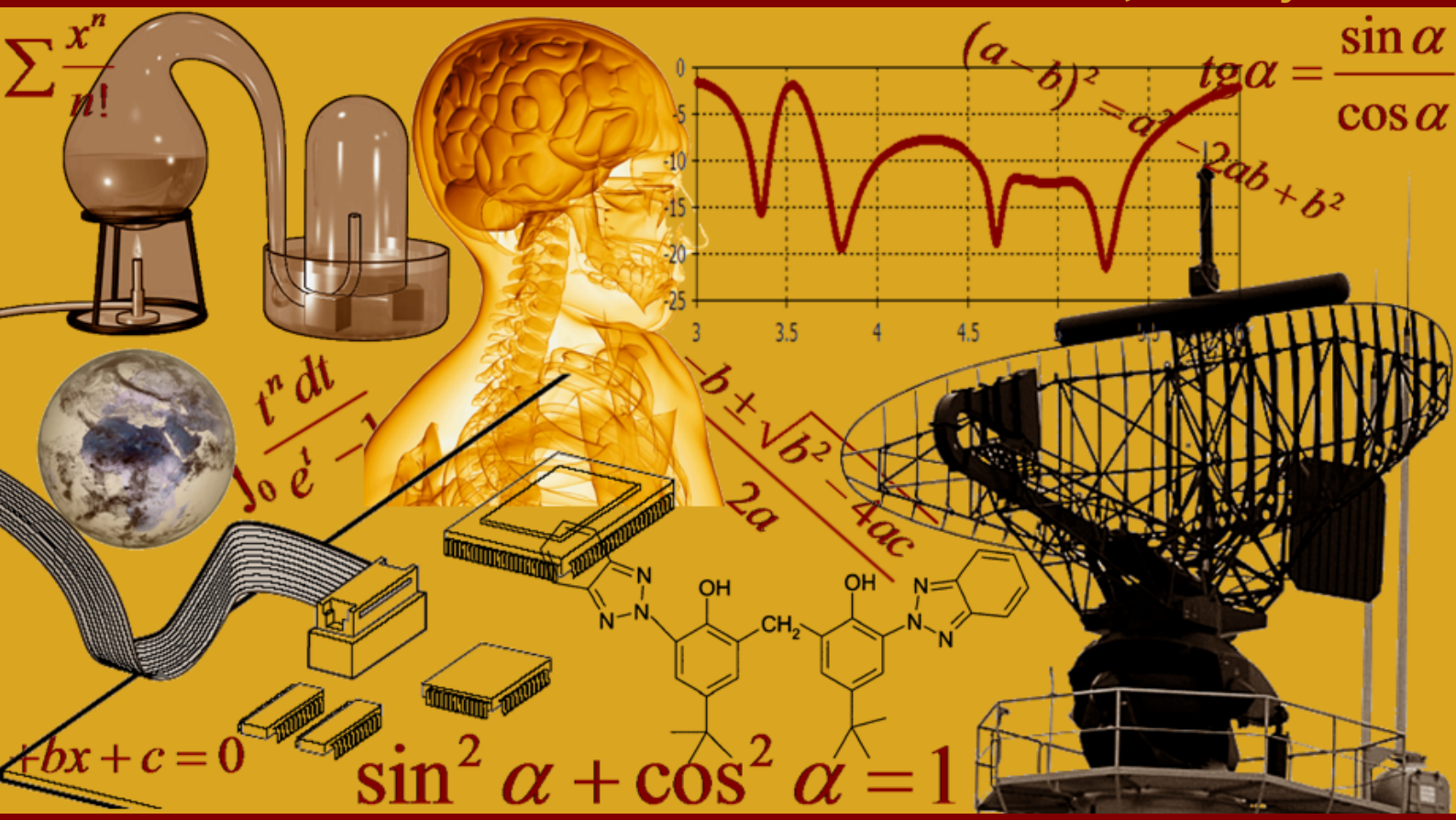
ISSN: 2351-8014 Impact Factor: 3.109

INTERNATIONAL JOURNAL OF INNOVATION AND SCIENTIFIC RESEARCH

Vol. 34 N. 2 January 2018



International Peer Reviewed Monthly Journal

Innovative Space of Scientific Research Journals
http://www.issr-journals.org/

International Journal of Innovation and Scientific Reseach

International Journal of Innovation and Scientific Research (ISSN: 2351-8014) is an open access, specialized, peer-reviewed, and interdisciplinary journal that focuses on research, development and application within the fields of innovation, engineering, science and technology. Published four times per year in English, French, Spanish and Arabic, it tries to give its contribution for enhancement of research studies.

All research articles, review articles, short communications and technical notes are sent for blind peer review, with a very fast and without delay review procedure (within approximately two weeks of submission) thanks to the joint efforts of Editorial Board and Advisory Board. The acceptance rate of the journal is 75%.

Contributions must be original, not previously or simultaneously published elsewhere. Accepted papers are available freely with online full-text content upon receiving the final versions, and will be indexed at major academic databases.

Table of Contents

International Journal of Innovation and Scientific Research
ISSN 2351-8014 Vol. 34 No. 2 Jan. 2018, pp. 70-78

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

SCREENING PHYTOCHIMIQUE ET EVALUATION DE L'ACTIVITE ANTI-DIARRHEIQUE DES EXTRAITS AQUEUX ET ETHANOLIQUES DE *Leucas Martinisensis* : UNE PLANTE MEDICINALE DU BUSH

BYUMANINE NTABAZA J. Roger[1], KWIBE MAYUNGA Daniel[2], BWAMI MUSOMBWA MWATY[3], FLESI NSHOBOLE M. Therese[4], and KAISHUSHA MBONI DANIEL[5]

[1]Assistant, 2e Mandat, Institut Supérieur des Techniques Médicales (ISTM/UVIRA) ET ISTCE BUKAVU-UVIRA, RD Congo

[2]Assistant, 2e Mandat, Institut Supérieur des Techniques Médicales (ISTM/UVIRA), RD Congo

[3]Assistant, 2e Mandat, Université Simon Kimbangu, USK/Bukavu, Chef de Bureau à l'ISTM/BUKAVU ET ISTCE BUKAVU-UVIRA, RD Congo

[4]Assistant, 1e Mandat, Laboratoire d'Entomologie Médicale, CRSN /LWIRO, RD Congo

[5]Université Catholique de Bukavu, RD Congo

ABSTRACT: This scientific publishing consisted by phytochemical screening and evaluation of anti-diarrheic effect of aqueous and ethanol extract of *Leucas Martinisensis*, a medicinal plant of Bushi (*Laureaceae*). The process consisted by qualitative chemical analysis of natural substances contained in this plant and biological activities test of their aqueous and ethanol extract on bacterial stumps of E. Coli; V. Cholerae; Sh. Flexineri and Salmonella polyvalento. Obtained results showed that among of founded substances this these plants extracts some of them were efficient on bacterial studs and others not. Some of these extracts were efficient as are some witness and diarrheic drugs. This justifies the using of *Leucas Martinisensis* plant in traditional treatment of diarrhea.

KEYWORDS: Phytochemical screening, Activity test, Anti-diarrheic, Extracts, Leucas Martinisensis.

RÉSUMÉ: Ce travail scientifique consistait à réaliser un screening phytochimique et évaluer l'activité anti-diarrhéique des extraits aqueux et éthanoliques de la plante *Leucas Martinisensis* : une plante médicinale du Bushi.
Pour y parvenir, nous avons effectué une analyse chimique qualitative des substances naturelles contenues dans cette plante. Certaines de ces substances se révèlent efficaces sur les souches des bactéries : E. Coli ; V. Cholerae ; Salmonella polyvalento et Shigella Flexineri après leur test d'activité au même titre que médicaments témoins utilisés dans le traitement de la diarrhée. Ce qui justifie l'utilisation de la plante *Leucas Martinisensis* dans le traitement traditionnel de la diarrhée au Bushi.

MOTS-CLEFS: Screening phytochimique, Test d'activité, Anti-diarrhéique, Extraits, Leucas Martinisensis.

Corresponding Author: BYUMANINE NTABAZA J. Roger

1 INTRODUCTION

1.1 PROBLÉMATIQUE

La diarrhée est l'évacuation fréquente des selles liquides, molles de début brutal et dépassant 300 gr/24h (UNESCO/OMS in SAVOIR SAUVER, 2000) ; on la retrouve généralement dans la plupart des maladies infectieuses aigues, aggravées le plus souvent par le climat (LAROUSSE MEDICAL, 2006), la diarrhée décime les populations des pays en développement (SCHORDERET, 1998).

