International Journal of Innovation and Applied Studies
ISSN 2028-9324 Vol. 29 No. 3 Jun. 2020, pp. 436-442

http://www.ijias.issr-journals.org/

Roasted corn flour consumption in the Abidjan district, Côte d'Ivoire

Sea Tehi Bernard[1], Rougbo N'djomon Paterne[1], Akoa Essoma Edwige Flore[1], Saki Suomion Justin[1], Soro Yadé René[1], and Kouamé Lucien Patrice[2]

[1]Department of Biochemistry, UFR Biosciences, Laboratory of Biotechnologies, Félix Houphouet-Boigny University, 22 BP 582 Abidjan 22, Côte d'Ivoire

[2]Department of food science and technology, Laboratory of Biocatalysis and Bioprocesses, Nangui-Abrogoua University, 02 BP 801 Abidjan 02, Côte d'Ivoire

ABSTRACT: A survey was undertaken in 10 communes in Abidjan district covering a total of 1500 respondents. The methodology used is a diagnosis of food consumption systems on roasted corn flour and level of consumption of roasted corn flour. The results of the survey showed that 93.37% of the surveyed population are consumers of roasted corn flour, compared to 6.13% who are non-consumers. This study identified forty-six (46) vernacular names (local names) for roasted corn flour. Concerning the frequency of consumption, 48.40% of the respondents rarely consume roasted corn flour, 37.50% of the population consumed regularly this flour and 14,10% respondents at least once a week. However, roasted corn flour is usually produced at home than bought at the market and supermarket. In addition, the consumption of roasted corn flour can be accompanied by sugar (72.0%), with peanut paste (12.4%), with red pepper and salt (5.2%), dried winged termites (4.2%), coconut flour (3.6%) and potash (2.6%).

KEYWORDS: roasted corn flour, consumption, production, type of accompaniment, self-life.

1 INTRODUCTION

Maize (*Zea mays* L.) is the most cultivated plant on the planet with a global production of 1 134 746 667 tons in 2017 [1]. It is a staple food for a large part of the population. In Côte d'Ivoire, corn is the second most widely grown cereal after rice (Oryza spp.) with 1 025 000 tons in 2017 [1]. In addition, corn has been found to be nutritionally superior to other cereals, except for its protein value [2]. In addition to satisfying the taste of consumers, corn is also a good source of vitamins, minerals and dietary fiber. According to [3], flour from corn grains is one of the most common ingredients used in culinary preparations. In its roasted form, corn flour is used in Côte d'Ivoire and especially in rural areas for the manufacture of various dishes including couscous, donuts, and cakes and tô [4]. It is used as an alternative to wheat flour because its caloric intake is similar.

In addition, it is an available food that has the potential to produce nutritious complementary foods when mixed with legumes such as soybeans and peanuts. Recent studies have been carried out by [2] to enrich roasted corn flour with crops rich in protein, minerals, phytochemicals, etc. In Côte d'Ivoire, compound flour based on roasted corn has been developed. It appears that this compound flour based on roasted corn and roasted corn flour has an interesting nutritional potential [5].

However, very little data on the scale of consumption and culinary attitudes towards flour from roasted corn grains is available in Côte d'Ivoire. It is therefore in order to contribute to a better knowledge of the consumption and forms of use of this flour that the present study was undertaken in the District of Abidjan.

Corresponding Author: Akoa Essoma Edwige Flore

2 MATERIAL AND METHODS

2.1 STUDY AREA

The Study was carried out in Abidjan metropolis, the economical capital of Côte d'Ivoire. This city is located in the south-east of the Ivorian territory on the Ebrié lagoon which meanders along the coast between longitude 4° and latitude 5.20°. The indigenous population of Abidjan consists of the Ebrié or Tchaman that belongs to the lagoon ethnic group. It is a city that offers a formidable mix of indigenous and immigrant populations with a cultural and ethnic mix [6].

