qu'une promotion n'engageant qu'un seul mécanisme. Cette perte de crédibilité résulte de la perception par le consommateur d'une tentative de manipulation lorsque l'offre semble trop avantageuse [31]. Ce raisonnement conduit à envisager que la multiplication des mécanismes sur une même offre augmente la complexité perçue. Parallèlement à cette démonstration, nous pensons que dans le secteur brassicole, la multiplication des étapes dans une promotion mono mécanisme pourrait en augmenter la complexité perçue de l'offre promotionnelle. Raison pour laquelle nous avançons l'hypothèse suivante :

H2 : Plus le mécanisme promotionnel est complexe, moins les consommateurs sont sensibles à la promotion des ventes.

Après cette mise au point des différentes hypothèses de travail, nous nous penchons sur la démarche méthodologique utilisée dans cette recherche.

2.2 ECHANTILLONNAGE

La validation des échelles de mesure créés et adaptées a nécessité une série de trois études exploratoires auprès des consommateurs ayant déjà été au contact d'une action promotionnelle mise en œuvre par les entreprises du secteur brassicole. Ainsi, 18 entretiens semi directifs menés dans un premier temps, ont permis de mettre en évidence les variables relatives à l'offre promotionnelle susceptibles d'expliquer de la sensibilitédu consommateur à la promotion des ventes ; puis, 2 études quantitatives exploratoires auprès de 180 et 250 individus nous ont permis de valider les échelles de mesures employés dans le questionnaire utilisé dans l'étude finale. Cette dernière a été réalisée auprès d'un échantillon de convenance. 1072 questionnaires complets et exploitables forment notre échantillon final de consommateurs de Soda et de bières, âgés de plus de 15 ans. L'enquête s'est déroulée dans les trois principales villes francophones du Cameroun à savoir Yaoundé (46.3% des enquêtés), Douala (45.4% des enquêtés) et Bafoussam (8.3% des enquêtés). Les questionnaires ont été administrés en face à face dans les domiciles ou sur le lieu de travail des consommateurs.

2.2.1 OPÉRATIONNALISATION DES VARIABLES

Cette étude met en évidence une variable dépendante (la sensibilité du consommateur à la promotion des ventes) et deux variables indépendantes (les techniques promotionnelles et lacomplexité du mécanisme promotionnel). Par souci de simplification, nous ne présenterons que les propriétés de s variables obtenues à partir des données de la collecte finale.

- **La variable dépendante**

Afin de mesurer la sensibilité à la promotion des ventes telle que définie précédemment, nous avons utilisé une version adaptée de l'échelle de mesure de [32] [1]. Pour purifier les items de cette variable, des analyses en composantes principales avec rotation oblique ont été conduites. L'indice Kaiser-Meyer-Olkin obtenu indique que les données sont factorisables (KMO = 0.953). Le test de sphéricité de Bartlett est significatif et permet de rejeter l'hypothèse selon laquelle la matrice des corrélations serait égale à la matrice identité. La structure obtenue explique 70.721 % de la variance des items retenus. On remarque que contrairement à la structure de [32] qui présentait deux dimensions de la sensibilité (sensibilité active et sensibilité passive), cette structure ne présente qu'une seule dimension. Le concept de sensibilité à la promotion des ventes est donc unidimensionnel. La fiabilité de l'échelle est par ailleurs confirmée par la valeur satisfaisante de l'alpha de Cronbach (alpha = 0.894).

- **Les variables indépendantes**

L'opérationnalisation de la complexité perçue du mécanisme promotionnel a nécessité la définition d'une échelle de mesure. Les items de cette échelle de mesure se trouvent en annexe. L'indice Kaiser-Meyer-Olkin indique que les données sont factorisables (KMO = 0.891). Le test de sphéricité de Bartlett est significatif ($P < 0.001$). L'analyse factorielle explique 71.401% de la variance avec une fiabilité satisfaisante (alpha de Cronbach = 0.899).

Etant donné qu'une technique promotionnelle peut se présenter sous plusieurs formes, nous avons apprécié individuellement les variantes habituellement mises en oeuvre par les brasseurs. Le degré de préférence de ces différentes techniques promotionnelles a été mesuré grâce à une échelle à support sémantique allant de 'très préférée' à 'pas du tout préférée', en intégrant la modalité « neutre » pour les personnes indifférentes.

2.2.2 ANALYSES STATISTIQUES EMPLOYÉES

- L'analyse de la variance ANOVA a contribué à tester la nature de la relation entre les techniques promotionnelles utilisées (variables nominales) et la sensibilité du consommateur à la promotion des ventes (variable métrique après calcul des scores).
- La complexité du mécanisme promotionnel et la sensibilité du consommateur à la promotion des ventes ont été mesurées sur une échelle d'attitude, notamment l'échelle de Likert à cinq points. Ces deux variables ont été transformées en variables quantitatives grâce au calcul des scores. Ceci nous a conduits au vu de la nature métrique de ces variables et nos objectifs, à faire recours au test de la corrélation linéaire pour mettre en évidence le lien pouvant exister entre elles. Le traitement des données a été fait au moyen du logiciel SPSS version 20.

3 RÉSULTATS ET DISCUSSIONS

Dans un premier temps, chacune des variables de l'étude fera l'objet d'une description, ensuite, les tests de lien entre les différentes variables ainsi que les analyses y afférentes seront effectués.

3.1 ANALYSE DESCRIPTIVE DES VARIABLES DE L'ETUDE

Le dépouillement des questionnaires d'enquête montre que 66.0% des enquêtés sont sensibles à la promotion des ventes. En d'autres termes, environ 6 consommateurs sur 10 sont sensibles à la promotion des ventes portant sur les produits du secteur brassicole au Cameroun.

On constate également que le dégré de préférences des consommateurs diffère en fonction des techniques promotionnelles utilisées. La technique promotionnelle la plus préférée par les consommateurs est celle de l'offre d'un cadeau au moment de l'achat d'un produit en promotion. C'est une technique très rassurante pour le consommateur car sans effort particulier, il est sûr d'avoir un gain. Ensuite, on a la vente de deux produits au prix d'un. Dans ce cas l'avantage est certain et immédiat, plus encore, elle permet d'accroitre la consommation. En troisième position, on a la capsule gagnante. C'est une technique omniprésente dans le secteur brassicole. C'est un jeu où le consommateur découvre son gain

[1] *Les échelles de mesures validées se trouvent en annexe.*

à l'ouverture sous le joint de la capsule. Les baisses de prix occupent la quatrième position. Les techniques de concours, tombola et prime de collection sont les moins appréciées car elles détiennent les scores de préférence inférieurs à 50%. On remarque aussi qu'au sein d'une même catégorie de technique, les préférences ne sont pas toujours les mêmes. C'est le cas par exemple pour les jeux / concours où les consommateurs préfèrent plus la capsule gagnante que la tombola.

Par ailleurs, la majorité des enquêtés trouvent que la promotion est compliquée lorsqu'il faut franchir plusieurs étapes avant de savoir son gain (82.7% des enquêtés), de même qu'il est embêtant d'effectuer des dépenses supplémentaires en temps et en argent pour participer à une promotion (79.2% des enquêtés). Ils trouvent également que la promotion est difficile à comprendre lorsque les gains sont présentés sous forme de code (78.9% des enquêtés), ou encore ils la qualifient de pénible (77.5% des enquêtés) lorsqu'on leur demande d'attendre les résultats d'une tombola sur le lieu de vente ou à la télévision. Enfin, 75.4% des enquêtés déclarent qu'il est gênant de se renseigner auprès des vendeurs ou de leurs pairs pour savoir son gain.

3.2 ANALYSE BIVARIÉE DES VARIABLES

La vérification de la première hypothèse a consisté à prendre en compte chacune de forme de présentation de techniques promotionnelles (variables nominales) que nous avons confronté à la variable quantitative 'sensibilité du consommateur à la promotion des ventes' à travers un test de la variance. Le tableau ci-dessous présente le résultat de ces relations :

***Tableau N° 1** : Résultat relation entre techniques promotionnelles et sensibilité du consommateur à la promotion des ventes*

Techniques promotionnelles	vente de 2 produits au prix d'un	baisse de prix	capsule gagnante	Tombola	Concours	Prime de collection	Vente avec prime	L'offre d'un cadeau
Résultat ANOVA	F = 7.653 P = .000	F = 6.200 P = .000	F =14.469 P = .000	F = 7.108 P = .000	F = 3.660 P = .006	F = 5.612 P = .000	F = 4.879 P = .001	F = 4.543 P = .000

Dans ce tableau, toutes les valeurs de Fisher sont élévées et les probabilités y afférentes significatives au seuil de 1%. Ce qui montre qu'il existe un lien entre chaque technique promotionnelle mise en évidence et la sensibilité du consommateur à la promotion des ventes. Ceci permet de valider l'hypothèse 1 selon laquelle « la sensibilité du consommateur à la promotion des ventes dépend de la technique promotionnelle utilisée ». D'un point de vue général, on pourrait dire que les consommateurs sont sensibles à la promotion des ventes dans une catégorie de produit quelle que soit la technique promotionnelle utilisée. Seulement, il est important de rappeler qu'ils n'apprécient pas les différentes techniques promotionnelles de la même façon. Autrement dit, toutes les techniques promotionnelles ne produisent pas la même efficacité. Ces résultats corroborent avec ceux des premiers chercheurs dans le domaine ([33], [34], [8]). La sensibilité du consommateur à la promotion des ventes est donc un concept général lorsqu'il est apprécié dans une catégorie de produit. En d'autres termes, on ne saurait parler de sensibilité à une technique promotionnelle dans une catégorie de produit car les individus apprécient en priorité l'action promotionnelle quelle que soit la technique promotionnelle utilisée. L'information « promotion des ventes sur un produit » les incitent à se mobiliser pour bénéficier des avantages octroyés par les entreprises. Ils sont très attachés au gain ou à tout autre élément qui accompagne la promotion si bien qu'ils acceptent d'adhérer même aux techniques promotionnelles qu'ils n'apprécient pas.

Après cette première conclusion, nous poursuivons notre analyse sur l'appréciation des modes de fonctionnement de techniques promotionnelles qui recommandent des efforts de participation chez le consommateur. Le tableau N°2 ci-dessous présente le résultat du test de corrélation effectué sur la variable sensibilité du consommateur à la promotion des ventes et la variable complexité du mécanisme promotionnel.

***Tableau N° 2** : Résultat relation entre complexité du mécanisme et sensibilité du consommateur à la promotion des ventes*

Corrélations			
		SENSIBILITE	**COMPLEXITE DU MECANISME**
SENSIBILITE	Corrélation de Pearson	1	-.133**
	Sig. (bilatérale)		.000
	N	1072	1072
COMPLEXITE DU MECANISME	Corrélation de Pearson	-.133**	1
	Sig. (bilatérale)	.000	
	N	1072	1072
**. La corrélation est significative au niveau 0.01 (bilatéral).			

Ce tableau présente l'existence d'un lien significatif au seuil de 1% entre le mécanisme promotionnel complexe et la sensibilité du consommateur à la promotion des ventes. Le signe négatif, dénote la présence d'un lien de sens contraire. Ce qui nous permet de valider notre deuxième hypothèse qui stipule que «*Plus le mécanisme promotionnel est complexe, moins les consommateurs sont sensibles à la promotion des ventes ».* On devrait ainsi s'attendre à ce que le consommateur réagisse négativement face à une promotion des ventes lorsqu'il perçoit le mécanisme comme compliqué. Ces résultats sont en concordance avec ceux de [7]. Certes ces auteurs ont travaillé sur la multiplicité de techniques promotionnelles associée à un produit lors d'une campagne promotionnelle (multi mécanisme), ils ont abouti à la conclusion selon laquelle le consommateur avait une réaction particulièrement négative en cas la conjonction de deux mécanismes proches pour la même offre. Donc, dès lors qu'il y'a multiplicité d'informations promotionnelles nécessitant un effort d'appréciation et / ou de comparaison, les consommateurs estiment que l'offre est complexe et réagissent défavorablement. De plus, les professionnels avertis[2] pensent à ce sujet, « qu'Il faut qu'une promotion reste simple et compréhensible, sans multiplier les mécaniques ». Ces résultats nous montrent globalement que les consommateurs seront refractaires à toute action qui leurs recommande des efforts supplémentaires en terme de dépense d'argent ou de temps.