Fig. 1. Leucas Martinisensis (Laureaceae): Kanyamafundwe (Shi)
Leucas Martinisensis : Kanyamafundwe (Shi)

Dans la quasi-totalité de ces pays, les diarrhéiques et les infections respiratoire constituent la première et la deuxième cause de mortalité chez les enfants de moins de 5 ans. Ensemble, elles sont responsables de 1600 décès d'enfant par jour selon les statistiques mondiales (ANONYME, 2000).

En 1993 par exemple, les statistiques mondiales des maladies diarrhéiques font état d'environ 3.000 décès chez les enfants (UNICEF SD). Les enquêtes MICS, 2013 en RDC révèle que, sur un total de 9549 enfant de moins de 5 ans enregistrés, 2.122 enfants ont été identifiés comme ayant fait la diarrhée au cours de 15 jours précédent l'enquête (UNICEF, 2013). Soit 22,4 % de cas de diarrhée. Au Nord-Kivu, le cas de diarrhée ayant été recensé dans les institutions de santé sont respectivement de 135 sur une moyenne annuelle de 250 cas, soit 54 % des cas et au Sud-Kivu sur une moyenne de 230 cas, 169 cas de diarrhée ont été recensés soit 73 % des cas (UNICEF, 2013).

Les cas de dysenterie ayant été évalué à 3.873 sur un total de 5.331 cas soit 72,6 % au Sud-Kivu et 4.213 autres cas sur un total de 8.626 cas, soit 48,8% au Sud-Kivu en 2011 (UNICEF, 2013). Entre 2007 et 2013, une moyenne des cas de diarrhée était révélé à 1407 cas sur un total de 1.936 cas soit 72,6 % au Sud-Kivu et 1.410 cas au Nord-Kivu (UNICEF, 2013).

Entre 2007 et 2013, une moyenne de cas de diarrhée était relevée à 1.407 cas sur un total de 1.936 cas soit un pourcentage de 72,6 au Sud-Kivu et 1.410 des cas sur un total de 2.010 cas soit 70 % des cas au Nord-Kivu. (UNICEF, 2013)

Les causes des diarrhées sont multiples. Elles sont souvent d'origine infectieuse et, en règle générale, bénigne dans les pays développés en l'absence d'immunodépression.

1.1.1 LES CAUSES BACTÉRIENNES

Deux mécanismes sont à distinguer :

a) Diarrhées sécrétoires : causées par des Escherichia coli enteropathogène ou par des E. Coli enterotoxigène provoquant une hypersécrétion hydro-électrolytique au niveau du grêle.

b) Les diarrhées invasives : causées par des nombreux germes tels que : salmonella spp (toute espèce) ; E. Coli (entero-invensifs, enterohemoragique ;

- Les shigella : responsable de certains cas de diarrhée des voyageurs.
- Les vibriocholeriques : induisant une maladie pandémique à l'origine d'épidémies sporadiques.

Ces bactéries se localisent plutôt dans le colon et dans le grêle terminal induisant une diarrhée glaro-sanglante.

1.1.2 LES CAUSES VIRALES

Les entérites virales induisant une diarrhée hydro-électrolytique, des nausées, vomissements, douleurs abdominales un syndrome pseudo-grippal, syndrome méningé (Alain et als : SD)

1.1.3 LES CAUSES PARASITAIRES

Les protozoaires et les helminthiases en sont responsables. Les germes incriminés sont : antamoebahistolyticus et giardraintestinalis (NAVEAU S. ; S.D).

1.1.4 LES CAUSES MÉDICAMENTEUSES

Des nombreux médicaments peuvent entrainer des troubles digestifs à type de diarrhée. Ces troubles sont peu violant et cèdent à l'arrêt du médicament.

Malgré des mesures de lutte, les maladies diarrhéiques persistent au sein des populations et font beaucoup de décès chaque année. Durant ces 15 dernières années, les recherches ont été entreprises dans le but de découvrir des nouveaux agents antimicrobiens, plus précisément des antibiotiques, antiparasitaires, quinolones et fluoroquinolones (ANONYME, 2000).

Il apparait de plus en plus évident que les plantes peuvent constituer une source des produits nouveaux moins onéreux surtout aux populations en développement et efficace contre la diarrhée (BASHWIRA, 1996).

La plante *Leucas Martinisensis* a attiré l'attention de nombreux chercheurs de différents domaines. A titre d'exemple nous citons : le domaine des stimulants et antispasmodiques (KARHARO, 1995, HANS & M'PIA, 1996).

Il a été découvert *Leucas Martinisensis* est utile dans le traitement de la fièvre, de la toux, des inflammations, rhumatisme, parasite intestinale, paludisme. (HUTCHIGS, 1986, NEWINGER, 2000)

Une l'interview accordée aux populations du Bushi a relevé que la plante *Leucas Martinisensis* possède des vertus thérapeutiques dans le traitement des diarrhées, la toux, etc.

Ce qui a attiré notre attention pour orienter le présent article dans la recherche des substances responsables de l'activité anti-diarrhéique d'origine bactérienne par le choix des méthodes appropriées aux laboratoires du CRSN/LWIRO car elle serait l'une des plantes à valoriser dans le domaine de phytochimiothérapie.

Le présent article intitulé « ***SCREENING PHYTOCHIMIQUE & EVALUATION DE L'EFFET ANTI-DIARRHEIQUE DES EXTRAITS AQUEUX & ETHANOLIQUES DE Leucas Matinisensis***» a été conçu dans le domaine de phytochimie pour l'analyse de l'efficacité de cette plante dans le traitement traditionnel de la diarrhée, en vue de contribuer l'épanouissement de la découverte des nouveaux produits moins onéreux contre les maladies diarrhéiques. Ceux-ci nous poussent à nous poser les questions suivantes :

- Quels sont les principes actifs contenus dans la plante *Leucas Martinisensis* ?
- Existe-il parmi ces principes actifs ceux qui sont responsables de l'activité anti diarrhéique ?

1.2 HYPOTHÈSE

La plante *Leucas Martinisensis* contiendrait des métabolites secondaires de quelle nature ?

Les extraits aqueux et organiques de la plante *Leucas Martinisensis* posséderaient-ils des principes actifs doués d'une activité anti-diarrhéique ?

1.3 OBJECTIFS

Pour justifier nos hypothèses, nous nous sommes assigné les objectifs suivants par réalisation des expériences au laboratoire de phytochimie du CRSN/LWIRO:

- Faire un screening phytochimique en vue de déceler la nature des principes actifs se trouvant dans la plante *Leucas Martinisensis*.
- Effectuer un test d'activités biologiques de ces extraits de la plante *Leucas Martinisensis* sur les souches de V. Cholerae, S. Polyvalento, Sh. Frexineri et E.Coli, souches responsables de la diarrhée bactérienne.

1.4 INTÉRÊT DU SUJET

Contribuer à la valorisation de la médecine naturelle pour réduire l'impact négatif des médicaments de synthèse.

2 MATERIELS ET METHODES

2.1 MATÉRIELS

- Des tubes à essai : pour réaliser le screening phytochimique
- Deux béchers pour réaliser la macération
- Une lampe à alcool pour désinfecter la pince
- Une pincette pour tenir les disques antibiogrammes.
- Une latte graduée pour mesurer le diamètre de la zone d'inhibition
- Les disques antibiogrammes
- Des pipettes graduées

2.2 MÉTHODES

RÉCOLTE DES PLANTES ET PRÉPARATION DES ÉCHANTILLONS

Récolte de la plante *Leucas Martinisensis*: dans les champs environnant le CRSN/LWIRO.

- Broyage des feuilles crues
- Réaliser la macération de la manière suivante
  - Peser 40g de feuilles broyées et les dissoudre dans 400ml d'eau distillée pour réaliser un extrait aqueux. Laisser reposer pendant 24 heures.
  - Filtrer le mélange pour obtenir un filtrat limpide
  - Procéder de la même manière pour réaliser un extrait alcoolique éthanolique

1. *Screening phytochimique*

Le screening phytochimique est l'ensemble des techniques et des méthodes de détection des substances naturelles dans la plante. Son résultat peut aboutir à la formation d'un précipité, d'une floculation d'une turbidité ou une opacité (MBUYI, 1988 in BASHWIRA 1996).

2. Recherche des alcaloïdes (Expériences effectuées au labo de phyto- chimie du CRSN/LWIRO, juillet 2016)

Les alcaloïdes sont des substances azotées d'origine végétale présentant un caractère basique. Elles constituent avec les hétérosides la majorité des principes actifs des plantes médicinales.

Leur importance tient d'une part à leur toxicité vis-à-vis de certaines souches microbiennes. Ils sont rencontrés dans des nombreux végétaux et rarement dans les champignons.