2.2 CONSUMER SURVEY

A Survey was conducted from September to October 2018 among 1500 people was interviewed in the ten (10) communes of Abidjan to obtain data on roasted corn flour. These communes are respectively Marcory, Koumassi, Port-Bouet, Treichville, Plateau, Cocody, Yopougon, Attécoubé, Adjamé and Abobo. Data collection was carried out using a questionnaire proposed to each respondent to be completed with their free consent. These people were met in densely populated areas, i.e. urban transport stations, markets and school areas. This survey covered women and men from three age groups (young, adult and elderly), either literate or illiterate and of different ethnic groups. The literate had either a primary, secondary or university level. The methodology used is a diagnosis of food consumption systems on roasted corn flour. The survey questionnaire was divided into three main parts. The first part focused on the socio-demographic status of the respondent. It provided information on the respondent's gender, age, ethnic group and level of education. The second part gave the level of knowledge and consumption of roasted corn flour (consumption, vernacular name, purchase price, etc.). Finally, the third part concerned the different methods of preservation and the shelf life of roasted corn flour.

2.3 STATISTICAL ANALYSIS

A descriptive analysis of the data was performed using the SPSS v20 statistical software. This made it possible to determine the frequencies and averages of different modalities. The Chi-square test was used to determine the existence of correlations between consumption patterns and socio-demographic characteristics of surveyed population.

3 RESULTS

3.1 CONSUMPTION OF ROASTED CORN FLOUR

The results of the survey showed that roasted corn flour is a well-known foodstuff among the population of the communes visited in the Abidjan district. Moreover, for all the municipalities visited, the rate of people familiar with roasted corn flour represents 93.37% of the population interviewed compared to 6.13% representing the proportion of the population that does not know this food. The respondents were constituted by fewer men (37.67%) and more women (62.33%). In addition, it appears from this survey that all age groups were represented. The high rate of surveyed had an age range between less than 20 years old (40.67%) followed by persons between 20 and 49 years (39.87%) and finally by people aged 50 and over (19.46%). Regarding of education level, illiterate people represented 10.53% compared to 89.47% for literate people. The latter category of people included 29.47% of respondents had primary school level, 44.47% secondary school level and finally 15.53% of respondents had university level. Surveyed persons belonged to several ethnic groups namely Akan (40.67%); Krou (11.93%); Gur (9.8%); Mande (25.47%). Foreigners were also represented (12.13%). This study reveals that there are socio-demographic characteristics that have a marginal effect on respondents' attitudes towards roasted corn flour. Indeed, the level of consumption of this flour is strongly linked to sex, age, education and ethnic group at $p<0.05$ (Table 1).

Table 1. Influence of socio-demographic variables on consumption of roasted corn flour

		% Consumers	% No Consumers	Total (%)	χ^2	*P*-Value
Gender	Woman	62.2	0.13	62.33	62.215	0.000
	Man	34.8	2.87	37.67		
Age	Less than 20	38.6	2.07	40.67	24.925	0.001
	20 - 49	39.73	0.13	39.87		
	50 and over	18.67	0.8	19.46		
Education level	Illiterate	10.53	0	10.53	57.813	0.001
	Primary	27.07	2.4	29.47		
	Secondary	43.93	0.53	44.47		
	Superior	15.47	0.07	15.53		
Ethnic group	Akan	40.13	0.53	40.67	112.702	0.001
	Krou	11.13	0.8	11.93		
	Mandé	25.47	0	25.47		
	Gur	09.80	0	9.80		
	Foreigners	10.4	1.67	12.13		

If asymptotic meaning <0.05, it means that there is a correlation between the variables.

3.2 ROASTED CORN FLOUR VERNACULAR NAMES

This study identified forty-six (46) vernacular names (local names) for roasted corn flour (Table 2). These names are very different from each other, depending on the ethnic group and even within the same ethnic group. To an ethnic group, therefore, corresponds one or more vernacular names, depending on the ethnic subgroups.