4 CONCLUSION

Cette recherche nous a permis de mettre en évidence et de vérifier statistiquement le lien entre les offres promotionnelles élaborées par les entreprises brassicoles et la sensibilité du consommateur à la promotion des ventes. Il ressort de nos analyses d'une part que les consommateurs réagissent positivement, mais à des degrés différents, à la promotion des ventes quelque soit la technique utilisée dans la même catégorie de produit. D'autre part, les modes de fonctionnement de la promotion des ventes qui recommandent un effort de participation de la part du consommateur l'incite à réagir plutôt défavorablement. Ce travail complète ceux déjà existants dans le domaine. En menant l'analyse dans une catégorie de produits (les boissons), les résultats obtenus se rattachent au courant de pensée selon lequel la sensibilité du consommateur à la promotion des ventes est un concept unidimensionnel en fonction des techniques utilisées ([15], [16], [17]). En d'autres termes, les individus sont sensibles à la promotion en général dans une catéogorie de produit quelque soit la technique promotionnelle utilisée. Il n'y a que le degré de sensibilité qui varie d'un individu à l'autre en fonction du degré de préférence pour le type de technique promotionnelle. Plus encore, ces résultats corroborent également avec ceux de [7] dans la mésure où la logique d'ensemble stipule que les consommateurs préfèrent le mono mécanisme. Elle prolonge l'appréhension de [7] en ajoutant que, même en cas de mono mécanisme de technique promotionnel, il faudrait adopter un principe de fonctionnement mono étape.

Fort de ces constats, nous recommandons aux brasseurs de mettre en œuvre prioritairement lors de leurs campagnes promotionnelles les techniques les plus appréciées par les consommateurs qui sont : les techniques de vente avec prime directe, de vente de deux produits au prix d'un, de capsule gagnante et de baisses temporaire de prix. Ceci les amènerait à rencontrer davantage du succès auprès de leurs cibles. Pour réduire la complexité perçue, les managers gagneraient à réduire l'effort de participation à fournir par le consommateur. Pour cela, on pourrait par exemple inscrire la signification du code de gain sur l'étiquette du produit ou encore préciser l'heure exacte à laquelle aura lieu le tirage au sort dans l'émission

[2] Source : LSA 14 février 2013, entretien avec les deux co-présidents d'ECR France, Vincent Ringenbach (Cora) et Tristan Farabet (Coca-Cola). http://www.cles-promo.com/actualite/actu_promotion_ventes Consulté le 01 juin 2014

télévisée ou sur le lieu le vente afin que les consommateurs n'aient plus à se renseigner auprès des tiers, ni à perdre beaucoup de temps. Ils devraient aussi réduire, voire supprimer les mécanismes promotionnels pour lesquels les consommateurs sont amenés à dépenser le crédit téléphonique pour envoyer des codes afin qu'on leur retourne une réponse qui précise si l'on a gagné ou pas. Il serait donc judicieux d'utiliser des mécanismes simplifiés c'est-à-dire facile à comprendre, à une seule étape, ayant un seul principe, dont on peut découvrir instantnément le gain et le rétirer sans trop de tracasseries.

Au terme de cette étude, il est important de relever quelques insuffisances de cette recherche. Du fait de la méthode d'échantillonnage choisie (méthode de convenance), ces résultats ne peuvent être directement extrapolés à la population camerounaise car l'échantillon n'est pas représentatif. Cette étude ne prend en compte que les variables relatives à l'offre promotionnelle, il serait judicieux de mettre en évidence les facteurs situationnels (ambiance, presence d'autres personnes sur le lieu d'achat) ou comportementaux susceptibles d'expliquer la sensibilité à la promotion des ventes. Enfin, la catégorie de produits étudié, les boissons, correspond à un marché banalisé avec une forte variété des produits et un comportement d'achat répété avec une faible implication. Il serait pertinent également d'apprécier ces résultats sur un marché à plus forte implication. De plus, une étude comparative sur plusieurs produits de catégories différentes, permettrait davantage d'enrichir la reflexion sur la dimensionalité du concept de sensibilité du consommateur à la promotion des ventes en fonction des techniques promotionnelles.

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The Management of Binocular Vision Anomalies by Eye Care Facilities in the Accra and Kumasi Metropolises (Ghana)

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ABSTRACT: This study sought to determine the state of management of binocular vision anomalies by eye care facilities in two major cities in Ghana: Accra and Kumasi. Using the snow balling technique, 86 eye care centres were sampled from the two cities from January to February, 2014. Well-structured questionnaires, verbal interviews and in most cases observational check-ups were employed in the data collection process. Out of the 86 clinics, 51 (59.3%) were located in the Accra metropolis. Binocular Vision Anomalies were reported to be managed by 63 (73.3%) clinics. Majority of the clinics (69.8%) managed accommodative dysfunction with added lenses (69.8%) being the most-employed method. Overall, 79 (91.9%) clinics reported that they referred unmanaged cases and mostly to the ophthalmologist (55.7%). It was found that reports of adequate training in management of binocular vision anomalies and number of instruments owned by the clinics were positively associated with management of binocular vision anomalies (p value =0.001 and p value =0.000 respectively). Based on the report of the clinics, it could be concluded that although some form of binocular vision anomalies are managed by most clinics, there is possibly lack of efficient provision of services as most clinics lacked instruments that are required in detecting, measuring and managing Binocular vision anomalies. It is therefore recommended that to ensure provision of more efficient and quality binocular vision services to clients, eye clinics in the country should endeavour to obtain the equipment that are necessary for managing Binocular vision anomalies.

KEYWORDS: binocular vision anomalies, management, eye care centres, services, instruments.

1 INTRODUCTION

According to Evans [1], binocular vision is the process of coordinating and integrating the images received by the two eyes separately into a single percept. The binocular visual apparatus which consists of sensory and motor systems provides single, clear and comfortable imagery that enables us to decide widely about the nature of our rich world [2]. Despite the advantages of binocular vision – such as wider field of view, spare eye if one is marred and stereopsis–, an interruption in the coordination process could result in a condition termed as binocular vision anomalies (BVA) [1],[2]. BVA are characterized by visual problems such as blurred vision, diplopia, asthenopia, headaches, reading difficulties, loss of concentration and avoidance of task [1],[2],[3].

Some generations back, visual demand focused mostly on good distant vision because means of living rested on the ability to hunt, gather, farm and fish [4]. Contemporarily, the advent of technology has caused a shift from the ancient way of living to a more computerized world which places more burden and emphasis on the binocular vision system of man [4]. Because today's work involves reading, desk work and computer viewing, one has to possess a dynamic binocular vision system in order to work comfortably and for a longer time without fatigue. This recent upsurge in near vision activities has eventually led to the increased attention on the impact of BVA on both comfort and productivity [5] as research has shown that a high proportion of symptomatic computer users experience binocular vision problems and ocular discomfort escalates with the extent of computer use [5],[6]. Numerous studies have also indicated that these dysfunctions are commonly

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encountered in clinical practice [7],[8],[9],[10],[11],[12],[13] with a recent estimation that about 20% of people who visit the optometry clinic will present with BVA [14].

In view of this, the assessment of the binocular vision status of a patient should be an integral part of the services rendered by an eye care facility. If not done routinely, this crucial examination should be carried out if a patient complains of binocular vision anomaly related symptoms or the clinician detects signs that intimate this condition [1]. When BVA in children in their sensitive period are ignored, the smooth development of their binocular vision system could be affected and hampered, resulting in conditions such as amblyopia [15]. Students and workers whose work involves identifying small details in close proximity may perform abysmally if they suffer from BVA [16]. Moreover, sportsmen or distant workers like drivers are not exempted because some binocular vision anomalies may cause ocular problems such as diplopia at distance which may result in accidents [17]. Binocular vision plays an essential role in our daily lives and activities and thus, eye care facilities should be able to detect, examine, diagnose and manage binocular vision anomalies or refer where necessary in order to ensure that their clients possess optimum single binocular vision.

In response to the aforementioned, this study sought to determine the state of management of BVA by eye care facilities in two major cities in Ghana: Accra and Kumasi with focus on whether or not the clinics manage BVA, types of BVA managed, methods employed, places of referral, clinician's perception of adequate training and instruments used for proper management.

2 MATERIALS AND METHODS

2.1 STUDY AREA AND DESIGN

A descriptive cross-sectional survey was conducted from January to February, 2014. Because of the difficulty in obtaining a full list of the clinics and their locations, the snow balling technique was used to sample 86 eye care centers from two major cities in Ghana: Accra and Kumasi, to participate in the study. Accra, being the capital city, has a population of 1,695,136 and an annual growth rate of 3.36% [18]. On the other hand, the Kumasi metropolis has a relatively smaller population of 1,170,270 but a higher growth rate of 5.4% [19]. These cities were purposively selected because they are populated with majority of the eye care centers and receive referrals from other places in the country.

2.2 ETHICAL CONSIDERATION

Eye care centers that were registered and had license to operate were included in the study. Besides that, all procedures required by the Ethics Review Committee of Kwame Nkrumah University of Science and Technology were carried out in this study.

2.3 DATA COLLECTION

Well-structured questionnaires comprising both open and closed-ended questions were administered to the eye care providers mainly the optometrist: in a few cases where the center lacked an optometrist, the ophthalmologist or ophthalmic nurse-in-charge was allowed to respond to the questionnaire. Verbal interviews and in most cases observational check-ups were conducted to confirm the answers given by the respondents. On the questionnaire, the duration of practice of the eye care clinics could be answered by checking one of these options: "less than 5 years", "5 to 10 years" and "more than 10years." The types of binocular vision dysfunctions were grouped into accommodative dysfunctions, vergence dysfunctions, strabismus and amblyopia. Treatment methods such as the use of added lens, prism, vision therapy, surgery and drugs were listed for eye care providers to check which ones applied to them. In order to assess the various instruments possessed by the clinics for effective diagnosis and management of BVA, a list of 30 instruments was compiled based on standard clinical practice guidelines stated by American Optometric Association's "Care of the Patient with Accommodative and Vergence dysfunctions" and "Care of the Patient with Strabismus and Amblyopia." They included instruments for visual acuity assessment, refraction, ocular health assessment and binocular vision assessment. Clinicians who responded to the questionnaires were made to report whether they had adequate, semi-adequate or lacked training in BVA management.

2.4 DATA ANALYSIS

The collected data was stored in a secured place out of reach of any person except the researchers. The Stata software version 11.0 was employed in analyzing the data. Descriptive analyses were represented in mean, standard deviations and frequency distribution tables whiles p values for association between two categorical data were computed using Pearson's χ^2

test. Two-sample t-test was used to determine significant differences between the mean number of instruments possessed by clinics in the two locations as well as the mean number of instruments possessed by private or public clinics. ANOVA analysis was made to determine significant statistical association between number of instruments and duration of practice of the clinics. A p value less than 0.05 was considered statistically significant.

3 RESULTS

3.1 DEMOGRAPHICAL CHARACTERISTICS

Out of the 86 clinics that participated in the study, 51 (59.3%) were located in the Accra metropolis whiles the remaining 35 (40.7%) were found in the Kumasi metropolis. The clinics included 71(82.6%) private and 15(17.4%) public eye care centers (Table 1). Majority (54.7%) of the clinics had been in existence for less than five years (Table 1).

3.2 MANAGEMENT OF BINOCULAR VISION ANOMALIES

Binocular Vision Anomalies were managed by 63 (73.3%) clinics based on their responses (Table 1). Thirteen clinics (56.5%) out of the remaining 23 explained that they could not manage BVA because they lacked the necessary equipment. Lack of qualified personnel and other reasons (such as affiliation to bigger clinics and lack of BVA patients) accounted for 7(30.4%) and 3(13.1%) clinics respectively.