Détections

Les alcaloïdes sont détectés sur base des réactions de coloration et/ou de précipitation avec les réactifs généraux tels que le réactif de BOUCHARDAT, de MEYER DRAGENDORF, de WAGNER.

Mode opératoire

- Prélever 3ml de chaque extrait de la plante dans quatre tubes à essai c'est-à-dire deux pour chaque extrait
- Ajouter 1ml de réactif de WAGNER (2g d'I_2 dans l'eau distillée) dans deux tubes d'extraits différents et 1ml de réactif de MEYER (1,3g de HgCl et 60ml)
- Ramener à 100ml avec de l'eau distillée dans deux autres tubes à essai d'extraits différents.
- Laisser la solution se reposer pendant 10min :
  - Avec le réactif de WAGNER : précipité bleu (+++) ; précipité rouge (++) ; précipité noir (+)
  - Avec le réactif de MEYER précipité blanc jaunâtre
  - Avec le réactif de BOUCHARDAT précipité brun

3. Recherche des saponosides (réalisée au laboratoire de phytochimie du CRSN/LWIRO en juillet 2016)

Les saponosides sont des hétérosides stéroïdiques ou triterpeniques dont la solution aqueuse possède des propriétés tensio-actives et afrogènes (pouvoir moussant)

Du point de vue pharmacologique, ils sont hémolytiques et très toxiques aux animaux à sang froid (serpent, reptiles…) on le localise surtout dans les racines de la plante.

Détection

En présence des réactifs appropriés tel que H_2S0_4 concentré et $K_2Cr_2O_7$, les saponosides donnent une coloration vert-sale, violette ou rouge (++).

Les saponosides sont aussi détectés par agitation de leurs solutions aqueuses (BASHWIRA et KAHINDO, 1996).

Mode opératoire

- Macérer pendant 24 heures 5g de poudre dans 500 ml d'eau distillée et évaporer à sec ;
- Récupérer les résidus avec 10 ml d'eau distillée ;
- Prélever dans 2 tubes à essai 30 ml de cette solution et agiter pendant une minute et laisser reposer pendant 30 minutes ;
- Mesurer la hauteur de la mousse persistante qui témoigne la présence des sapanosides.

4. Recherche des glycosides (réalisée au labo de phyto-chimie au CRSN / LWIRO, en juillet 2016)

Définition

Appelés encore hétérosides, les glycosides sont des molécules organiques comportant une partie mono ou poly-osidique et une partie non osidique appelée genine ou aglycone.

La partie non osidique conditionne l'activité pharmacologique des glycosides (GUIGNARD et al 1988).

En présence du HCl et/ou H_2SO_4, les glycosides s'hydrolysent pour libérer la genine (alcool, phénol, stéroïde, flavonoïde, …).

Les glycosides peuvent être des dérivés quinoniques, chloroglyciques, cyanogeniques, indoliques, cholamiques, cardiotoniques, anthracéniques, isosulfocyanogenique, ou même coumariniques.

Les glyco-alcaloides sont rattachés au groupe des glycosides cardiotoniques (stéroidiques)

Détection

En présence de réactifs appropriés, les solutions aqueuses glycosidique donnent des colorations particulières

Mode opératoire

- Prélever 3ml de chaque extrait dans deux tubes à assai chacun.
- Y ajouter 1ml de liqueur de Fehling acidulée sous HCl 1%
- Refaire la manipulation avec de l'acide sulfurique 84%
- Des colorations particulières (rouges briques ou rouges brun) sont perceptibles.

5. Recherche des flavonoïdes (expérience réalisée au Labo de phyto-chimie au CRSN/LWIRO en juillet 2016)

Les flavonoïdes sont généralement des hétérosides solubles dans l'eau en général et dans l'alcool éthylique. Ils sont insolubles dans l'éther, chloroforme et benzène.

Détection

En présence de H_2SO_4 1N, l'extrait contenant les flavonoïdes donne des colorations caractéristiques aux chromanes (composant des pigments des plantes), flavones, flavonol, et aux chalcones.

En présence de KOH, N_aOH, l'extrait aqueux donne des colorations profondes.

Mode opératoire

- Prélever 3ml de chaque extrait aqueux dans deux tubes à essai
- Y ajouter 1ml de KOH et dans l'autre 1ml de N_aOH
- L'apparition des colorations profondes témoigne la présence des flavonoïdes.

6. Recherche des stéroïdes (expérience réalisée au Labo de phyto-chimie au CRSN/LWIRO en juillet 2016)

Définition

Les stéroïdes ou stérols sont des groupes cristallisés alcooliques en noyau tétra-cyclique, perhydrocyclophenanthrène et dérivés des fractions insaponisables des plantes et des animaux.

Les stéroïdes végétaux sont des phytostérols.

Détection

En présence de l'acide acétique et l'acide sulfurique concentré, un extrait organique éthéré ou chloroformique contenant des stéroïdes donne une coloration mauve ou verte.

Mode opératoire

- Prendre 10g de feuilles pillées, le macérer dans 30ml de chloroforme pendant 24 heures.
- Après macération chauffer à plus au moins 96°C refroidir puis évaporer le solvant.
- Reprendre le résidu dans 30ml d'anhydride acétique.
- De ce résidu obtenu, prélever 3ml auxquels on ajoute le réactif de LIEBERMAN-BURCHARD (solution d'anhydride acétique et d'acide sulfurique)
- L'apparition d'une coloration mauve verte témoigne la présence des stéroïdes.

7. Recherche des quinones (expérience réalisée au Labo de phyto-chimie au CRSN/LWIRO, en juillet 2016)

Définition

Les quinones sont des dioxo-derivés des systèmes dihydro-aromatiques.

Elles dérivent chimiquement de six systèmes : Benzène, Naphtalène, Anthracène, Phénanthrène, Acénaphtène et Chrysène

Détection

En présence des alcalis (NH_4OH, N_aOH, KOH) les quinones donnent des colorations caractéristiques selon le type de composés quinoniques présents

Mode opératoire

A un extrait benzénique, ajouter 5ml de N_a OH 1%

Après filtration et agitation il apparait une coloration rouge-rosâtre

8. Recherche des tanins (réalisée au Labo de phyto-chimie au CRSN/LWIRO en juillet 2016)

Définition

Les tanins sont des polyholosides présents chez les plantes chlorophylliennes (feuilles, écorces fruits et sur toutes les galles) qui jouent un grand rôle dans la production vis-à-vis des phytophages.

Détection

En présence de F_eCl_3 1% ou HCl 1N, les extraits aqueux taniques donnent des colorations bleues (+++) bleu-vert (++) ; bleu sombre (+)

Mode opératoire

- A 3ml d'un extrait aqueux, ajouter 1ml de $F_e Cl_3$ 1% ou HCl 1N
- Prélever 3ml de la solution testée, y ajouter 1ml du réactif de STIANSY (formol 40% + HCl 1N en portion 2 : 1) puis chauffer au bain-marie
- Il apparait un précipité bleu-noir attestant la présence des tanins

9. Test d'activité antibactérienne (expérience réalisée au Labo de microbiologie au CRSN/LWIRO, août 2016)

Définition

Un test d'activité antibactérienne est une méthode très pratiquée en thérapie consistant à déterminer dans une gamme de médicaments témoins, celui qui est plus efficace pour un agent causal bien déterminé (BALAGIZI, 2001).

Souche bactérienne

Les souches bactériennes de salmonella polyvalento, shigella flexneri et vibriocholerae et escherichia coli ont été identifiées, serotypés puis isolées au laboratoire de microbiologie du Centre de Recherche en Sciences Naturelles (CRSN) de LWIRO à Katana/Sud-Kivu / RD-Congo.

Milieu de culture

- Plusieurs milieux de culture ont été utilisés pour arriver à isoler les souches bactériennes
- Pendant les tests, ces souches ont été gardées dans leur milieu de transport
- L'eau peptonnée et la gélose nutritive ont été respectivement utilisées pour la préculture et l'étalement de ces souches bactériennes. Elles ont été ensuite coulées dans les boites de pétri.

Préparation des dilutions

Les disques de 4mm de diamètre étaient découpées dans les papiers filtres puis déposés dans une boite de pétri puis stérilisées au four-Pasteur

Ils étaient ensuite trempés dans les solutions des extraits de la plante *Leucas Martinisensis* pendant 24 heures. Ces extraits ont été dilués à différentes concentrations dont la dilution 1 ; 10 ; 100 et dilution 1000. Ces disques ont été antiseptiquement déposées à plat sur les boites de pétri contenant des souches microbiennes. Le dépouillement a eu lieu 24 heures après.

Mesure de la sensibilité

La présence ou l'absence d'une zone d'inhibition renseigne sur l'activité biologique (activité antibactérienne) du médicament vis-à-vis du genre de microbe.