Table 2. Roasted corn flour vernacular names

Group	Ethnic	Vernacular names
Akan	Abbey	Agbô môrô
	Ebrie	Mandoumle, montou, animan
	Attie	N'kpouê pou, N'kpouêmongou Aplenourouin.
	Baoule	Abble n'zouin, Able djinginwâ, Able sam'lin kinwa, kpoukpoussian,
	Aboure	Dabo
	Aïzi	Kôtoumongou
	Apolo	Able zonin
	Agni	Samlian gainwa
	Adioukrou	Kôtôtou, okômounan
	Abron	Minan
Krou	Bété	Gbôgbô
	Guéré	Kpaoupou
	Wan	Gbôgnan, Gôpon
	Wôbê	Gbohoun, Tôgbohoun
	Kroumen	Tôpou
Mande	Gouro	Gopou, Gôpouan
	Yacouba	Gbômbi, kpôbi, pkêbi yê
	Malinke	Gaba mouriani, kabamougou, kamanazô, n'gbassi, wômi,
	Gagou	kpoto pouê, kpodoundou
Gur	Senoufo	Kabamougou, mandesour, mimikala, mimêh
Foreigners	Beninese	Ewô, nifi
	Burkinabe	Chimpkemou, goula, pôla
	Fulani	Massalsavar
	Nigerian	Kalaba

3.3 FREQUENCY OF CONSUMPTION OF ROASTED CORN FLOUR

The figure 1 shows the frequency of consumption of roasted corn flour by consumers. The results reveal that 48.40% of the respondents rarely consume roasted corn flour. However, this flour is consumed by 37.50% of the population surveyed at least once a month and 14,10% of the respondents consume least once a week.

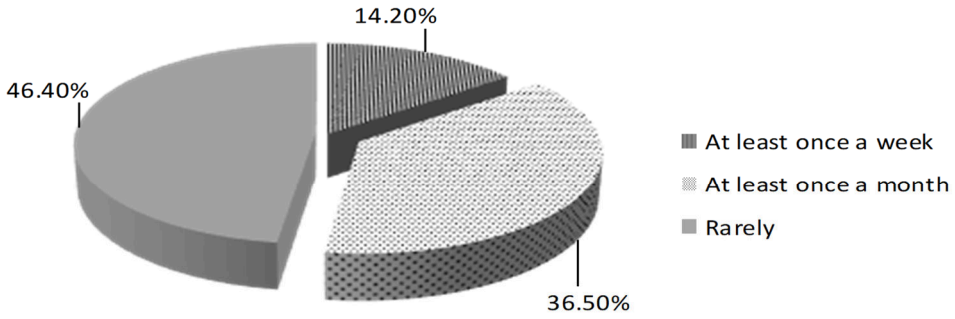

Fig. 1. Frequency of consumption of roasted corn flour

3.4 METHOD OF OBTAINING ROASTED CORN FLOUR

The different ways in which respondents obtain roasted corn flour are represented in Figure 2. Results show that there are three ways of acquiring this flour. These are the home production mode with 92.39% of respondents. While, 7.61% of people buy roasted corn flour at the market and supermarket.

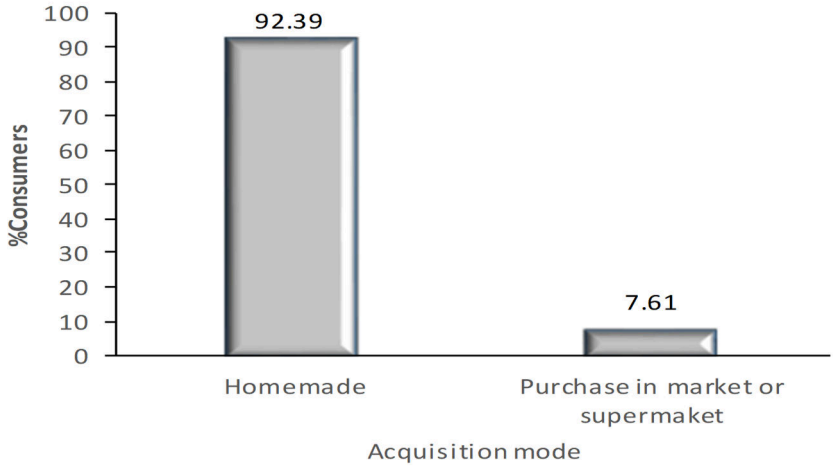

Fig. 2. Method of obtaining roasted corn flour

3.5 DIFFERENT TYPES OF ROASTED CORN FLOUR

The consumption of roasted corn flour varied from one consumer to another. Thus, among consumers, 72.0% meant that the consumption of roasted corn flour was accompanied by sugar. While, roasted corn flour mixed with coconut flour consumed by 3.6% of respondents. Small percentage of respondents (2.6%) was consumed roasted corn flour with potash. Other people (12.4%) mixed roasted corn flour with peanut paste. Some (4.2%) added dried winged termites to this flour and 5.2% of the respondents consumed roasted corn flour with red pepper and salt (Figure 3).