According to the results, the percentages of clinics that managed BVA were comparable in Accra and Kumasi (p value= 0.858). In the Accra metropolis, clinics that had been in operation for longer periods were likely to manage BVA (p value= 0.003), whereas no such significant association was found in the Kumasi metropolis (p value = 0.231) and in the overall study (p value = 0.243). Moreover, type of ownership of a clinic was not associated with management of BVA in the overall study (p value =0.055), in the Kumasi metropolis (p value = 0.385) and in the Accra metropolis (p value = 0.058).

Table 1: Distribution of clinics by ownership, duration of practice and management of BVA (number (%))

		Ownership		Duration of practice			Management of BVA	
City	Number	Private	Public	Less than 5 years	5 to 10 years	More than 10 years	Yes	No
Accra	51 (59.3)	44(86.3)	7(13.7)	28(54.9)	10(19.6)	13(25.5)	37(72.5)	14(27.5)
Kumasi	35(40.7)	27(77.1)	8(22.9)	19(54.3)	6(17.1)	10(28.6)	26(74.3)	9(25.7)
Total	86(100)	71(82.6)	15(17.4)	47(54.7)	16(18.6)	23(26.7)	63(73.3)	23(26.7)

3.3 TYPES OF BINOCULAR VISION ANOMALIES MANAGED BY THE CLINICS

Sixty clinics (69.8%) managed accommodative dysfunctions whiles 49 (57%) managed vergence dysfunctions. Amblyopia and strabismus were managed by 36 (41.9%) and 22 (25.6%) clinics respectively. Similar trend was identified in both Accra and Kumasi metropolises but with different proportions (Table 2).

Table 2: Distribution of the Types of BVA managed by the clinics

	Type of BVA (number (%))			
City	Accommodative dysfunction	Vergence dysfunction	Amblyopia	Strabismus
Accra	36(70.6)	29(56.9)	24(47.1)	14(27.5)
Kumasi	24(68.6)	20(57.1)	12(34.3)	8(22.9)
Total	60(69.8)	49(57.0)	36(41.9)	22(25.6)

3.4 METHODS EMPLOYED IN THE MANAGEMENT OF BINOCULAR VISION ANOMALIES

In this study, added lenses were used by 60 clinics (69.8%) to manage BVA. This was followed by the use of vision therapy, prisms, surgery and drugs by 50 (58.1%), 22 (25.6%), 14 (16.3%) and 10 (11.6%) clinics respectively (Table 3). This trend was slightly different from results in both cities. Whiles in the Kumasi metropolis, drugs (5.7%) were employed as a method of management more than surgery (2.9%); in the Accra metropolis, surgery (25.5%) was used more than prisms (21.6%) and drugs (15.7%) in that order to manage BVA (Table 3).

Table 3: Distribution of the methods employed by the clinics in the management of BVA

	Methods employed in BVA management (number (%))				
City	Added lens	Vision therapy	Prisms	Surgery	Drugs
Accra	37(72.5)	31(60.8)	11(21.6)	13(25.5)	8(15.7)
Kumasi	23(65.7)	19(54.3)	11(31.4)	1(2.9)	2(5.7)
Total	60(69.8)	50(58.1)	22(25.6)	14(16.3)	10(11.6)

3.5 REFERRAL OF UNMANAGED CASES OF BINOCULAR VISION ANOMALIES

Out of the 86 clinics, 79 (91.9%) reported that they referred BVA cases they could not manage. All the 51 clinics in the Accra metropolis claimed that unmanaged cases of BVA were referred. Overall, the ophthalmologist received most (55.7%) of these referrals from the eye care centers in this study. However, whiles in the Kumasi metropolis, most (46.4%) of the referrals were directed to the optometrist; in the Accra metropolis, the ophthalmologist was the target for the majority (68.6%) of referrals of BVA cases (Table 4).

Table 4: Distribution of Professionals referred to by the eye care centers in the study

	Professional referred to by eye care centers				
City	Optometrist only	Ophthalmologist only	Optometrist or ophthalmologist	Neurologist	Orthoptist or ophthalmologist
Accra	3(5.9)	35(68.6)	12(23.5)	1(2.0)	0(0)
Kumasi	13(46.4)	9(32.1)	5(17.9)	0(0)	1(3.6)
Total	16(20.25)	44(55.70)	17(21.51)	1(1.27)	1(1.27)

3.6 CLINICIAN'S PERCEPTION OF ADEQUATE TRAINING IN MANAGEMENT OF BINOCULAR VISION ANOMALIES AND THE NEED FOR MORE SERVICES

Approximately two-thirds (68.6%) of the clinicians who responded to the questionnaire reported that they had adequate training in BVA management. Whiles eight (9.3%) clinicians claimed that they did not have adequate training, 19 (22.1%) of them reported that they had semi-adequate training in BVA management (Table 5). In the overall study population (p value = 0.001) and in the Accra metropolis (p value = 000), it was found that report of adequacy of training in BVA management was positively associated with management of BVA. However, in the Kumasi metropolis, such association was not realized (p value = 0.2). Eighty three (96.5%) clinics acceded to the need for more BVA services including a unanimous consent from all the 51 clinics in the Accra metropolis.

Table 5: Distribution of the clinics based on Clinician's perception of adequacy of training in BVA management and the need for BVA services

	Clinician's perception of adequacy of training in BVA management			The need for BVA services		
City	Adequate training	Semi-adequate training	Lack of adequate training	Agree	Neither agree nor disagree	Disagree
Accra	36(70.6)	8(15.7)	7(13.7)	32(91.4)	3(8.6)	0(0)
Kumasi	23(65.7)	11(31.4)	1(2.9)	51(100)	0(0)	0(0)
Total	59(68.6)	19(22.1)	8(9.3)	83(96.5)	3(3.5)	0(0)

3.7 INSTRUMENTS AVAILABLE FOR EFFECTIVE DIAGNOSIS AND MANAGEMENT OF BINOCULAR VISION ANOMALIES

A total of 30 instruments which included those for visual acuity testing, refraction, ocular health assessment and binocular vision assessment were enlisted for the study. The number of clinics that had a particular type of instrument was documented (Table 6). In the overall study population, the mean number (standard deviation (SD)) of instruments possessed by the clinics was 15.88(4.5). Eye care centers in the Accra metropolis (16.92 (5.22)) had a significantly higher mean number of instruments than those in the Kumasi metropolis (14.37 (2.59); p value = 0.0045). Two clinics –one in Kumasi and the other in Accra– had 6 instruments which was the least number of instruments possessed by a clinic in the study whereas the maximum was 27.

It was noticed in the overall study (p value = 0.002) and in the Accra metropolis (p value = 0.001) but not in the Kumasi metropolis (p value= 0.275) that older clinics were likely to possess more instruments than younger ones. Also, private clinics in the Kumasi metropolis were more likely to possess more number of instruments than public ones (p value = 0.003). This association was seen in the overall study (p value = 0.032) but not in the Accra metropolis (p value = 0.283).

The number of instruments possessed by the clinics was grouped into very low (0-6), low (7-12), medium (13-18), high (19-24) and very high (25-30) levels to provide a clearer picture of the distribution. Majority (57%) of the clinics in the study had medium level number of instruments. Again, clinics with greater number of instruments were more likely to manage BVA than those with smaller numbers. This trend was found in both Kumasi (p value =0.004) and Accra (p value =0.000) and in the overall study population (p value =0.000) (Table 7).

From Table 6, instruments that are necessary for performing visual acuity testing (e.g. snellen and illiterate E charts), refraction (e.g. retinoscope or autorefractor, trial lens set and frame) and ocular health assessment (e.g. ophthalmoscope and slit lamp) were possessed by quite a good number of the clinics. On the contrary, clinics lacked in general, instruments (marked * in Table 6) that are considered necessary for detecting, measuring and managing BVA.

Table 6: Distribution of the Number of the Various Instruments Possessed by the Clinics in the study

Instrument	Number of instruments (%)			Instrument	Number of instruments (%)		
	Accra	Kumasi	Total		Accra	Kumasi	Total
Snellen chart	51	35	86(100)	Pinhole	49	35	84(97.7)
Illiterate E	50	35	85(98.8)	Occluder*	51	35	86(100)
Logmar chart	10	5	15(17.4)	RAF rule*	14	1	15(17.4)
Near chart	51	34	85(98.8)	Maddox rod*	36	33	69(80.2)
Picture chart	34	6	40(46.5)	Maddox wing*	0	0	0(0)
Isolated chart	13	2	15(17.4)	Red/green goggles*	36	0	36(41.9)
Retinoscope/ Autorefractor	42	27	69(80.2)	Accommodative flippers*	17	0	17(19.8)
Trial lens set	48	33	81(94.2)	Prism flippers*	0	0	0(0)
Trial frame	49	33	82(95.3)	Prism bar*	10	4	14(16.3)
Pd rule	50	33	83(96.5)	Mallet*	2	0	2(2.3)
Phoropter*	15	7	22(25.6)	Penlight*	51	35	86(100)
JCC	33	10	43(50.0)	Slit lamp	32	32	64(74.4)
Focimeter	30	30	60(69.8)	Ophthalmoscope	51	35	86(100)
Astigmatic dial	5	1	6(7.0)	Stereochart with polaroid lenses *	9	0	9(10.5)
Duochrome chart	2	24	26(30.2)	Synoptophore *	0	0	0(0)

*Instruments considered as necessary for detecting, measuring and managing BVA in this study

Table 7: Cross Tabulation of the Number of Clinics that manage BVA and their level of number of instruments

Number of instruments owned by the clinics		Management of BVA						
		Accra		Kumasi		Overall		
Level	Range	Manage	Do not manage	Manage	Do not manage	Manage	Do not manage	Total
Very low	0-6	0	1	0	1	0	2	2 (2.3)
Low	7-12	3	10	0	3	3	13	16(18.6)
Medium	13-18	16	3	25	5	41	8	49(57.0)
High	19-24	13	0	1	0	14	0	14(16.3)
Very high	25-30	5	0	0	0	5	0	5(5.8)
P value		0.000		0.004		0.000		

4 DISCUSSION

Based on the responses from the clinics, this study revealed that most (73.3%) of the clinics manage some form of BVA in their facilities. It was also noticed that the percentages of clinics that managed BVA in both cities were comparable suggesting that accessibility to BVA services in the two cities might be fairly distributed taking into consideration their respective population sizes.

From Table 2, accommodative and vergence dysfunctions were reported as mostly managed by the clinics in both Accra and Kumasi metropolises and in the overall study population. Generally, research has shown that these two types of binocular vision dysfunctions are more prevalent than strabismus and amblyopia [7] [20]. This suggests that most of the patients that will attend the eye care centers with BVA may report with accommodative or vergence dysfunctions resulting in the higher frequency of their management. Furthermore, therapy for management of accommodative and vergence dysfunctions such as the use of plus lenses or vision therapy may not require advanced and expensive procedures and instrumentations [4], permitting most of the clinics to manage these conditions and not encumber themselves with the other types of BVA.

In this study, added lenses and vision therapy were reported by the clinics as the most-employed methods of management. Because of their effectiveness and simplicity; added lenses, vision therapy and prisms are mostly used in the treatment of accommodative and vergence dysfunctions [4] which are already known to be mostly managed by majority of the clinics in the study. It then confirms that if these types are mostly managed because they are more prevalent, then, added lenses and vision therapy should be the most-employed methods of treatment. The relatively lower use of prisms compared to added lenses and vision therapy could be explained by the difficulty in prescribing prisms in the country. The lens production companies in Ghana rarely manufacture prisms and importing them from abroad for a patient could be expensive. It is therefore recommended that policy makers and bodies regulating eye care services in the country should work on improving accessibility to prisms in order to broaden the options of management of BVA in the country. The existence of more clinics with advanced infrastructure and qualified professionals in the Accra metropolis could explain why surgery was used more in the Accra metropolis than in the Kumasi metropolis.