Le diamètre de la zone d'inhibition était mesuré au moyen d'une latte graduée.

3 RESULTATS ET DISCUSSION

3.1 SCREENING PHYTOCHIMIQUE

Le screening phytochimique réalisé sur la plante *Leucas Martinisensis* a donné les résultats présents dans le tableau suivant :

Tableau 1. Résultat du screening phyto-chimique de Leucas Martinisensis

Principe actif	***Présence ou absence***
Alcaloïdes	++
Flavonoïdes	+++
Stéroïdes	+
Tannins	-
Glucosides	+++
Saponosides	+
Quinones	-

Source : Tableau fait par nous sur base d'expériences au Labo de Phytochimie du CRSN/LWIRO en juillet 2016

Légende

+++ *= forte proportion en principes actifs*
++ *= moyenne proportion en principes actifs*
+ *= faible proportion en principes actifs*
= absence d'un principe actif

Il s'avère que la plante *Leucas Martinisensis* contient 71,4 % des substances recherchées mais à des proportions diverses.

3.2 RÉSULTAT DU TEST ANTIBACTÉRIEN

Tableau 2 : Test antibactérien

	Extrait et médicament témoins	**Concentration en mg/ml**	**Diamètre de zone d'inhibition (en mm)**			
			S. polyv.	***Sh. flexineri***	***E. colis***	***Cholerae***
Leucas Martinisensis	Extraits aqueux	2,455	11	6	7	6
		0,2455	7	-	6	-
		0,02455	7	-	-	-
	Extrait ethanolique	4,75	12	-	-	-
		0,475	6	6	-	-
		0,0475	-	-	-	-
Médicament témoins	Negramme®	0,015	13	34	13	20
	Chloramphenicole	0,015	-	-	-	10
	Tétracycline	0,015	11	-	-	-
	Ciprofloxacin	0,015	-	34	-	-

Source : Tableau fait par nous sur base d'expériences réalisées au Laboratoire de microbiologie de CRSN/LWIRO en août 2016.

Du tableau ci-dessus, il ressort que les extraits de *Leucas Martinisensis* sont différemment efficaces sur des souches des bactéries à des doses différentes.

4 DISCUSSION

Des tableaux ci-dessus nous tirons les conclusions suivantes :

- La plante *Leucas Martinisensis* contient une forte proportion des flavonoïdes et des glycosides, une proportion moyenne d'alcaloïdes, et une faible proportion en stéroïdes et saponosides.
- Elle ne contient pas les quinones et des tannins. La présence des glucosides, des stéroïdes et des flavonoïdes justifierait l'activité anti-diarrhéique de la plante *Leucas Martinisensis.*
- Son extrait aqueux est efficace sur toutes les souches bactériennes à forte concentration (2,455mg/ml) ; mais aussi efficace sur Salmonella polyvalento à toutes les dilutions.
- L'extrait éthanolique de la plante *Leucas Martinisensis* est aussi efficace sur :

- Salmonella polyvalento mais à forte et moyenne concentration. Mais plus la dilution des extraits augmente plus son efficacité diminue et même devient nulle. Cependant, les extraits aqueux de cette plante paraissent plus efficaces sur les souches bactriennes que les extraits éthanoliques.

5 CONCLUSION

Le présent travail intitulé : « **SCREENING PHYTOCHIMIQUE ET EVALUATION DE L'ACTIVITE ANTIDIARRHEIQUE DES EXTRAITS DE *Leucas Martinisensis*** » avait comme objectifs :

Réaliser un screening phytochimique des extraits de *Leucas Martinisensis* pour déceler les principes actifs contenus dans cette plante.

Effectuer un test d'activité antibactérienne sur les souches bactériennes de : V. Cholerae ; E. Coli ; S.polyvalento et Sh. Flexineri des bactéries responsables des maladies diarrhéiques. Après expérimentation aux laboratoires du CRSN / LWIRO, nous avons abouti aux conclusions suivantes :

La plante *Leucas Martinisensis* contient des principes actifs recherchés à des concentrations différentes.

La *plante Leucas Martinisensis* est efficace sur toutes les souches bactériennes à des concentrations élevées.

Les extraits aqueux de *Leucas Martinisensis* sont efficaces sur toutes les souches bactériennes à toutes les concentrations et au même titre que les médicaments témoins utilisés dans les traitements modernes des maladies diarrhéiques. Les extraits aqueux et éthanoliques *Leucas Martinisensis* sont beaucoup plus efficaces sur S.polyvalento que sur d'autres souches ; tandis que les extraits aqueux de cette plante sont très efficaces sur toutes les souches et à diverses dilutions.

L'activité pharmacologique de la plante *Leucas Martinisensis* de type anti-diarrhéique est vérifiée et prouvée par la présence des stéroïdes, des glucosides et des flavonoïdes.

Il conviendrait donc d'étudier sa toxicovigilance en vue de bien élucider la posologie de ce médicament.

REFERENCES

[1] BASHWIRA S. et KAHINDO M., 1996 ; Screening phytochimique et évaluation de l'effet des extraits aqueux de quelques plantes médicinales sur E. Coli, Sh. Flexineri et Sh dysanteriae type I in cahier de CERUKI n°27 pp 4-10.
[2] BROSSART H. et TERRY O., 1992 ; Bactériologie systématique T. I. C. R.D.P, Lyon.
[3] BYAMUNGU N. et KAHINDO M., 1996 ; Evaluation de l'activité biologique des extraits de quelques plantes médicinales de la région des grands Lacs sur les agents des maladies entériques et membres de la flore intestinale in cahier de CERUKI n°27 pp 12-23
[4] BYAMUNGU L., (SD) ; plantes médicinales du Kivu, notes inédites CRSN/LWIRO (KABARE)
[5] KERHARO J., 1974 : Pharmacopée traditionnelle sénégalaise Ed. Vugo-Frère
[6] Martin HIRT H., 1996 ; La Médecine naturelle tropicale, 4° éd. Kwango-Zaïre, 59p.
[7] SCHORDERET M. et al, 1998 ; Pharmacologie : Des concepts fondamentaux aux applications thérapeutiques. 3ème éd. FRISSON ROCHE Paris, 1010 pages.
[8] SOFOWORA A., 1996 ; plantes médicinales et médecine traditionnelle d'Afrique, Ed. Karlatha 371 pages.

International Journal of Innovation and Scientific Research
ISSN 2351-8014 Vol. 34 No. 2 Jan. 2018, pp. 79-82

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

Neurofibroma of the breast revealing a Von Recklingenhausen disease: a case report

Rezgani Mona[1], Adouni Olfa[2], Hadiji Achref[1], Bettaieb Ilhem[2], Goucha Ahlem[2], Ben Abdallah Fakher[2], Jaidane Olfa[1], Ghalleb Montassar[1], Bouzaiène Hatem[1], Rahal Khaled[1], Ben Hassouna Jamel[1], and Gamoudi Amor[2]

[1]Service de chirurgie carcinologique, Institut Salah Azaiz, Faculté de médecine de Tunis, Université Tunis El Manar, Tunisia

[2]Service d'anatomie pathologique, Institut Salah Azaiz, Faculté de médecine de Tunis, Université Tunis El Manar, Tunisia

ABSTRACT: Neurofibromatosis type 1 is a genetic disease characterized by changes in skin pigmentation and the growth of tumors along nerves in the skin, brain, and other parts of the body. Neurofibromas are the most common benign tumours of Neurofibromatosis type 1 developing at any point along a nerve with a neuro-cutanous tropism. This genetic affection is an autosomal dominant disorder with complete penetrance and an important phenotypic variability. Disease manifestations occur at the childhood mostly before five years. Nevertheless, many de novo cases remain undiagnosed well into adult life. Neurofibroma that occur in the breast and constitute a revealing signs of the disease at adulthood are extremely rare.
We report a case of a 30-year-old woman presenting a neurofibroma of the breast revealing Neurofibromatosis type 1.

KEYWORDS: Neurofibroma, breast, Von Recklingenhausen.

1 INTRODUCTION

Neurofibromatosis type 1 (NF1), also known as Von Recklingenhausen disease, is one of the most common genetic diseases in humans, affecting one case in 3,000 births. (A) (1). It's a multisystem disease but with a neuro-cutaneous tropism. This affection is characterized by changes in skin pigmentation (café-au-lait spots, skin fold freckling and Lisch nodules) and the growth of tumors along nerves in the skin, brain, and other parts of the body. Neurofibromas, which are the most common benign tumours of NF1, develop at any point along a nerve. Their presence of in the skin is more common than the deeper soft tissues. This autosomal dominant disorder with complete penetrance is characterized by an important phenotypic variability. Therefore we noted many clinical forms of benign to severe. Desease manifestations occur at the childhood mostly before five years. Nevertheless, many de novo cases remain undiagnosed well into adult life. Neurofibroma that occur in the breast and constitute a revealing signs of the disease at adulthood are extremely rare(2).