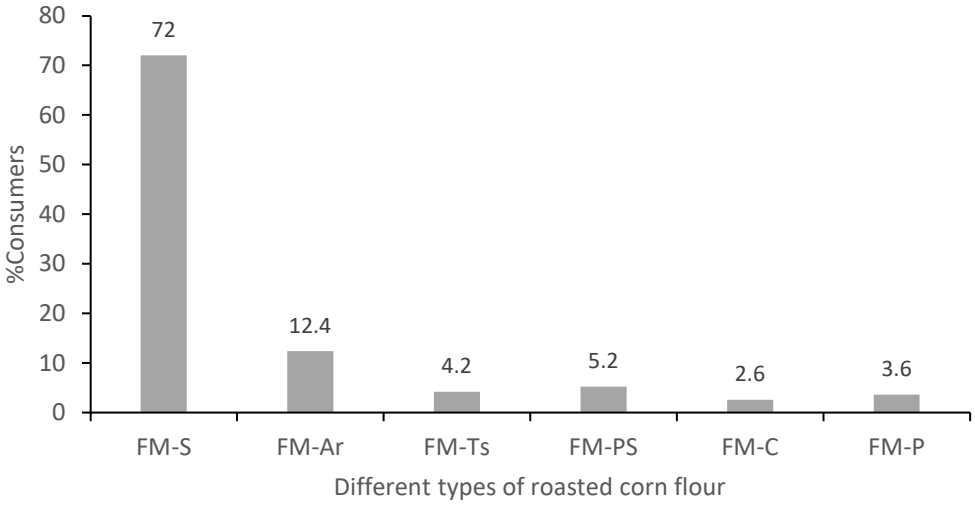

Fig. 3. Different types of roasted corn flour by consumers

FM-P: Roasted corn flour and Potash
FM-C: Roasted corn flour and Coco
FM-PS: Roasted corn flour and chili and salt
FM-Ts: Roasted corn flour and dried garlic termites
FM-Ar: Roasted corn flour and Peanut
FM-S: Roasted corn flour and sugar

3.6 ADVANTAGE OF ROASTED CORN FLOUR

Various benefits observed by consumers after the consumption of roasted corn flour were illustrated in Figure 4. It appears, after analysis, that the consumption of roasted corn flour satisfies the energy intakes (71.5%) of consumers and then nourishing and less expensive (28.5%).

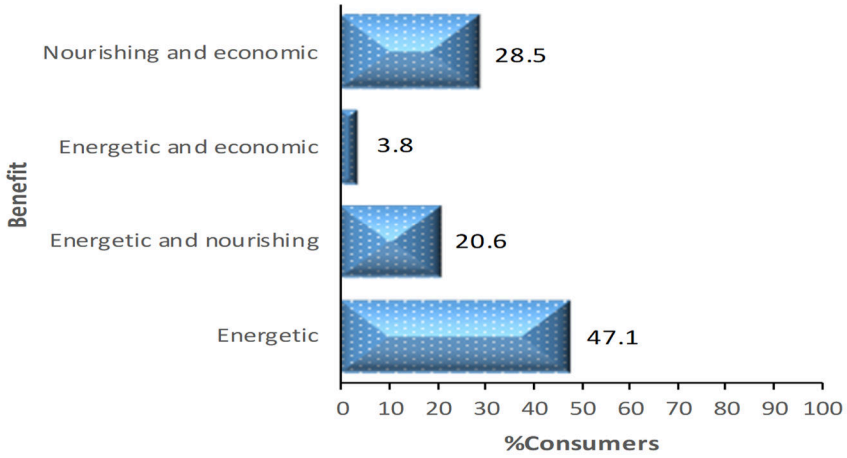

Fig. 4. Advantage of roasted corn flour according to consumers

3.7 CONSERVATION OF ROASTED CORN FLOUR

Statistical analysis has shown that duration of conservation of roasted corn flour is strongly correlated with the place of storage at $p=0.000<0.05$. Hermetically sealed jars are widely used for the preservation of roasted corn flour compared to other preservation methods and provide a shelf life of one month (Figure 5).