Furthermore, clinics in this study reported that they referred their unmanaged cases mostly to the ophthalmologist, followed by the optometrist. Admittedly, the scope of practice of the ophthalmologist in Ghana surpasses that of the optometrist and includes surgery which the optometrist is incapable of performing. However, ruling out situations like inadequate training in BVA management and lack of required instruments, optometrists being the primary eye care providers and mostly, the renders of binocular vision services, should be able to handle most of the cases of BVA with the exception of rare situations requiring extra ocular muscle surgery. Possibly, these unmanaged cases referred to the ophthalmologist included procedures that were out of scope of practice of the optometrist whiles those referrals directed to the optometrist could be as a result of lack of optometrist at the facility, lack of required instruments and perhaps, lack of expertise in the management of those cases.

Unsurprisingly, this study demonstrated that clinician's perception of adequacy of training in BVA management was associated with management of BVA. Across domains such as health, sports and academics, research has established an association between knowledge and performance in that subjects who are abreast with the techniques and skills of a particular field are most likely to perform successfully [21],[22],[23]. It is therefore recommended that more in-service training and occasional workshops on modern trends of BVA management should be organized for clinicians in order to possibly ensure an improvement in the number of clinics that manage BVA and the efficiency of management.

Even though clinics in the Accra metropolis had a higher significant mean number of instruments than those in the Kumasi metropolis, generally, majority of the clinics had medium (13–18) number of instruments. Also, according to Table 6, most of the clinics lacked the instruments (e.g. mallet, prism bars, Maddox wing, RAF, accommodative and prism flippers, synoptophore etc.) that are required in detecting, measuring and managing binocular vision dysfunctions. This could suggest that clinics that manage BVA may improvise with the use of the Maddox rod and loose prisms which are inherent in the trial lens case and thus, it would be very difficult for them to perform tests such as Von Graefe, measurement of vergence amplitudes and facility etc. This therefore questions the efficiency of management of BVA in the various eye care facilities. Also, it was identified that clinics with higher number of instruments were likely to manage BVA than those with lower numbers. Indisputably, it will be very arduous for clinics to operate and provide binocular vision services bereft of the prerequisite equipment. Eye care facilities are therefore encouraged to purchase the necessary instruments that would help them in managing BVA cases more efficiently.

Generally, this study relied mostly on the responses of the clinics during the collection of data as it was difficult to ascertain whether the clinics managed BVA or not. Also, due to time constraints, observational check-ups needed to confirm the presence of the instruments reported as being owned by the clinics were not carried out for some of the clinics.

5 CONCLUSIONS

In conclusion, most (73.3%) of the clinics reported that they managed some form of BVA in their facilities. Accommodative and vergence dysfunctions were reported to be largely managed by the clinics with added lenses and vision therapy being the most employed method of management. Referral of unmanaged cases was directed to the ophthalmologist and optometrist. In the overall study, majority of the clinics had medium (13–18) number of instruments and lacked instruments that are prerequisite in detecting, measuring and managing BVA suggesting a possible lack of efficient management of BVA in most of the clinics. It was found that as the number of instruments possessed by the clinics increased, the likelihood of management of BVA also increased. This study recommends that clinics in the two major cities and the entire country should endeavor to acquire the necessary instruments for management of BVA. It is also recommended that policy makers and bodies that regulate the provision of eye care services should assist in increasing accessibility to prisms and occasional workshops to help widen the options for management of BVA and bring to speed the skills and knowledge of eye care providers in the attempt to raise the standards of binocular vision services rendered to the society.

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CONFLICT OF INTEREST

The authors of this manuscript have no conflicts of interest.

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RESIDENTIAL WATER USE IN ONITSHA NORTH LOCAL GOVERNMENT AREA, ANAMBRA STATE, NIGERIA

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ABSTRACT: Meeting domestic water requirements has been a very big problem to urban planners. To evaluate the pattern of water supply and use in households in the study area, systematic random sampling technique was used to select the households that were interviewed. Survey questionnaires were employed with which data on water-use characteristics of the respondent households were obtained. A total of 250 households selected at random sampled, and the data obtained were presented in frequency distribution tables, bar charts, pie charts and graphs. The hypothesis formulated were tested using chi-square (x^2) test for the goodness of fit. The gross inefficiency in domestic water-use observed among residents in the study area requires that government and NGOs make provision for water to augment the efforts of the private sector, promote sanitation and enforce conservation if water-use is monitored.

KEYWORDS: Residential, water, Domestic, Commercial, Conservation.

1 INTRODUCTION

Water is required in almost all spheres of human activities. The uses of water can be broadly classified into residential water use and commercial water use. The use of water under both classes include direct consumption or indirectly for washing, cleaning , power generators, cooling, transportations, cooking, livestock watering or even waste disposal. The end uses of water include all places where water is used in a regular household's home such as toilets, shower, washing machines, faucets, lawn watering etc. Accurately measuring and modeling these end uses and the effectiveness of conservation efforts has been the problem of urban water planning for many years. Understanding where and when the consumer uses water is critical information for utilizing, planning and conserving water so as to ensure adequate water supply at and when due.

Effective evidence on conservation measure can be used to improve the design and supply of residential water by professionals. Residential water demand is a function of temperature, rainfall, house value; water price and household size. Household use of water is very vital. What will your day be without water? Personal alimentation such as bathing, brushing the mouth, drinking, washing dishes, and general laundry will be difficult or impossible. This means that every day, we all rely on water for a wide variety of uses within the house and outside.

According to Unites States Environmental Protection Agency (EPA), each house uses an approximate of 50gallons of water. When water is efficiently allocated in a particular residential area, the quality of life of the inhabitants of this particular area is improved as water is a basic prerequisite for sustenance of life.

1.1 STATEMENT OF THE RESEARCH PROBLEM

Virtually all urban cities in Nigeria do not have adequate water supply in their homes. Residential water supply is a determinant of the quality of life that will be expected from a particular residential area. In the case of Onitsha North L.G.A., the problem lies with irrational use of potable water for domestic use. Scarcity of water have now become the order of the

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day as people trek long distances and also pay high bills for water supply. Lack of adequate water supply for domestic purposes results to poor environmental sanitation/hygiene giving rise to spread of diseases as well as death from water borne diseases.

On the other hand, over-use of water occurs in some parts of Onitsha under the same local government. This is as a result of improper planning as well as population density within these areas. On the basis of this, the research is centered on residential water use and how water is supplied to various parts of Onitsha North local government area. Effort is also geared towards bridging the gap between over-use and under-use of water among various areas in the study area and ensures rational water supply, treatment and management of water and conservation of water resources for sustenance.

On the basis of this; the following Research Questions were raised for which answers where sought for in the research work:

1. To what extent is the water requirement of the water users in the study area satisfied?
2. Are there cases of over-use and under-use in the study area? (Imbalance in water-use among water users)
3. Is there a suitable water management plan on ground in the study area?

1.2 AIM AND OBJECTIVES

The aim of the study is to strike a balance in the water-use across users irrespective of socio-economic or geographical orientation of the residents in the study area with a view to attain sustainability in water-use for the present and future generation. To achieve this goal, the following objectives were set:

1. To determine the consumption pattern of water in Onitsha North and factors that affect water supply
2. To determine if the adoption of management mechanic based on conservation can significantly improve water supply and active sustainable water supply for the future
3. To estimate the quantity of water used per capita and make deductions based on rational and irrational use of water
4. To broaden the mind of the inhabitants of the area on water management schemes to ensure sustainable use of water

1.3 SCOPE OF THE STUDY

The study focuses on Onitsha North L.G.A. of Anambra State, Nigeria. Fourteen (14) test sites were chosen using random systematic sampling for convenience in data handling. As a result of time and financial constraints, this study is limited in scope to address pattern of water supply, pattern of consumption, factors that influence supply and consumption, management and conservation techniques geared towards water resources and creating awareness on water resources management. The scope also covers the use of water for various domestic purposes such as washing, cooking, bathing, laundry, cleaning and so on. The research considers water consumption per capita use not per purpose. Per capita involves the total amount of water that is usable in a given family unit each day. Survey questionnaires were used as primary source of data. The questionnaires were administered only to selected areas and information obtained was analyzed using frequency distribution such as bar charts, pie charts, graphs and chi-square (x^2) statistical methods.

1.4 THE STUDY AREA

Onitsha North is located in the South Eastern part of Nigeria with coordinates: 6º10'N and 6º47'E. The area of Onitsha covers:

- City: 14sq mi (36.19km^2)
- Land: 13.9sq mi (36.2km^2)
- Water: 0sq mi (0.067km^2)
- Urban: 9.8sq mi (25.45km^2)
- Metro: 14sq mi (36.19km^2)
- Time zone WAT (UTC +1)

As of 2001, Onitsha had an estimated population of 511,000 with a metropolitan population of 1,003,000. But the population of Onitsha was 561,066 as at 2006 according to GeoNames geographical databases.

The state of Lagos and various Northern towns are partially fed by supplies from Onitsha. Trade soared between the east and west of Nigeria because of the Onitsha market. This made a strategic gateway for trade between the former eastern and western regions. The major occupation in Onitsha is trading with few people mostly residing in the rural part of Onitsha engaging in fishing. The chief commercial products growing Onitsha are nuts, corns, fruits and vegetables. Other products

which form an integral part of trade in Onitsha include tires, petroleum products, nails and bearings. They are largely manufactured in and around the city. The city has a great source mineral water.

Onitsha is being located in the South eastern part of the country which is usually associated with rainy season and dry seasons. The rainy seasons runs from March-November while the dry season runs from November-February. During rainy seasons, Onitsha always experience heavy rainfalls due to its nearness to River Niger. This gives rise to flooding in coastal areas leading to destruction of lives and properties.

2 THE CONCEPT OF RESIDENTIAL WATER USE

Urban water use typically consist of residential, industrial and public uses, as well as some minor uses for other purpose such as firefighting, line cleaning and system losses. For example, in the metropolitan water district of Southern California (MWD) service area, covering about 15million people living along the Southern California coast from Oxford to San Diego, the largest sector of urban water use is residential accounting for 66% of total municipal and industrial use. Residential water can be divided into use by single-family units versus multiple family units. The types of units generally have different patterns of use for both economic and demographic reasons in multifamily units are usually not metered and billed individual, instead, there is a single bill for the entire building. Demographically, multifamily units are associated with smaller family size although the opposite may be true in lower income areas where large households may live in an apartment unit because they cannot afford to buy home of their own. Also, multifamily units may have somewhat fewer water using points than single family units. For example, residential water use in a normal quarter area is now estimated to average about 150 gallons per capita per day for single family units and 110 gallons for multiple family units generally (Urban water use in California, 1993).

Table 1 presents data on breakdown of residential water use among different end users for simple versus multi-family units in the service area

WATER USE CATEGORY	SINGLE FAMILY	MULTI FAMILY
INDOOR		
Toilets	30	30
Showers/bath	27	25
Washing clothes	21	17
Croaking leaning	13	13
Dish washing	6	4
SUBTOTAL	97	89
OUTDOOR		
Landscape	46	18
Cooling	0	1
Swimming pool, car washing	7	2
SUBTOTAL	53	21
TOTAL	150	110

Source: Urban water use characteristics in the metropolitan water district of Southern California

As an illustration during much of the 1980's, water planners in California and elsewhere generally assumed that indoor water use averaged about 77 gallons in a traditional non-conserving single home and about 60 gallons in a conserving home, based on information about water saving from conservation developed by Brown and Caldwell (1984). The Brown and Caldwell study assumed that people flush toilets at home about 4 times per person per day and low-flush toilets use 3.5 gallons per flush versus 5.5 gallons per flush for traditional toilets. It is assumed that low-flow shower heads use about 2 instead of 3.5 gallons per minute for about 4.8 minutes per person per day and conserving clothes washing machines use 42 instead of 55 gallons per load, with 0.3 loads per capita per day. Indoor residential water usage depends crucially on the types of appliances owned and how often they are used. Outdoor residential water usage depends crucially on lot size, climate and style of landscaping.

According to American water works association in a sponsored detailed study by Aqua craft, because residential water usage is not metered by appliance, it is quite complicated trace back usage to individual appliance etc. from the result of the study, Aqua craft estimated the following for the study sites

- Average per capita daily use: 171.8gdp
- Average per capita indoor use: 69.3gdp
- Average per capita leakage: 9.5gdp, concentrated in small homes
- Indoor use patterns are more stable than outdoor use patterns
- 30% reductions are achievable on indoor use with new fixtures etc.