We report a case of a 3O-year-old woman presenting a neurofibroma of the breast revealing NF1.

2 CASE REPORT

This is a case of a 30-year-old woman with no medical history. She presented with a left breast lump evolving for a year.

The clinical examination revealed multiple café-au-lait spots and a left breast tumour measuring 3 cm in the upper-outer quadrant. The mass was well limited and mobile. No other signs were found.

The ultrasound (US) demonstrated a 3 cm well-defined, hypoechoic solid mass suggesting fibroadenoma. The mammography was performed and showed the well defined mass. The patient had a lumpectomy.

Histopathologic examination of the mass showed benign tumour structure nonencapsulated but well circumscribed (Fig. 1), measuring 3cm composed of interlacing bundles of elongated cells with wavy nuclei in the breast tissue areas constituted of lobuli (Fig. 2). Several small nerves fibres were also present. The tumour cells were set in a fibromyxoid backround (Fig. 3).

Corresponding Author: Rezgani Mona

Mast cells were present. Mitotic activity was low. Immunohistochemical examination revealed that tumor cells were S100 protein positive. Actine and CD 34 were negative. The diagnosis of neurofibroma was made on the basis of the histopathological and immunohistochemical findings.

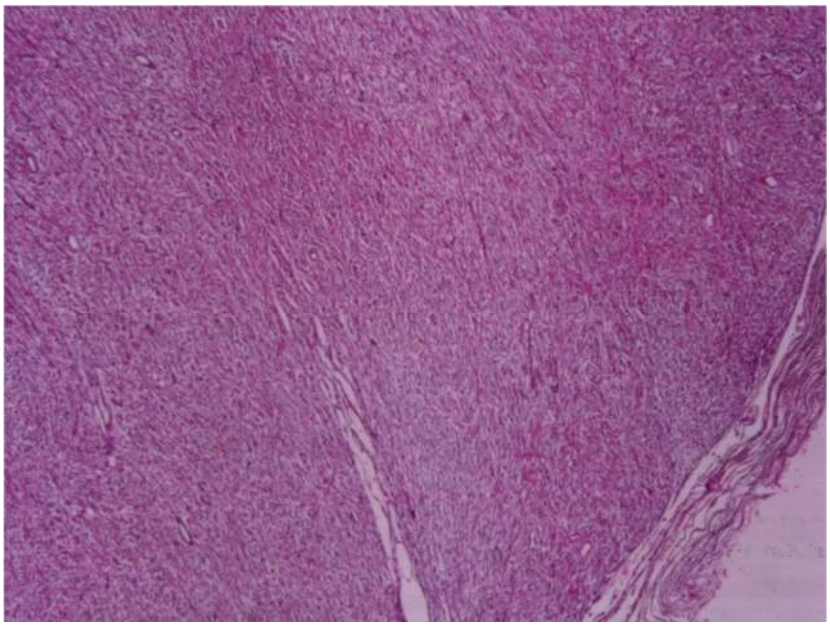


Fig. 1. Benign tumor non-encapsulated but well circumscribed

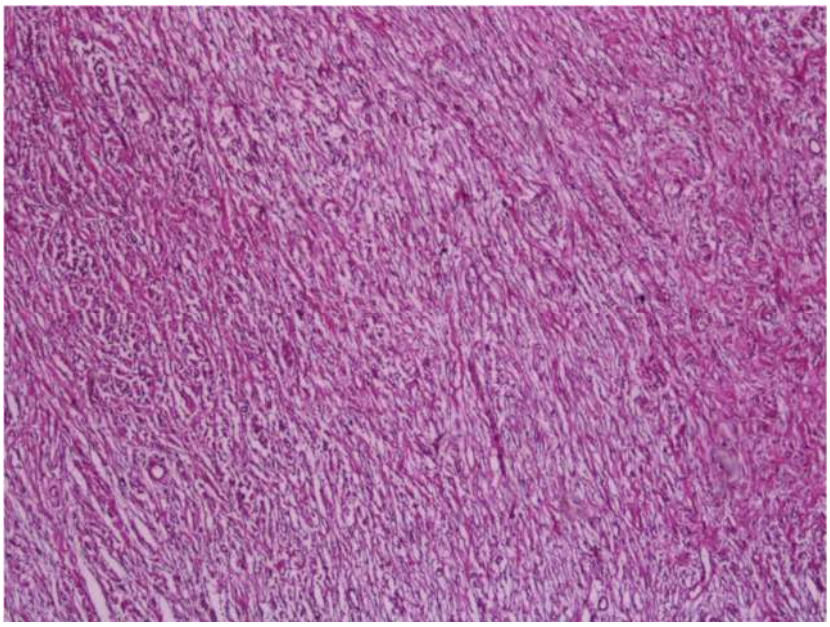


Fig. 2. Tumour composed of interlacing bundles of elongated cells

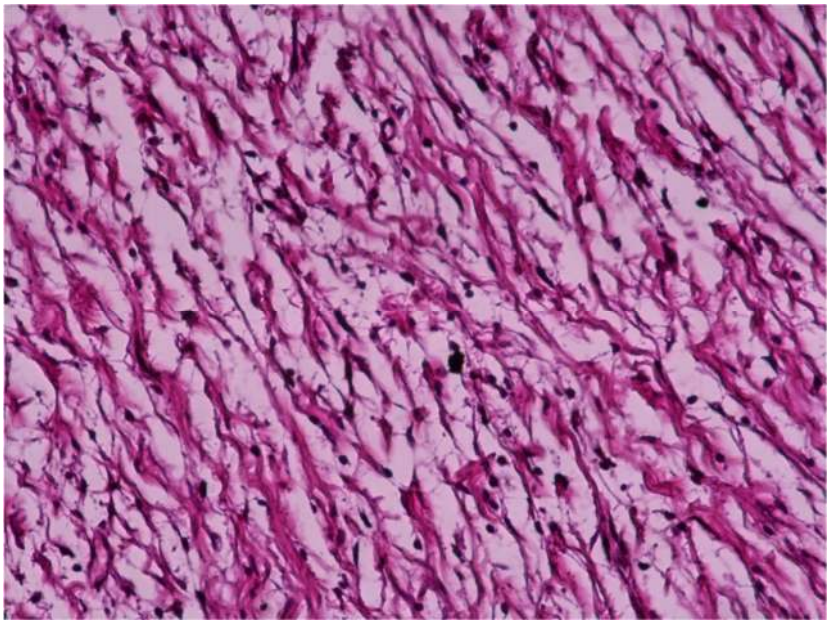


Fig. 3. Tumour cells, with wavy nuclei, were set in a fibromyxoid backround

3 DISCUSSION

Neurofibromas are common benign tumours of the skin. They are nonencapsulated tumours of the nerve sheath of peripheral nerves and usually occur in groups.(3)

They were first described by Smith in 1849 and later by Von Recklingenhausen in 1882. Because of the latter's major contribution, the syndrome of multiple neurofibromatosis bears his name.

The NF1 gene is located on chromosome 17 in the 17q11.2 region. Penetrance close to 100% at the age of five and de novo mutations account for about half of cases.(1)

Diagnostic criteria for NF1 are: six or more café-au-lait spots, two or more neurofibromas or one or more plexiform neurofibromas, freckling in the axilla or groins, optic glioma, two or more Lisch nodules, sphenoid wing dysplasia or thinning of a long bone cortex with or without pseudoarthrosis, and a first-degree relative who meets the above criteria for NF1. Two or more of the criteria are required for diagnosis. (4) In our case, the presence of multiples café-au-lait and a breast neurofibroma made the diagnosis of NF1.

Neurofibromas are the most common benign tumours of NF1.They are characteristically distributed over the trunk, head and neck area. Occurring in the breast is very rare, and in such cases they are most common in the areolar area(5). In our case it was the palpable mass that motivated the consultation and permitted to reveal the disease. In male patient, gynecomastia may be observed.(2)

Radiologically, neurofibromas usually appear as oval or round lesions with circumscribed margins on both mammography and US. On US, they appear as hypoechoic lesions with posterior acoustic enhancement, resembling a cyst, which may cause misdiagnosis.(6)

In our case, the mass was thought to be a fibroadenoma, that's way our patient didn't have further examination beside US.