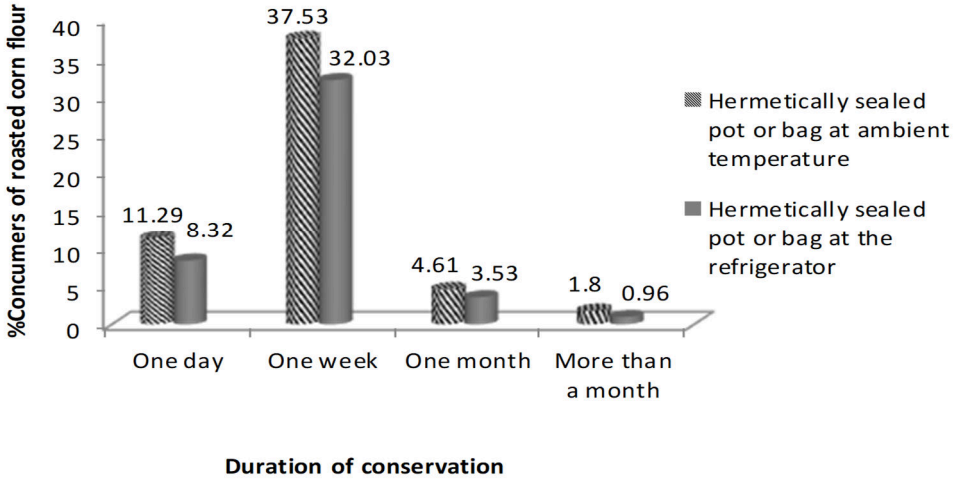

Fig. 5. Duration of conservation depending on method of preservation

4 DISCUSSION

The study of food consumption of roasted corn flour reveals that this flour is a food well known by the population of Côte d'Ivoire and by some populations in West Africa. This situation could be explained by the fact that corn is the most widely grown cereal in the world, particularly in Côte d'Ivoire, where it is the staple food of many ethnic groups [7]. During the survey, the vernacular names used by the populations are very different from one ethnic group to another and sometimes within the same ethnic group. However, the vernacular name most commonly used in local markets is "kabamougou" which comes from the Malinke group. This dominance of this name could be explained by the fact that Malinke are mainly traders and the most numerous in the various local markets. In addition, people in northern Côte d'Ivoire use maize as their main source of food and feed for poultry, pork and livestock [7], [8].

The different methods of obtaining roasted corn flour are of two kinds, namely market purchase and homemade. The most commonly used channel for obtaining roasted corn flour is "home-made" milling followed by market purchase. This type of flour is most often obtained home because of the ease of realization of this roasted corn flour and the particle size texture specific to each individual. Indeed, the corn grains, previously dried, are then roasted, crushed and sieved into sieves whose dimensions depend on the user's appreciation. This processing mechanism is the most commonly used to obtain roasted corn flour. Several consumption patterns were observed at the end of this study. Indeed, roasted corn flour can be consumed as couscous (cooked flour), tôh (flour dough cooked in water) or under porridge.

The frequency of consumption of the various dishes made from roasted corn flour is at least once a week with a high consumption in the form of couscous. We also note that roasted corn flour is consumed at any time of the year and especially during lean periods. Indeed, this is explained by the fact that maize has a short production time of 3 to 4 months in Côte d'Ivoire [7]. The benefits of consuming roasted corn flour are diverse and related to the goals that each consumer wants to achieve. This study showed that the consumer benefits of roasted corn flour are energetic, nutritious and economical (less cost). Corn flour is composed of water, carbohydrates, protein, fat and minerals [9]. The calorific value of roasted corn flour is largely due to its starch content. So, roasted corn flour is an energetic food. In addition, [3] reveal that the percentage of corn fiber is very high. High fiber content promotes a good digestibility of roasted corn flour. As a result, roasted corn flour is a good nutrient to incorporate into the diet. It should also be noted that the intake of fiber in our diet has beneficial effects on our health and these effects are largely due to the activity of the microorganisms that we host in our digestive tract [10]. In addition, the different technological treatments that corn grains undergo to obtain roasted corn flour make it easier to digest after consumption.