The most important conclusion from a water supply planning standpoint is that indoor water usage reduction are achievable through the introduction of new fixtures and other water conservation measures. Outdoor usage can typically be reduced by 30-35% using available water conservation landscaping practice.

2.1 FACTORS INFLUENCING RESIDENTIAL WATER DEMAND

Historically, most of water demand literatures have focused on price because of its role as a short term and long term demand management tool.

2.2 THE ROLE OF PRICE IN DETERMINING DEMAND

As with many publicly provided goods, the price paid by individual household is not based on a series of market outcomes (example, the interaction of supply and demand) rather, the rates, as well as the rate structures themselves are often determined by the water provider. This has resulted in the use of wide variety of pricing schemes as utilities attempt to generate a stable steam of revenue while simultaneously promoting conservation and equitable allocation of water among households. Households typically pay a fixed service charge in addition to per unit cost. Within the United States, there are three predominant rate structures use to price water: the uniform, the increasing block rate and decreasing block rate. Uniform rate structure pay the same margin price for all units consumed. Households facing an increasing block rate structures face a constant price over the first units consumed, but pay a higher amount over the next units. Increasing block rate structures have become increasing popular because of their ability to promote conservation among individual water uses (Cavanagh et. al., 2002).

2.3 WEATHER

Generally, scientists agree that weather related variable may affect water demand. There are two (2) pertinent questions on the concept of weather affecting water demand

- Which of the weather related variables do consumers actually respond to (example, temperature, versus precipitation)
- Do households respond to changes in weather as continuous events or based on predetermined threshold, i.e. do households respond to the amount it rains or simply that it rained.

Effective precipitation has been used to reflect change in the quantity of water needed for outdoor irrigation purposes. The result for Texas illustrates that water use rises when temperature reaches about 70ºF and then arises sharper at 90ºF. This indicates climate affects water use due to rise and fall in weather elements. In the tropics - the non-arid zones, during rainy seasons, people in those areas collect water from the rain water thereby decreasing the demand for municipal water supply.

2.4 SIZE OF THE HOUSE AND THE LOT

It is frequently hypothesized that house size and lot size are positively correlated with indoor and outdoor water demand respectively. Much of the available research however struggles to establish statistical significance among these intuitive relationships. Cavanagh et. al, (2002), for example found that every 1,000 square feet of house size in 11 urban areas in the U.S. and Canada, 39 increased water demand by 13-15%. Also, they found each bathroom increases demand by 6% and also that the number of bathrooms significantly and positively correlated with water demand. A somewhat clearer picture exists regarding lot size. Arbues et. al., (2001) found that water use is less proportional to the increase in household size or population because of economics of scale in discretionary and non-discretionary water usage, including cooking, cleaning, car washing and gardening.

3 RESEARCH METHODOLOGY

3.1 SAMPLING METHOD AND QUESTIONNAIRE ADMINISTRATION

Sampling the whole Onitsha North will not be cost and time effective. In view of this, random systematic sampling was used to select 14 test sites which act as representatives of the entire streets in Onitsha North. A total of 250 questionnaires were administered directly on 250 households for seven days.

DATA INTERPRETATION AND ANALYSIS

Data collected were analyzed. Based on the 250 households sampled, the findings are shown below;

Table 2: Distribution of Respondents by location

S/N	LOCATION	FREQUENCY	PERCENTAGE (%)
1.	Kano street	16	6.4
2.	Nwokedi street	10	4.0
3.	Affar street	19	7.6
4.	Venn Road South	21	8.4
5.	Emejulu street	18	7.2
6.	Benjamin street	20	8.0
7.	Obi street	18	7.2
8.	New American street	16	6.4
9.	Anazonwu street	19	7.6
10.	Old cemetery road	17	6.8
11.	Ozomagama street	21	8.4
12.	Anionwu street	16	6.4
13.	Obanye street	19	7.6
14.	Ezenwa street	20	8.0
TOTAL		250	100

Source: Field survey

Table 3: Distribution of respondents by housing type

S/N	HOUSING TYPE	FREQUENCY	PERCENTAGE (%)
1.	Bungalow	60	24
2.	Self-contained flats	107	42.8
3.	Duplex	7	2.8
4.	One-room apartment	76	30.4
TOTAL		250	100

Source: Field survey

Table 4: Distribution of respondents by access to public water supply

S/N	ACCESS TO PUBLIC WATER	FREQUENCY	PERCENTAGE (%)
1.	Yes	55	22
2.	No	195	78
TOTAL		250	100

Source: Field survey

Table 5: Distribution of respondents by source of water supply

S/N	SOURCES OF WATER SUPPLY	FREQUENCY	PERCENTAGE (%)
1.	Boreholes	195	78
2.	Tap water	25	10
3.	Well	17	6.8
4.	Others	13	5.2
TOTAL		250	100

Source: Field survey

Table 6: Distribution of respondents by adequacy of water supply

ADEQUACY OF WATER SUPPLY	FREQUENCY	PERCENTAGE (%)
Adequate	37	14.8
Inadequate	213	85
TOTAL	250	100

Source: Field survey

Table 7: Distribution of respondents according to water supply per household per day

EXISTING WATER PER HOUSEHOLD PER DAY	FREQUENCY	PERCENTAGE (%)
100 Litres	8	3.2
200 Litres	39	15.6
400 Litres	86	34.4
>400 Litres	93	37.2
Others	24	9.6
TOTAL	250	100

Source: Field survey

Table 8: Distribution of respondents according to how often water is supplied

DELIVERY TIME	FREQUENCY	PERCENTAGE (%)
Daily	78	31
Weekly	63	25.2
Monthly	30	12
Yearly	0	0
Any time it finishes	79	32
TOTAL	250	100

Source: Field survey

4 DISCUSSION OF FINDINGS

The results show that there is scarcity of water for domestic consumptions in Onitsha North as compared to World Health Organization (WHO) standard specifications for household water use which stands at 150mg/l per person per day. The Unites States environmental protection agency standard for water use per person per day is 150-170mg/l. These standards were met only about 10% of the sampled population, the remaining 90% does not meet these standards. About 32% of the sampled population can be said to be in excess supply of water, an unacceptable attitude as it affects conservation of fresh water resources, whereas the remaining 68% are in short supply; this result in the case of overuse and underuse in the area. There is also problem of overexploitation of fresh water resources through the drilling of many boreholes leading to increase in extraction of ground water more than the rate of recharge. Individuals that are of high income status usually indulge in this in their homes and pump water at will. This forms about 45.6% of the sampled population leading to overuse of water resources by these people. The low income earners forming about 54.4% of the sampled population who cannot drill boreholes bears the pain of underuse, lack of funds for efficient functioning of water management services. These problems can be traced to:

Delivery system or accessibility: access to water supply contributes greatly to the quantity of water put into use in the residents sampled. Some people trek considerable distance from their homes to their source of water supply. This affects the quantity of water they can fetch per day, which will not necessarily be up to stipulated standard.

Water tariff: the price at which individuals purchase water or pay for water services also determine the quantity of water that will be made available to them. The price of water usually varies especially with the weather conditions. This is because, during the dry season, there is increase in the price of water which will consequently lead to scarcity of water. Water points are not metered, as a result of this, individuals use water carelessly because they are not billed. Most of the water points used in Onitsha are not modern. They are old water points that use low pressure to pump water for various purposes. Lack of education and awareness on the part of the inhabitants on the need to manage and conserve fresh water resources also leads to over exploitation and overuse of water. Increase in population of the urban centers leads to overstretching of urban services which include water supply. Overstretching of these facilities leads to shortages and scarcity.

These findings have its implications both on the dwellers and on the environment. Disease epidemics loom in view of this as adequate water supply or domestic water use is directly related to the regression of water borne diseases, lack of water for personal and domestic hygiene, lack of portable water for drinking. Inadequacy of potable water supply leads to dependency on contaminated water which may lead to water-washed, water-based and water-borne diseases. The total effect of these tells on the sanity of the environment making it less attractive. Increased extraction of water leads to overdraft and draught. Since mankind depend only on less than 3% of the total water (fresh water) for his sustenance, depletion of this resources will lead to several environmental impacts such as: scarcity of water, eutrophication of fresh water, loss of aquatic lives, reduction or halt in human activities, halt in developmental activities, loss of harmony between man and the environment.

5 RECOMMENDATIONS

On the basis of these findings, the following recommendations are made:

1. There should be adequate provision of water services by the government to ensure adequacy of water
2. Water services should be properly planned and managed for efficient allocation
3. Water used by the domestic sector should be monitored and metered especially those operating private boreholes to ensure rational use
4. Influx of population in the urban areas should be checked to avoid overstretching of urban services
5. Conservation programme should be conducted towards water management to broaden the mind of the inhabitants on proper water management and conservation

6 CONCLUSION

Water use for domestic purposes constitutes over half of the total water use. Inadequacy of water for consumption in Onitsha North as revealed by the result is an indication of poor planning and inefficient allocation of water services in the area. As a result of this, individuals take up the task of providing water for efficient functioning of domestic activities. This leads to deterioration of both water resources and the environment. Price, accessibility and demographic factors greatly alter availability of water for domestic purposes. Scarcity of water leads to spread of diseases, both water borne and otherwise. Government should gear effort towards providing adequate water supply services in Onitsha North, Anambra State.

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Transcriptomes of Teak (*Tectona grandis*, L.f) in Vegetative to Generative Transition Stage Development

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ABSTRACT: Teak (*Tectona grandis* L.f) is highly famous woody plant species for the quality and durability. Teak has two main problems on long reproductive cycle and produces low seeds. Both problems are basically related to mechanism of flower development. Hence, the determination of the genetic pathways and specific genes involved in teak flowering development could be beneficial for teak productivity improvement. The aim of this study was preliminary development of expressed gene database to characterize the floral transcriptome in teak. Two subtracted cDNA libraries were constructed from teak bud tissues. Libraries were sequenced using Illumina MiSeq technology which generated 3,778,316 in vegetative and 3,701,878 in generative paired-end reads sequences. The sequences were combined QC tested, trimmed, and de novo assembled conducted using CLCGenomics Workbench. The sequence reads assembled de novo into 87,365 transcript contigs consisting of 42,435,728 bases with N50 of 498bp. 64,961 (74.36%) of assembled contigs exhibited similarity BLASTN to *Arabidopsis thaliana* database. The assembled contigs were annotated through high stringency BLASTX analysis to proteome of *A. thaliana*. Distribution of contigs abundance between vegetative and generative stages analyzed using the DEGseq approach. The numbers of contigs distribution are 24,730 in vegetative, 28,912 in generative and 33,723 in transition stage. The functionally protein datasets characterized by gene ontology (GO) annotation and KEGG metabolic pathways assignments for the result of DEG analysis. This study allowed us compare the transcriptomes of vegetative and generative tissues of teak in flowering developmental stage, and identify potential biological processes involved in teak flowering developmental stage.

KEYWORDS: de novo assembly, teak flowering, NGS, DEG, Gene Ontology, EST, non model plant.

1 INTRODUCTION

Teak (*Tectona grandis*, L. f) is a tropical tree species distributed naturally in countries including India, Myanmar, Thailand, Myanmar and Indonesia ([18],[17]). Teak is one of the world's premier hardwood tree species, highly famous for its quality, profile and durability of timber. In Indonesia, teak flowering usually appears every year at the beginning of the rainy season (October-November) and only few flowers (about 1%) develop into fruits. Fruits fall gradually during the dry season ([18]). According to the fact, the main limitations of teak improvement are it has a long reproductive cycle and produces low seeds. Both problems are basically related to mechanism flower development, ([18],[19], [20]). Hence, the determination of the genetic pathways and identifying specific genes involved in teak flowering and flower development could be beneficial for teak productivity improvement. We are interested in studying more about the roles of genes that control development of flowers in teak especially during the transition period between shifts of the vegetative to reproductive phase. This study was preliminary of teak floral transcriptome characterization, before isolation and characterization of functional genes involved in flowering development pathways.