On magnetic resonance imaging (MRI), they demonstrate high signal intensity on T2-weighted images, especially if the tumour has a myxoid matrix. They may demonstrate either non- enhancement or gradual enhancement after contrast material injection.(6)

Macroscopically, neurofibromas are typically white-grey, well circumscribed and not encapsulated tumours. They vary in size and shape but most range between 1 and 2 cm. However, a huge 20cm neurofibroma of the breast has also been reported. Their diagnosis ultimately depends on histological standard examination.(2)

They are distinct from schwannomas or neurilemomas, which are also tumours of the peripheral nerve sheaths. They contain interlacing bundles of elongated cells with wavy, dark staining nuclei and slender cytoplasmic processes. These cells are arranged closely and are separated by small amounts of mucous material.

The primary differential diagnosis for this tumour is a neurilemoma. However, fibroadenoma, phyllodes tumour, malignant peripheral nerve sheath tumour and myofibroblastoma should all be considered.

Some cancers are regularly observed during NF1 such as pheochromocytoma, neurofibrosarcoma, myelogenous leukaemia, optic glioma, malignant Schwannoma and rhabdomyosarcoma(7). Few cases of breast cancer with neurofibromatosis have been reported. The first report of an association between NF1 and breast cancer was published in 1972.(8)(9)

Neurofibromas rarely grow rapidly; such growth can suggest malignant transformation. The incidence of sarcomatous changes of neurofibromas varies from 2% to 16% (10).

Treatment of breast neurofibromas is carried out through surgical excision. However, despite a complete resection, recurrences are frequent. The risk of malignant transformation of these neurofibromas is estimated between 2 and 29% according to Enzinger(5). That's why a complement of excision (in a case of incomplete surgery) and long-term surveillance are imperatives.

4 CONCLUSION

Neurofibromas occurring in the breast are very rare. However, these must be taken into account since they can be revealing signs of the disease. Imagery certainly has an important diagnosis role. MRI remains the favourite diagnosis means to highlight neurofibromas in the breast and to detect a possible malignant transformation. Diagnosis is based on the standard histological and immunohistochemical study especially in atypical forms.

REFERENCES

[1] Pinson S, Wolkenstein P. La neurofibromatose 1 (NF1) ou maladie de Von Recklinghausen. Rev Med Interne. 2005;26(3):196–215.

[2] El Ounani F, Alami D, Dafiri R. Gynaecomastia revealing neurofibromatosis type 1 in a young child. Eur J Radiol Extra. 2009;69(3):2008–10.

[3] Sherman JE, Smith JW. Neurofibromas of the breast and nipple-areolar area. Ann Plast Surg. 1981 Oct;7(4):302–7.

[4] Murat A, Kansiz F, Kabakus N, Kazez A, Ozercan R. Neurofibroma of the breast in a boy with neurofibromatosis type 1. Clin Imaging. 2004;28(6):415–7.

[5] Lamalmi N, Benkiran L, Gamra L, Regragui A, Amrani M, Belabbas M. Neurofibrome géant du sein révélateur d'une maladie de Von Recklinghausen : À propos d'un cas. Rev Française des Lab. 2002;2002(347):71–3.

[6] Lee H, Kim HJ, Yang B, Lee SM, Jeong JY. Neurofibroma of the Breast Detected on Positron Emission Tomography-CT in a Patient with Neurofibromatosis Type 1 : A Case Report 제1형 신경섬유종증 환자에서 양전자방출단층촬영으로 발견된 유방의 신경섬유종 : 증례 보고. 2016;74(2):128–31.

[7] Seminog OO, Goldacre MJ. Risk of benign tumours of nervous system, and of malignant neoplasms, in people with neurofibromatosis: population-based record-linkage study. Br J Cancer. Nature Publishing Group; 2013;108(1):193–8.

[8] Brasfield RD, Das Gupta TK. Von Recklinghausen's disease: a clinicopathological study. Ann Surg. 1972 Jan;175(1):86–104.

[9] Da Silva AV, Rodrigues FR, Pureza M, Lopes VGS, Cunha KS. Breast cancer and neurofibromatosis type 1: a diagnostic challenge in patients with a high number of neurofibromas. BMC Cancer. BioMed Central; 2015 Mar 26;15:183.

[10] Millman SL, Mercado CL. An unusual presentation of neurofibromatosis of the breast. Breast J. 10(1):45–7.

International Journal of Innovation and Scientific Research
ISSN 2351-8014 Vol. 34 No. 2 Jan. 2018, pp. 83-95

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

Effet du niveau de protéine alimentaire sur les caractéristiques chimiques de la viande de cobaye (*Cavia porcellus* L.) à l'Ouest Cameroun

[Effect of the level of dietary proteins on the chemical characteristics of Guinea Pig meat (*Cavia porcellus* L.) in the Western Highland of Cameroon]

Zougou Tovignon Gilbert[1-2], Tendonkeng Fernand[1], Miégoué Emile[1], Noumbissi Marie Noël Bertine[1], Mboko Arsène Valery[2], Matumuini Ndzani Essie Férence[2], Mweugang Ngouopo Nathalie[1], Lemoufouet Jules[1], Boukila Benoit[2], and Pamo Tedonkeng Etienne[1]

[1]Institut National Supérieur d'Agronomie et de Biotechnologies (INSAB),
Université des Sciences et Techniques de Masuku, Franceville, Gabon

[2]Laboratoire de Nutrition Animale, Département des Productions Animales,
FASA, Université de Dschang, B.P. 222 Dschang, Cameroon

ABSTRACT: In the light of evaluating the chemical characteristics of Cavis meat, 54 animals of age 3 weeks, partitioned in 3 groups of 18 animals each (9 males and 9 females)**,** were monitored individually up to 8 weeks of age and subsequently used for the exercise. Each group received a ration containing 14%, 16% or 18% of crude protein (CP). After 12 hours of fasting/starving, all the animals were slaughtered and muscles (loin, shoulder and thigh) were obtained. The lipid content of the loin of Cavis placed on the ration containing 16% CP (1.75%FM) was comparable ($p>0.05$) to that of animals that consumed diet containing 14% and 18%CP, respectively 2.50% FM and 1.68% FM. The lipid content of the shoulder muscle from Cavis placed on 16% and 18%CP in their rations were statistically comparable ($p>0.05$), respectively 2.50% FM and 3.44% FM, but significantly ($p<0.05$) higher than those placed on 14%CP diet (1.00%FM). Apart from the water content which presents no significant difference ($p>0.05$) between the different muscle parts, that of lipids, proteins and ash of the thigh muscles were significantly ($p<0.05$) higher than that of the shoulder and loin muscles. The calcium content of the thigh of Cavis placed on a diet of 18% CP was comparable ($p>0.05$) to that of animals placed on a diet containing 14% and 16% CP. The sodium content of the loin of cavis placed on a ration containing 14% CP was comparable ($p>0.05$) to that of animals fed with rations containing 16% and 18% CP. The potassium content of the thigh of Cavis placed on a diet of 16% and 18% CP was comparable ($p>0.05$) but significantly ($p<0.05$) lower than that of Cavis fed diet containing 14% CP. The Zinc content of the loin, thigh and shoulder of the animals of batch RC1 (14%CP) and RC2 (16%CP) were statistically comparable ($p>0.05$) but significantly ($p<0.05$) lower than those of batch RC3 (18%CP). Apart from contents in Mg and Zn which do not present any significant difference ($p>0.05$) between the different parts of the muscle, the Ca, Na, K and Fe proportions of the thigh muscle were significantly ($p>0.05$) higher than those of the shoulder and loin muscles.

KEYWORDS*:* Guinea pig, alimentary protein, meat, chemical characteristics, west-Cameroon.