Several storage methods are used to store roasted corn flour, the most commonly used of which is storage in hermetically sealed jars or bag, either stored at room temperature or refrigerated. The shelf life varies from one (1) day to one (1) month. The water content of corn flour is an important condition for its proper preservation. It is approximately less than 13%. This could allow the flour to retain its qualities over a long period of time and be protected from the development of microorganisms during storage. Indeed, a water content of more than 12% in flours favors the development of microorganisms [11], [12]. The production method of this flour seems to be adequate for a good conservation.

5 CONCLUSION

This study highlighted the characteristics associated with the consumption of roasted maize flour in the district of Abidjan. In fact, roasted corn flour is a well-known food of the population studied and whose preferences, consumption, mode of acquisition and frequency of consumption strongly depend on sex, age, level of study and the ethnic group of respondents. In addition, this study revealed that this flour can be consumed with several ingredients including sugar, peanut and termites. Its life depends greatly on the material used and the place of conservation.

From a nutritional point of view, this flour deserves to be enriched by the addition of other ingredients, including legumes, to provide additional nutritional value to consumers.

REFERENCES

[1] Faostat, Données de l'alimentation et de l'agriculture. www.fao.org/faostat/fr/2019.

[2] O.A.Olugbenga, S.O. Olufunmilayo, O. Olumide and D. Modupe, Optimization of production and quality evaluation of corn-based snack supplemented with soybean and tiger-nut (*Cyperus esculenta)* flour., *Food Science and Technology*, 11p, 2016.

[3] M. Escalante, T. Hoopen and A. Maïga, Production et transformation du maïs., *collection pro-agro.* 32 p, 2012.

[4] R. Ndjouenkeu, C.M. Mbofung and F.X. Etoa, Etude comparative de quelques techniques de transformation du maïs en farine dans l'Adamaoua., AUPELF-UREF, edition *Libbey Eurotext,* Paris, France, pp 179-186, 1989.

[5] N.P. Rougbo, N.J. Kouadio, T.B. Sea and L.P. Kouame, Nutritional assessment of precooked flour formulated from corn (*Zea Mays*), Soybean (*Glycine Max*) and Groundnut (*Arachis Hypogaea*) flours consumed in Côte D'Ivoire. *European Journal of Food Science and Technology.*, 6(4), 1-10, 2018.

[6] A.B. Boutin and J.K. N'Guessan, Abidjan, une métropole de plus en plus francophone., 14 p, 2002.

[7] L. Akanvou, R. Akanvou, K. Anguété and L. Diarrassouba, Bien cultiver le maïs en Côte d'Ivoire. Direction des programmes de recherche et de l'appui au développement - Direction des innovations et des systèmes d'information., Centre national de recherche agronomique (CNRA), Côte d'Ivoire, 4 p, 2006.

[8] D. Soro, K. Ayolié, F.G.B. Zro, F.Y. Yéboua, H.K.-K. Kouadio, S. Bakayoko, P.T. Angui and J.Y. Kouadio, Impact of organic fertilization on corn (*zea mays* L.) production in a ferralitic soil of centre-west côte d'ivoire., *Journal of Experimental Biology and Agricultural Sciences*, 3(6), 556-565, 2015.

[9] E.O. Cuevas-Rodrıguez, N.M. Verdugo-Montoyaa, P.I. Angulo-Bejaranob, J. Milan-Carrilloa, R. Mora-Escobedoc, L.A. Bello-Pèrezd, J.A. Garzon-Tiznadoe and C. Reyes-Moreno, Nutritional properties of tempeh flour from quality protein corn (Zea mays L.)., *Food Science and Technology*, 1072–1079, 2006.

[10] P. Mosoni, Dégradation des fibres alimentaires par le microbiote colique de l'Homme., *Innovations Agronomiques*, 36, 83-96, 2014.

[11] M. Ahmed, M.S. Akter, J.C. Lee and J.B. Eun, Encapsulation by spray drying of bioactive components, physicochemical and morphological properties from purple sweet potato., LWT - *Food Science and Technology*, 43, 1307-1312, 2010.

[12] M.V. Van-Hal, Quality of sweet potato flour during processing and storage., *Journal of Food Reviews Inter*, 16, 1-37, 2000.