In this study, we sequenced the transcriptome of *T. grandis* using the next generation of high throughput paired-end RNA sequencing (RNA-seq) technology, Illumina MiSeq^{TM} 2000 ([7]). Then, CLC bio bioinformatics technology tool was used to

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perform a de novo assembly and annotation without prior genome information ([1]). This transcriptome database helped to reveal much about the functional genomics of *T. grandis*, and was then used to predict the functional classification of many unigenes using GO and KEGG pathway analysis ([15]). These results lay the foundation for understanding the relation between gene expression patterns and plant development, physiology and structure, and will be helpful for the molecular approach to improve of *T. grandis*. Furthermore, we focused on the sequences that are related to flowering developmental biological process in the aim of exploring the relationship between genes in transition development vegetative to generative stage.

2 METHODS

2.1 TEAK TISSUES MATERIALS AND RNA ISOLATION

Vegetative and generative stage shoot tips of teak were collected from a 12 year old teak D plant in Institute Technology Bandung, Indonesia for RNA isolation.The following D-VS tissues were sampled from vegetative apical shoots. D-LB2 tissues were sampled from lateral (nodal) floral-Buds 2nd of generative stage shoots. Both of teak tissue samples were frozen in liquid nitrogen immediately upon collection and putted in Dry Shipper for shipping from ITB-Indonesia to Pennsylvania State University (PSU)-USA. Samples were immediately frozen at -80 upon arrival at PSU until use. Total RNA was obtained using the method for RNA isolation protocol that developed by Dr. Carlson's team at Schatz Center Laboratory, PSU-USA. Frozen tissue were ground to a fine powder under liquid nitrogen, and dispersed in CTAB buffer. Following 2 chloroform extractions, RNA was precipitated with $LiCl_2$, again extracted with chloroform and precipitated with ethanol. The resulting RNA pellet was resuspended in 20-100 µl of DEPC-treated water ([3]). RNA concentration analysis on a Qubit™ fluorometer (www.invitrogen.com/qubit) to showed a total yield of RNA sample. The concentration of RNA are 555 ng/ µl and 206 ng/ µl for DVS and DLB2 sample, respectively. The integrity of RNA was assessed with the Agilent 6000 RNA Nano Chip Kit on 2100 Bioanalyzer (AgilentTechnologies).

2.2 PAIRED-END CDNA LIBRARY PREPARATION AND MISEQ ILLUMINA SEQUENCING

Total RNA of teak was extracted from the two tissues using the protocol described previously. The double-stranded cDNA was synthesized using the cDNA Synthesis System using random hexamer primers (illumina) according to manufacturer's instructions. The paired-end library was developed according to the protocol of the Paired-End sample Preparation kit (Illumina, USA) ([1], [7], [14]). The resulting library was sequenced at Penn State University using Illumina MiSeq™ 2000 (Illumina Inc., USA).

2.3 TRANSCRIPT ASSEMBLY

Two sequence data in FASTQ files computed with CLCbio for transcript assembly strategy ([1]). Paired-End reads were trimmed for quality score and the presence of repeated sequences>50 bp using the modified Mott-trimming algorithm present (default parameters) in CLCbio. We assembled de novo the Illumina-trimmed paired-end reads into transcript contigs using the software 'CLC Genomics Workbench' by setting minimum 95% identity, minimum 40% overlap, and 200 bp as minimum contig length.

2.4 CONTIG ANNOTATION

The quality of the de novo assembly was assessed with a local BLASTn (e-value< 10^{-6}) alignment of all the contigs against *Arahidopsis thaliana* and *Populus tricocharpa* (www.phytozome.com) using CLCbio workbench. Top hit species results use for homology based annotations of Teak ([2], [3]).

2.5 DEGSEQ ANALYSIS

Comparison of digitally gene expression (DEGseq) between vegetative and generative tissues was done using RNAseq analysis software test developed by CLCbio genomic work bench. DEGseq analysis was used to identify flowering development genes in transcript abundance because it integrates several statistical methods ([2], [3]). The number of reads per contig for each gene was compared between vegetative stage as control and generative tissues in teak separately. Similar analyses were performed for gene orthologs from both tissues. Orthologs were identified using a reciprocal best hit approach. RNAseq employs a random sampling model based on the read count in vegetative and generative tissues libraries

and performs a hypothesis test based on that model. Genes expression in vegetative, generative and both of them are identified and go to GO enrichment.

2.6 GO ANALYSIS

Further assessment of the quality of the de novo assembly was carried out as follows.We compared the dept hand the length of contig coverage with reference to orthologous genes in *A. thaliana*, by plotting the ratio of contig length to *A. thaliana* orthologue coding region length against coverage depth. Orthologous genes were retrieved performing a local BLASTX alignment (e-value< 10^{-6}) usingCLCbio workbench with the TAIR9 *A. thaliana* database predicted proteins (Unipro/Swissprot database). To further assess the coverage and the quality of the assembly, we used BLASTX to align the contigs to the manually curated protein database Uniprot/Swissprot using DAVID Bioinformatics Resources at http://david.abcc.ncifcrf.gov/ ([10], [11], [12]). DAVID Bioinformatics is an automated tool for the assignment of Gene ontology (GO) terms to BLAST hits, and it has been designed for use with novel sequence data ([12]), Assignment of GO terms to contigs with significant BLASTX match with swissprot (http://www.expasy.ch/sprot/) and the KEGG pathway (http://www.genome.jp/kegg/) were also performed using DAVID Bioinformatics. In addition, we generated GO assignments for *A. thaliana* annotated proteins to compare the distribution of functional annotation in Teak to those plants species with a well-characterized transcriptome, we did the GO analysis for the result of DEG analysis from vegetative stage and generative stage of teak samples.

3 RESULT

3.1 ILLUMINA SEQUENCING OUTPUT STATISTICS AND READS ASSEMBLY

T. grandis vegetative and generative cDNA library was constructed from a pool of RNA isolated from Vegetative and generative bud tissues of D teak tree using the Illumina MiSeq™ 2000 system at Penn State University. A total of 3,778,316 and 3,701,878 reads were generated from vegetative and generative teak transcriptomes respectively (Table1). The average length of the reads was 151 nucleotides (Figure1). De novo contig construction of the Illumina reads using the CLCbio assembly software led to the construction of 87,365 contigs from combined vegetative and generative teak (Table2). Those contigs having an average length of 486 nt, 225nt for minimum length and 4,361 nt for maximum length (Figure2).

Table 1. Summary statisitcs of cDNA library.

Library		
Vegetative Shoot (D-VS)	:	3,701,878 sequences in pairs
Generative Shoot (D-LB2)	:	3,778,316 sequences in pairs

Table2. Summary statisitcs of sequencing and de novo assembly results

	Value
Input sequence	3,701,878 and 3,778,316
Total bases	42,435,728
Contigs	87,365
Minimum length of contigs	225
Maximum length of contigs	4,361
Average length of contigs	486
N75	359
N50	498
N25	805

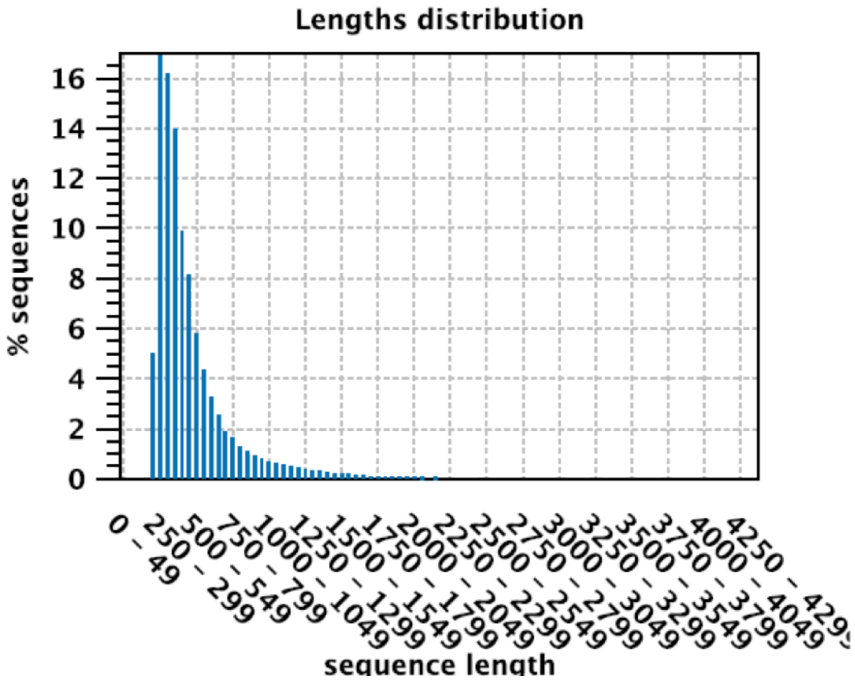


Fig. 1. Paired reads distance distribution

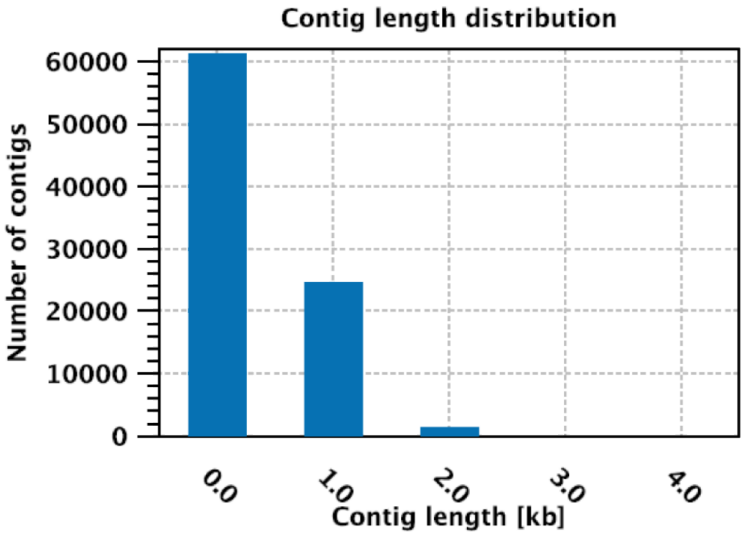


Fig. 2. Histogram of the frequency of different contigs sizes in transcriptome assemblies of Teak samples.

3.2 CONTIGS ANNOTATIONS

Collection of 87,365 contigs, enriched in vegetative to generative transition stage related transcripts, was obtained from both vegetative and generative bud subtracted libraries. Top hit species for homology based annotations of teak contigs to the model species (Table 3) were: *Arabidopsis thaliana* (74.36%) and *Populus trichocarpa* (8.56 %). *A. thaliana* was the highest blast hits model species for teak. This is a remarkable result when considering the current state of functional annotation of teak to the *A. thaliana* proteome database (www.phytozome.com).

Table 3. Number of Blast Hit Top Species for Homology Based Annotations of Teak Contigs

Species	Number of Hits	%
Arabidopsis thaliana	64,961	74.36%
Populus trichocarpa	7,479	8.56 %

3.3 TRANSCRIPTOME COMPARISON BETWEEN VEGETATIVE AND GENERATIVE TISSUES

We compared the transcriptomes from teak vegetative tissues and generative tissues to gain insight into the differences in the gene activity of the transition vegetative to generative stages in teak development. This comparison showed that the distribution of contigs in vegetative stage, generative stage and both using DEG analysis software (Figure 3).