RÉSUMÉ: En vue d'évaluer les caractéristiques chimiques de la viande de cobaye, 54 animaux âgés de 3 semaines, repartis en 3 lots de 18 animaux (9 mâles et 9 femelles) chacun, ont été conduits individuellement jusqu'à 8 semaines d'âge et utilisés à cet effet. Chaque lot recevait une ration contenant 14%, 16% ou 18% de protéines brutes (PB). Après un jeune de 12 h, tous les animaux étaient abattus et les muscles (longe, épaule, cuisse) ont été obtenus. La teneur en lipides de la longe des cobayes soumis à la ration de 16% de PB (1,75% MF) était comparable ($p>0,05$) à celles des animaux consommant les régimes de 14% et 18% de PB, respectivement 2,50% MF et 1,68% MF. Les teneurs en lipides de l'épaule des cobayes ayant 16% et 18% de PB dans leurs rations ont été statistiquement comparables ($p>0,05$), respectivement 2,50% MF et 3,44% MF, mais

Corresponding Author: Pamo Tedonkeng Etienne

significativement ($p<0,05$) plus élevées que celle de ceux dosant 14% de PB dans leur régime (1,00% MF). En dehors de la teneur en eau qui ne présente aucune différence significative ($p>0,05$) entre les différentes parties du muscle, celles en lipides, en protéines et en cendres du muscle de la cuisse ont été significativement ($p<0,05$) plus élevées que celles des muscles de l'épaule et de la longe. La teneur en calcium de la cuisse des cobayes recevant 18% de PB dans leur ration était comparable ($p>0,05$) à celles des animaux soumis aux régimes contenant 14% et 16% de PB. La teneur en sodium de la longe des cobayes soumis à la ration contenant 14% de PB était comparable ($p>0,05$) à celles des animaux nourris à l'aide des aliments contenant 16% et 18% de PB. Les teneurs en potassium de la cuisse des animaux alimentés avec les rations contenant 16% et 18% de PB ont été comparables ($p>0,05$) mais significativement ($p<0,05$) plus faibles que celle des cobayes nourris à l'aide de l'aliment dosant 14% de PB. Les teneurs en zinc de la longe, la cuisse et l'épaule des animaux des lots RC1 (14%PB) et RC2 (16%PB) ont été statistiquement comparables ($p>0,05$) mais significativement ($p<0,05$) plus faible que celle des cobayes du lot RC3 (18%PB). En dehors des teneurs en Mg et en Zn qui ne présentent pas de différence significative ($p>0,05$) entre les différentes parties du muscle, les proportions en Ca, Na, K et Fe du muscle de la cuisse ont été significativement ($p<0,05$) plus élevées que celles des muscles de l'épaule et de la longe.

MOTS-CLEFS: Cobaye, protéines alimentaires, viande, caractéristiques chimiques, Ouest-Cameroun.

1 INTRODUCTION

The population explosion observed these recent years in developing countries in general and Cameroon in particular, has brought about food insufficiency among other things [1]. The rising demand in animal proteins exposes the local population to protein-energy malnutrition [2]. This type of malnutrition is responsible for the death of about 3.5 million children per year in Sub-Saharan Africa [3]. It is therefore absolutely necessary to find solutions rapidly in order to curb this increase. As such, the identification of supplementary protein sources and a particular interest for nutritional quality of canned products which seems indispensable. [4] and [5] underlines that caviaculture is one of the long term solutions to nutritional needs in general and proteins in particular. Otherwise, the importance given to the rearing of Cavis rests, among others on its speed of growth, lean meat and high protein content [6]. Despite the efforts of the Cameroon Government, the World Bank and FAO in this domain [7], more is left to be done [8]. In fact, the rearing of Cavis is practiced in an extensive system [9]. All of these practices put together do not permit the animal to express its genetic ability. In animal husbandry in general, and in Caviaculture in particular, feeding plays an important facultative role [10; 11 ; 6]. A feed containing the optimum quantities of protein will ameliorate the production performances of Cavis (Guinea Pig) [12; 13 ; 14], having as proposition the amelioration of the nutritional values (water, proteins, lipids and minerals) of Cavis meat [15]. Therefore, the objective of this study is to evaluate the impact of the level of dietary proteins on the chemical composition of Cavis meat.

2 MATERIALS AND METHODS

This study was carried out between April 2015 and February 2016 at the Research and Application Farm ('FAR' in French), at the soil science and at the animal nutrition and feeding laboratories of the Faculty of Agronomy and Agricultural Sciences ('FASA' in French) of the University of Dschang (Uds). Dschang is situated in the highlands of the West Region of Cameroon at an altitude of 1410m, longitude East of 10° 26'and latitude Nord of 5° 26'. This region receives between 1500 and 2000mm of rainfall annually, with a temperature from 10° to 25°C. The climate is equatorial of the Cameroon type in altitude with short dry season from mid-November to mid-March and a long rainy season from mid-March to mid-November.

2.1 MATERIALS

2.1.1 ANIMAL AND HOUSING

After weaning, Fifty four (54) young Cavis were repartitioned into three homogenous batches of 18 animals (9males and 9 females) each. These young animals were monitored individually up to the age of 8 weeks in the stall. Each stall was littered with untreated wood shavings of 5cm in depth, renewed every 7days to avoid accumulation of faeces and urine.

2.1.2 EXPERIMENTAL RATIONS

For the growth trial, three experimental rations (Table 1) iso-energetic (digestible energy = 2800Kcal/kgMS) were formulated containing 14%, 16% and 18% of crude protein respectively.

- RC14 = Ration with 14 % of proteins batch 1, n = 18)
- RC16 = Ration with 16 % of proteins (batch 2, n = 18)
- RC18 = Ration with 18 % of proteins (batch 3, n = 18)

Table 1 : Chemical composition and formulation of experimental rations for the period of growth

Ingredients (%)	Proportion of ingredients (%)		
	RC1 (14 %)	RC2 (16 %)	RC3 (18 %)
Maize	23	22	18
Residues of semolina of cassava	8	7.5	8
Wheat bran	34.5	34	32
Cotonseed cake	0	2	5
Soybean cake (49%)	0	1	4
Fish meal (60%)	7	9	9
Seashell meal	2	2	2
Iodide salt	1.5	1.5	1
Pennisetum purpureum	23	20	20
Premix 2 %*	1	1	1
Total	100	100	100
Chemical composition			
DM (%)	89.77	93.45	90.42
OM (%DM)	85.35	84.67	83.23
Crude Protein (%DM)	14.02	16.06	18.09
Crude Cellulose (%DM)	12.30	11.55	11.86
Ash (%DM)	14.65	15.33	16.77
Ca	1.35	1.48	1.49
P	0.72	0.79	0.79
Ca/P	1.88	1.87	1.89
DE (Kcal/KgDM)	2805.94	2806.96	2808.32
DE/CP	200.14	174.78	155.24

**Vit A : 3 000 000UI, Vit D 3 :600 000UI, Vit E :4 000mg, Vit K : 500mg, Vit B1 : 200mg, VitB2 : 1000mg, Vit B6 : 400mg, Vit B12 :4mg, Fer : 8000mg, Cu : 2000mg, Zn : 10 000mg, Se : 20mg, Mn : 14000mg, Méthionine : 200 000mg, Lysine : 78000mg ; RG1 : ration gestation contenant 18% de PB ; RG2 : ration gestation contenant 22% de PB ; RG3 : ration gestation contenant 22% de PB.*

2.2 METHODS

During the experimental trial, each animal of the different batches received 31.42gDM of grannulated feed of 4mm in diameter daily and vitaminated water *ad libitum* (240mg Vitamin C tablet in 1.5litres of water). The Cavis were identified with the help of labeled metal rings. With the exception of *P. purpureum*, all the other ingredients used in the fabrication of the feed were bought from retailers of agricultural byproducts in the town of Dschang. This graminaceae, harvested from 'FAR', was chopped off, dried, crushed and incorporated into the different rations. A sample of 100g was extracted from each experimental ration and dried in a ventilated oven of mark Gallemkamp at 60°C till constant weight. These samples were crushed to sizes of 1mm and conserved in plastic sachets for subsequent nutritional analyses.

At the end of the growth trial of young at 8 weeks of age, all the animals were starved for 12hours and weighed and then slaughtered by cervical dislocation followed by evisceration for the evaluation of the chemical characteristics of the meat. Three (03) muscle samples (loin, shoulder and thigh) were extracted respecting the different batches and age (8weeks) of the animals.

2.3 CHEMICAL COMPOSITION OF THE EXPERIMENTAL ALIMENT AND OF THE MEAT

The parameters of chemical composition such as the contents in dry matter (DM) ; organic matter (OM) ; crude protein (CP) ; Crude celloluse (CB) ; Fats ; Ash ; Ca ; P ; DE(Kcal/kg), of the granules and ingredients were evaluated. For the Cavis meat,

the water, lipids, proteins, ash (minerals) Ca, Na, K, Zn and Fe were also determined. These parameters were determined according to the method [16].

2.4 STATISTICAL ANALYSES

The data on the chemical characteristics of meat were subjected to the 2 way (ration and sex) Analysis of variance following the general linear model as follows:

$Yijh = \mu + \alpha i + \beta j + (\alpha\beta)\, ij + e(ijh)$

where : Yijh = observation on animal h subjected to factors i and j
μ = general mean
αi = effect of the level of ration i
βj = effect of sex j
e(ijh) = residual error on the animal subjected to i and j
$(\alpha\beta)ij$ = effect of the interaction between factors i and j

Once any significant difference existed between the treatments, the separation of the means was done using Waller Duncan test at a threshold of 5% significance (Steel and Torrie, 1980). The analytical software used was SPSS. 20.0.