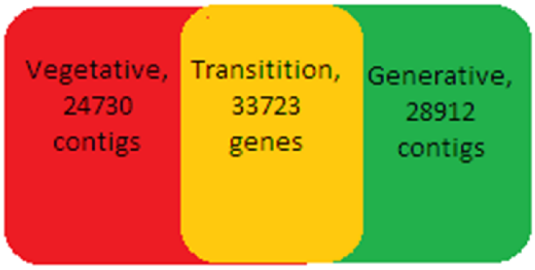


Fig. 3. Contigs Disribution Result of DEG Analysis

Detailed comparison of the gene ontology (GO) transcriptomes in vegetative stage, generative stage and transi showed the different percentage of biological processes, cellular component and molecular function (Figure 4). Figure 5 showed top 25 of biological process, cellular component and molecular function that occurred in the tissue samples. In the category of biological process, regulation of transcription (vegetative stage 0%; generative 0%; transition stage 8%), phosphorus metabolic process (vegetative stage 6.4%; generative 6.2%; transition stage 5.9 %), phosphate metabolic process (vegetative stage 6.4%; generative 6.2%; transition stage 5.9 %), phosphorylation (vegetative stage 5.9%; generative 5.8%; transition stage 5.5%), protein amino acid phosphorylation (vegetative stage 5.4%; generative 5.4%; transition stage 5.3%), response to abiotic stimulus (vegetative stage 6.1%; generative 5.3%; transition stage 5.2%), transcription (vegetative stage 0%; generative 0%; transition stage 5.2%), proteolysis (vegetative stage 4.6%; generative 0%; transition stage 4.1%) of the total, respectively. According to flowering development biological processes, there are post-embryonic development (vegetative stage 4.5%; generative 3.8%; transition stage 3.9%), reproductive developmental process (vegetative stage 4.2%; generative 3.6%; transition stage 3.6%), reproductive structure development (vegetative stage 3.8%; generative 3.3%; transition stage 3.3%) comprised part of the top ten largest proportion.

In the category of cellular components, plastid comprised (vegetative stage 15.3%; generative 13.6%; transition stage 13.9%), chloroplast was (vegetative stage 15.3%; generative 13.6%; transition stage 13.9%), and intrinsic to membrane (vegetative stage 11.6%; generative 10.8%; transition stage 11%) these three subgroups were dominant over the others. In the category molecular function, sequences with the functions of nucleotide binding, ion binding and cation binding comprised (18.4% in vegetative stage, 16.7% in generative stage and 17.1% in transition stage), (0% in vegetative stage, 14.9% in generative stage and 15.3% in transition stage) and (0% in vegetative stage, 14.8% in generative stage and 15.2% in transition stage) of the total (Table 4).

On the other hand we also identified the other biological processes of flower development. We compare the biological processes of flower development between vegetative stage, generative stage and both. In the flowering developmental biological processes, positive regulation of developmental process, positive regulation of flower development and regulation of meristem development comprised only in vegetative stage. The pollen tube development, tube development and negative regulation of flower development accounted only in generative stage (Table 5). Analysis of KEGG metabolic pathway assignments revealed that our contig catalog covers all major plant metabolic pathways, with a certain dominance of of alkaloids derived from terpenoid and polyketide, alkaloids derived from histidine and purine, alkaloids derived from shikimate pathway, terpenoids and steroids, and plant hormones biosynthesis, indicative that those pathways, seemingly paired in response to reproductive developmental process (Table 6).

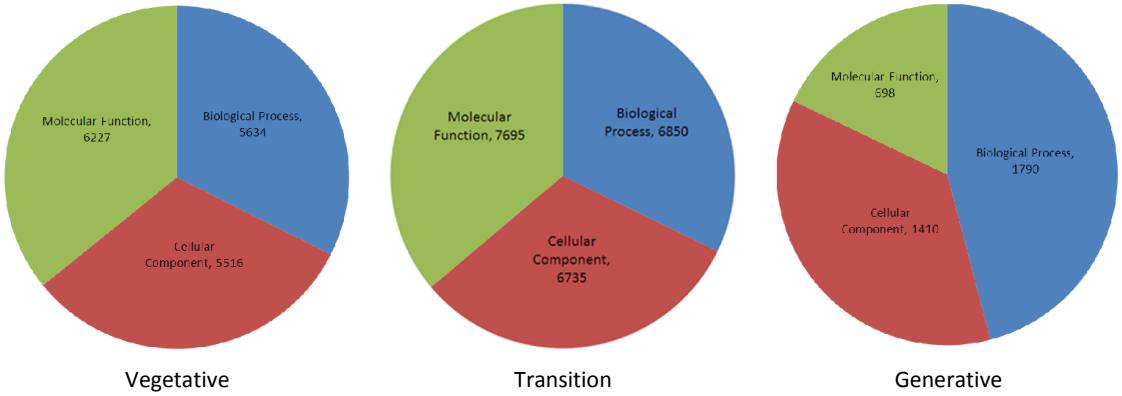
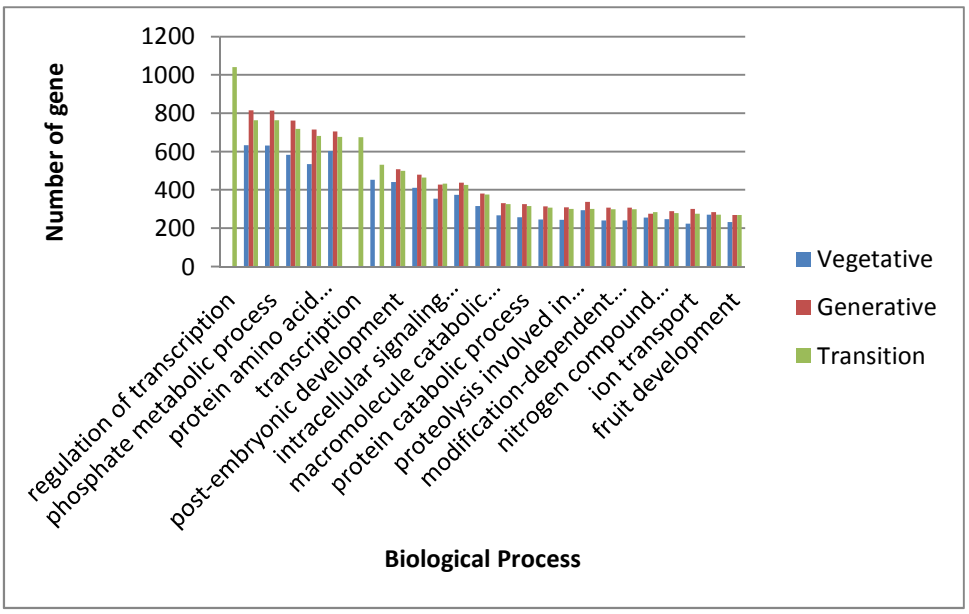
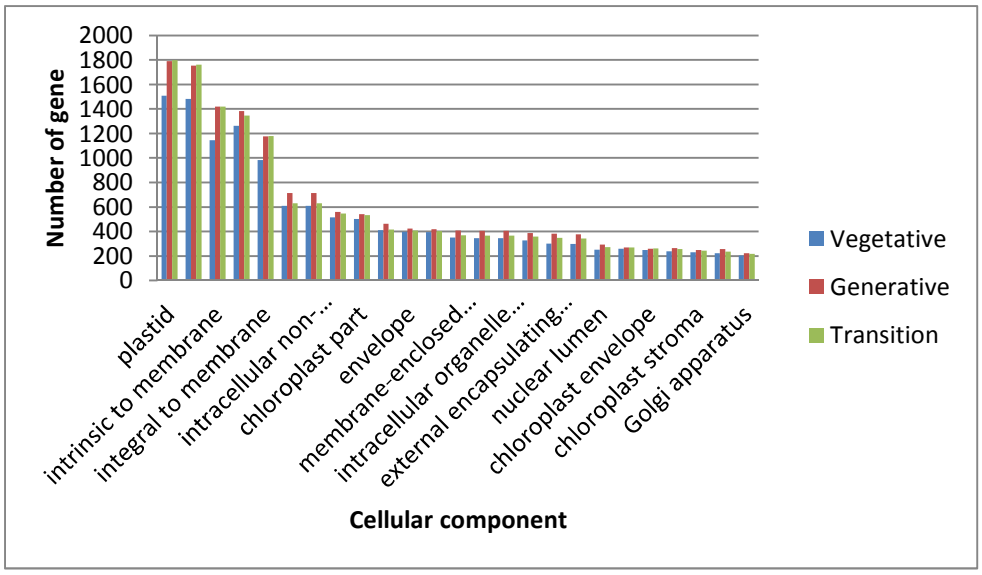


Fig. 4. Chart of GO Categories of Teak





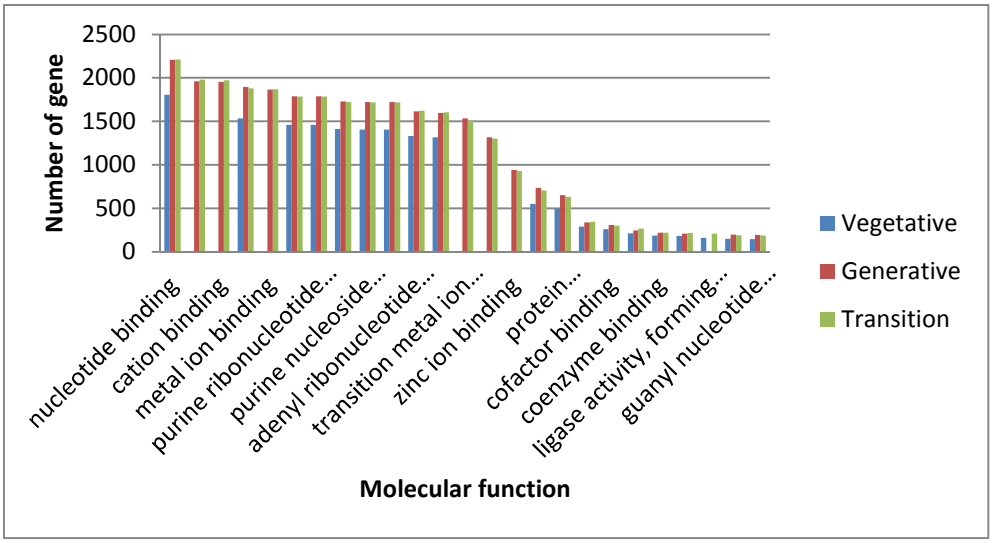


Fig. 5. Histogram of GO Classification of Teak

Table 4. GO classification of Teak

Biological Process Categories	Vegetative		Generative		Transition	
	Value	%	Value	%	Value	%
regulation of transcription	0	0	0	0	1040	8
phosphorus metabolic process	633	6.4	815	6.2	764	5.9
phosphate metabolic process	632	6.4	814	6.2	763	5.9
phosphorylation	583	5.9	761	5.8	718	5.5
protein amino acid phosphorylation	535	5.4	715	5.4	681	5.3
response to abiotic stimulus	602	6.1	704	5.3	677	5.2
transcription	0	0	0	0	674	5.2
proteolysis	452	4.6	0	0	531	4.1
post-embryonic development	440	4.5	507	3.8	499	3.9
reproductive developmental process	411	4.2	480	3.6	465	3.6
intracellular signaling cascade	354	3.6	427	3.2	433	3.3
reproductive structure development	374	3.8	437	3.3	425	3.3
macromolecule catabolic process	316	3.2	381	2.9	375	2.9
cellular macromolecule catabolic process	267	2.7	331	2.5	325	2.5
protein catabolic process	257	2.6	325	2.5	316	2.4
cellular protein catabolic process	246	2.5	313	2.4	307	2.4
proteolysis involved in cellular protein catabolic process	243	2.5	309	2.3	301	2.3
response to inorganic substance	293	3	337	2.6	300	2.3
modification-dependent protein catabolic process	240	2.4	307	2.3	298	2.3
modification-dependent macromolecule catabolic process	240	2.4	307	2.3	298	2.3
nitrogen compound biosynthetic process	256	2.6	276	2.1	284	2.2
response to radiation	247	2.5	289	2.2	279	2.2
ion transport	224	2.3	300	2.3	275	2.1
protein localization	271	2.8	283	2.1	271	2.1
fruit development	232	2.4	268	2	268	2.1
regulation of transcription	0	0	0	0	1040	8

Cellular Component Categories	Vegetative		Generative		Transition	
	Value	%	Value	%	Value	%
plastid	1508	15.3	1789	13.6	1797	13.9
chloroplast	1482	15.1	1753	13.3	1761	13.6
intrinsic to membrane	1146	11.6	1420	10.8	1420	11
plasma membrane	1263	12.8	1383	10.5	1345	10.4
integral to membrane	984	10	1176	8.9	1180	9.1
non-membrane-bounded organelle	609	6.2	713	5.4	630	4.9
intracellular non-membrane-bounded organelle	609	6.2	713	5.4	630	4.9
plastid part	516	5.2	559	4.2	548	4.2
chloroplast part	503	5.1	542	4.1	535	4.1
cytosol	411	4.2	464	3.5	415	3.2
envelope	398	4	424	3.2	408	3.2
organelle envelope	396	4	420	3.2	404	3.1
membrane-enclosed lumen	351	3.6	408	3.1	368	2.8
organelle lumen	347	3.5	406	3.1	367	2.8
intracellular organelle lumen	347	3.5	406	3.1	367	2.8
vacuole	328	3.3	387	2.9	359	2.8
external encapsulating structure	301	3.1	382	2.9	348	2.7
cell wall	298	3	378	2.9	342	2.6
nuclear lumen	253	2.6	293	2.2	272	2.1
plastid envelope	259	2.6	270	2	269	2.1
chloroplast envelope	248	2.5	259	2	261	2
plastid stroma	239	2.4	264	2	257	2
chloroplast stroma	231	2.3	250	1.9	245	1.9
endoplasmic reticulum	224	2.3	257	1.9	237	1.8
Golgi apparatus	205	2.1	224	1.7	219	1.7
Molecular Function Categories	**Vegetative**		**Generative**		**Transition**	
	Value	**%**	**Value**	**%**	**Value**	**%**
nucleotide binding	1806	18.4	2207	16.7	2210	17.1
ion binding	0	0	1961	14.9	1978	15.3
cation binding	0	0	1954	14.8	1971	15.2
purine nucleotide binding	1535	15.6	1895	14.4	1881	14.5
metal ion binding	0	0	1865	14.1	1870	14.5
ribonucleotide binding	1459	14.8	1787	13.5	1783	13.8
purine ribonucleotide binding	1459	14.8	1787	13.5	1783	13.8
nucleoside binding	1411	14.3	1728	13.1	1722	13.3
purine nucleoside binding	1406	14.3	1721	13	1716	13.3
adenyl nucleotide binding	1406	14.3	1721	13	1716	13.3
adenyl ribonucleotide binding	1333	13.5	1616	12.2	1621	12.5
ATP binding	1315	13.4	1598	12.1	1603	12.4
transition metal ion binding	0	0	1533	11.6	1503	11.6
DNA binding	0	0	1318	10	1303	10.1
zinc ion binding	0	0	940	7.1	931	7.2
protein kinase activity	552	5.6	735	5.6	704	5.4
protein serine/threonine kinase activity	499	5.1	651	4.9	632	4.9
ATPase activity	290	2.9	337	2.6	345	2.7
cofactor binding	261	2.7	308	2.3	301	2.3
ATPase activity, coupled	213	2.2	247	1.9	268	2.1

coenzyme binding	186	1.9	221	1.7	220	1.7
magnesium ion binding	182	1.8	207	1.6	214	1.7
ligase activity, forming carbon-nitrogen bonds	160	1.6	0	0	207	1.6
protein tyrosine kinase activity	148	1.5	199	1.5	190	1.5
guanyl nucleotide binding	147	1.5	192	1.5	185	1.4
guanyl ribonucleotide binding	144	1.5	189	1.4	183	1.4

Tabel 5. Biological processes of flower development

Biological processes of flower development categories	Vegetative		Generative		Transition	
	Value	%	Value	%	Value	%
post-embryonic development	440	4.5	507	3.8	499	3.9
reproductive developmental process	411	4.2	480	3.6	465	3.6
reproductive structure development	374	3.8	437	3.3	425	3.3
fruit development	232	2.4	268	2	268	2.1
seed development	221	2.2	257	1.9	257	2
embryonic development ending in seed dormancy	201	2	222	1.7	232	1.8
shoot system development	140	1.4	166	1.3	164	1.3
shoot development	139	1.4	164	1.2	162	1.3
root development	108	1.1	124	0.9	129	1
flower development	117	1.2	138	1	126	1
phyllome development	107	1.1	128	1	120	0.9
gametophyte development	99	1	0	0	115	0.9
leaf development	97	1	115	0.9	110	0.9
shoot morphogenesis	82	0.8	98	0.7	103	0.8
developmental growth	87	0.9	113	0.9	103	0.8
developmental growth involved in morphogenesis	0	0	98	0.7	88	0.7
regulation of post-embryonic development	80	0.8	91	0.7	85	0.7
ectoderm development	69	0.7	78	0.6	79	0.6
pollination	64	0.7	83	0.6	76	0.6
pollen development	73	0.7	0	0	74	0.6
embryo sac development	0	0	0	0	53	0.4
meristem development	55	0.6	62	0.5	53	0.4
post-embryonic morphogenesis	42	0.4	0	0	49	0.4
developmental cell growth	38	0.4	47	0.4	45	0.3
hair cell differentiation	34	0.3	39	0.3	38	0.3
developmental maturation	32	0.3	0	0	37	0.3
root epidermal cell differentiation	29	0.3	30	0.2	36	0.3
negative regulation of post-embryonic development	0	0	0	0	35	0.3
photomorphogenesis	29	0.3	0	0	29	0.2
pollen-pistil interaction	0	0	0	0	27	0.2
organ formation	20	0.2	24	0.2	24	0.2
meristem structural organization	25	0.3	0	0	24	0.2
pollen germination	23	0.2	23	0.2	21	0.2
meristem initiation	14	0.1	0	0	16	0.1
regulation of cell morphogenesis	14	0.1	16	0.1	16	0.1
embryonic meristem development	15	0.2	0	0	15	0.1
negative regulation of photomorphogenesis	0	0	0	0	8	0.1

Tabel 6. KEGG Pathway

KEGG Pathway Categories	Vegetative		Generative		Transition	
	Value	%	Value	%	Value	%
Histidine metabolism	0	0	0	0	12	0.1
Glycerolipid metabolism	0	0	0	0	15	0.1
Homologous recombination	0	0	0	0	20	0.2
Glycerophospholipid metabolism	0	0	0	0	23	0.2
Inositol phosphate metabolism	0	0	0	0	26	0.2
Aminoacyl-tRNA biosynthesis	37	0.4	35	0.3	33	0.3
Nucleotide excision repair	0	0	0	0	37	0.3
Pentose phosphate pathway	0	0	0	0	37	0.3
Citrate cycle (TCA cycle)	45	0.5	43	0.3	43	0.3
Endocytosis	0	0	0	0	43	0.3
Pyruvate metabolism	50	0.5	51	0.4	46	0.4
Glycolysis / Gluconeogenesis	60	0.6	67	0.5	55	0.4
Carbon fixation in photosynthetic organisms	50	0.5	52	0.4	56	0.4
Spliceosome	69	0.7	0	0	69	0.5
Biosynthesis of alkaloids derived from terpenoid and polyketide	105	1.1	110	0.8	95	0.7
Biosynthesis of alkaloids derived from histidine and purine	109	1.1	113	0.9	108	0.8
Biosynthesis of alkaloids derived from shikimate pathway	112	1.1	119	0.9	110	0.9
Biosynthesis of terpenoids and steroids	123	1.2	131	1	119	0.9
Biosynthesis of plant hormones	177	1.8	197	1.5	191	1.5

4 DISCUSSION

4.1 VEGETATIVE AND GENERATIVE STAGE OF TEAK TRANSCRIPTOME SEQUENCING AND ANNOTATION

Next generation sequencing (NGS) technology during the last decade have dramatically impacted genome sequencing and transcriptome analysis ([7], [8], [9]). This technique could be used for model plants with known genome sequences and also has been successfully used to analyze the transcriptome in non model plants ([5], [14], [15]). However, this technique requires cDNA cloning and individual RNA preparations for each sample stages, is time consuming and very costly. Pyrosequencing like 454 and illumina plat form introduced recently constitutes a better alternative for transcriptomics ([16]). The high number of reads generated per run together with the low sequencing error rate in the contigs obtained makes it a good tool to deeply sequence the transcriptome of plants. This approach has been used successfully for analyzing the transcriptomes of maize and *Arabidopsis* ([4]) and have applied it to the non-model tree species *Castanea dentata* and *C. mollissima* ([2], [3], [5])

Tectona grandis, also known as teak is a tropical deciduous tree native from moist tropical forests of Asia ([18], [13]). *T. grandis* is lamiaceae family is known for the quality of its wood ([17]). Despite its ecological and increasing economic importance, very little is known about the biology of this species at the genetic, molecular and biochemical levels ([4]). Genomic tools have recently increased the numbers and volume of genomic resources for several crop plants and trees and have contributed to enlarge our knowledge on basic aspects of plant biology; furthermore, they represent valuable sources of candidate genes and new molecular markers to assist improvement programs ([5], [6], [10]). Biological sequences reported to date in public databases and belonging to Teak do not exceed 20 entries: this very narrow availability of genetic information is the main problem to initiate improvement programs in *T. grandis*.

Our study generated 3,778,316 and 3,701,878 reads and 87,365 high quality contigs from vegetative and generative teak transcriptomes respectively. A fraction of teak contigs could be annotated using the *Arabidopsis* proteome than *Poplar* (Table2). Most of the genes in teak hits to the *Arabidopsis* proteome encoded proteins annotated. Those genes could be

homology to *Arabidopsis* using the Blast algorithm. Over 80% of the teak reads could be annotated using the *Arabidopsis* proteome. By taking into consideration the sequences that have homologies in the *Arabidopsis* proteome, assuming that the two samples of teak have a similar gene number as *Arabidopsis*. cDNA sequences generated from both teak samples cover various biological processes and molecular functions indicating that the technique constitutes a powerful tool for sequencing the transcriptome of non model species. These results confirm that pyrosequencing constitutes a powerful tool for transcriptome characterization and gene discovery.

4.2 TRANSCRIPTOME COMPARISON BETWEEN VEGETATIVE AND GENERATIVE TISSUES FROM *TECTONA GRANDIS*

Gene Ontology (GO) annotation analyses showed that, overall, vegetative and generative tissues from teak present a similar transcriptome. Gene function categories associated with response to abiotic stimuli and metabolic process are highly represented in both transcriptomes. The second most highly represented category includes genes involved in reproductive development. The category represented the most is composed of genes associated with various reproductive processes as previously described in other systems such as Gerbera, Fagopyrum and Prunus. Detailed analysis of illumine sequences from both vegetative and generative tissue showed that the tagged genes included a large number associated with response to abiotic stimuli, metabolic process and reproductive development. These include genes involved in regulation of development, meristem development, and reproductive development genes. Comparison of flowering developmental genes highly expressed in the vegetative and generative tissues of teak showed that a fraction were either preferentially expressed in vegetative or in generative stage. Genes of positive regulation of developmental process, regulation of meristem development, meristem development, shoot development, shoot system development; positive regulation of flower development, embryonic meristem development, and embryo sac development represented the functional category with the largest number of reads in vegetative stage. Genes of reproductive developmental process, reproductive structure development, regulation of flower development, flower development, gametophyte development, pollen development, pollen tube development, tube development, negative regulation of flower development, fruit development, seed development complied the largest number of reads in generative stage.

Positive regulation of developmental process, regulation of meristem development and positive regulation of flower development genes category expressed only in vegetative stage. Pollen tube development, tube development, negative regulation of flower development genes category founded only in generative stages. These different suggest that these tissues may modulate the expression of flowering development genes in transition vegetative to generative in teak. The important thing after this step is select the candidate genes involved in regulation of teak vegetative to generative transition. Overall, this study allowed us to conclude that teak tree responds to abiotic stimuli before entering to flowering developmental stage. The different category of flowering developmental processes between vegetative and generative stage showed us the regulation of transitional vegetative to generative.

5 CONCLUSION

In conclusion, this study allowed us to (i) Obtain 87,365 contigs from vegetative and generative tissue of teak, (ii) Transciptomes of teak could be annotated using the *Arabidopsis* proteome according to Blast result, (iii) Compare the transcriptomes of vegetative and generative tissues of teak in flowering developmental stage, and (iv) Identify potential biological processes involved in teak flowering developmental stage.

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