3 RESULTS

3.1 EFFECT OF THE LEVEL OF DIETARY PROTEINS ON THE WATER, LIPIDS, PROTEINS, AND ASH CONTENTS OF CAVIS MEAT

The contents in water, lipids, proteins and ash of the different muscles of Cavis aged 8 weeks, with respect to rations and sex are presented on the Table 2. Generally, it stems out that, the contents in water, lipids, proteins and ash of meat have evolved consistently regardless of the part of meat and sex. In fact, in males, the water content of the loin of animals fed with ration containing 14% and 16% CP (91.00% and 90.00% respectively) were statistically comparable ($p=0.05$) but significantly ($p<0.05$) higher than those fed diet containing 18% CP (80.00%). Equally, in females independently of the sex, no significant difference ($p>0.05$) was observed between the different rations. In males, the water content of the thigh of Cavis fed 18% CP was comparable ($p>0.05$) (90.00%) to that of animals fed ration containing 14% and 16% CP (84.00% and 91.00% respectively), meanwhile, that of animals fed ration containing 14%CP was significantly ($p<0.05$) higher than that of Cavis fed diet of 16% CP ; on the contrary; in females, the water content of the thigh muscle from Cavis fed diet containing 18% CP was comparable ($p>0.05$) (92.00%) to that of animals subjected to diets containing14% and 16% CP (90.00% and 93.00% respectively) ; but the water content of the thigh muscle from animals fed diet containing 16% CP was significantly ($p<0.05$) higher than that from animals fed diet containing 14% CP. Independently of sex, no significant difference ($p>0.05$) was observed between the rations pertaining to the water content of the thigh muscle.

Either in males or independently of sex, no significant difference ($p>0.05$) was observed between the treatments in the water content of the shoulder muscle. Otherwise, the females fed ration containing 14% CP had a significantly ($p<0,05$) higher (93,00%) water content in the shoulder than that from Cavis fed diets containing 16% and 18% CP (51.00% and 83.00% respectively) ; that from animals fed ration containing 18% CP was significantly ($p<0.05$) higher than Cavis fed diets containing 16% CP.

In males, the lipid content of the loin muscle from animals fed rations containing 14% CP was significantly ($p<0.05$) higher (2.78% FM) than that of Cavis subjected to diets containing 16% and 18% CP, 2.00% FM and1.49% FM respectively; that of animals fed diets containing 16% CP was significantly ($p<0.05$) higher than that of Cavis fed diet containing 18% CP. In females, the lipid content of the loin muscle didn't present any significant ($p>0.05$) difference between the rations. Independently of sex, the lipid content of the loin muscle from Cavis subjected to the ration of 16% CP (1.75% FM) was comparable ($p>0.05$) to that of animals fed diet of 14% and 18% CP, 2.50% FM and 1.68% FM respectively; but that of animals fed ration containing 14% CP was significantly ($p<0.05$) higher than that of Cavis fed ration of 18% CP. Whether in males or independently of sex, no significant difference ($p>0.05$) was observed between the treatments as concerns lipid content of the thigh muscle. In females, the lipid content of the thigh muscle from Cavis subjected to the ration containing 18% CP was significantly ($p<0.05$) higher (4.10% FM) to that of Cavis fed diet containing 16% and 14% CP, 3.74% FM and 3.00% FM respectively; that of animals fed ration containing 14% CP was significantly ($p<0.05$) lower than that from Cavis fed diet containing 16% CP.

Table 2 : Different muscle contents in water, lipids, proteins and in Ash for Cavis aged 8 weeks with respect to rations and sex

Characteristics		Treatments			SEM	Prob.
		RC1	RC2	RC3		
Water content (%)	Loin					
	♂	91.00^{a}	90.00^{a}	80.00^{b}	2.27	0.008
	♀	92.00^{a}	94.00^{a}	92.00^{a}	0.56	0.281
	♂♀	91.50^{a}	92.00^{a}	86.00^{a}	1.40	0.153
	Thigh					
	♂	91.00^{a}	84.00^{b}	90.00^{ab}	1.52	0.002
	♀	90.00^{b}	9300^{a}	92.00^{ab}	0.62	0.004
	♂♀	90.50^{a}	88.50^{a}	91.00^{a}	0.93	0.555
	Shoulder					
	♂	91.00^{a}	91.00^{a}	91.00^{a}	0.26	1.000
	♀	93.00^{a}	51.00^{c}	83.00^{b}	8.02	0.000
	♂♀	92.00^{a}	71.00^{a}	87.00^{a}	4.47	0.129
Lipid content (% FM)	Loin					
	♂	3.00^{a}	2.00^{b}	1.49^{c}	0.28	0.005
	♀	2.00^{a}	1.50^{a}	1.87^{a}	0.17	0.584
	♂♀	2.50^{a}	1.75^{ab}	1.68^{b}	0.17	0.003
	Thigh					
	♂	3.00^{a}	2.00^{a}	2.88^{a}	0.23	0.115
	♀	3.00^{c}	3.74^{b}	4.10^{a}	0.21	0.005
	♂♀	3.00^{a}	2.87^{a}	3.49^{a}	0.21	0.483
	Shoulder					
	♂	0.36^{c}	2.00^{b}	3.22^{a}	0.59	0.000
	♀	2.00^{c}	3.00^{b}	3.66^{a}	0.31	0.006
	♂♀	1.00^{b}	2.50^{a}	3.44^{a}	0.36	0.005
Protein content (% FM)	Loin					
	♂	11.00^{b}	8.50^{b}	14.00^{a}	1.05	0.021
	♀	6.59^{a}	7.50^{a}	7.00^{a}	0.26	0.354
	♂♀	8.75^{a}	8.00^{a}	10.50^{a}	0.81	0.477
	Thigh					
	♂	18.50^{a}	17.00^{b}	19.00^{a}	0.40	0.033
	♀	13.50^{a}	15.00^{a}	13.00^{a}	0.37	0.125
	♂♀	16.00^{a}	16.00^{a}	16.00^{a}	0.68	0.988
	Shoulder					
	♂	11.50^{b}	10.50^{b}	16.00^{a}	1.09	0.005
	♀	9.50^{a}	10.50^{a}	8.00^{a}	0.56	0.182
	♂♀	10.50^{a}	10.50^{a}	12.00^{a}	0.77	0.698
Ash content (% DM)	Loin					
	♂	4.00^{a}	4.00^{a}	5.00^{a}	0.42	0.650
	♀	3.00^{a}	2.50^{a}	3.00^{a}	0.31	0.829
	♂♀	3.50^{a}	3.25^{a}	4.00^{a}	0.34	0.693
	Thigh					
	♂	7.00^{a}	5.50^{a}	6.50^{a}	0.33	0.164
	♀	5.50^{a}	5.50^{a}	5.50^{a}	0.22	1.000
	♂♀	6.25^{a}	5.50^{a}	6.00^{a}	0.23	0.435
	shoulder					
	♂	5.00^{a}	4.00^{a}	6.00^{a}	0.52	0.354
	♀	4.10^{a}	4.50^{a}	3.50^{a}	0.29	0.461
	♂♀	4.55^{a}	4.25^{a}	4.75^{a}	0.32	0.840

a, b and c:the means carrying the same letters on the same line are not significantly different at a threshold of 5% ; RC1, RC2,RC3 : 14% ; 16% ; 18% rates of dietary protein respectively ; FM= fresh matter ;DM=dry matter ; MSE=mean standard error ; Prob= Probability ; ♂= male ; ♀= female; ♂♀= male and female

In males, as well as in females, the lipid content of the shoulder muscle from Cavis fed ration containing 18% CP was significantly ($p<0.05$) higher than that from Cavis fed diet containng 16% and 14% CP; the shoulder from animals subjected to the ration containing 16% CP was significantly ($p<0.05$) higher than that from animals fed diet containing 14% CP. Independently of sex, the analysis reveal that the lipid content of the shoulder muscle from Cavis containing 16% and 18% CP in their rations were statistically comparable ($p>0.05$), 2.50% FM and 3.44% FM respectively, but significantly ($p<0.05$) much higher than that from animals fed diet containing 14% CP (1.00% FM).

In males, the protein contents of the loin muscle from animals fed diet containing 14% and 16% CP in their ration were comparable ($p>0.05$), 11.00% FM and 8.50% FM respectively, but significantly ($p<0.05$) lower than that from animals fed diet containing 18% CP (14.00% FM) ; on the contrary, in females or independently of sex, no significant difference ($p>0.05$) was observed between the rations pertaining to the protein content of the loin muscle. In males, the RC3 (18% CP) has led to obtaining the highest (19.00% FM) protein content in the thigh muscle, and the RC2 ration (16% CP) had the lowest protein content (17.00% FM). The analysis shows that the protein content of the thigh muscle from animals subjected to rations containing 14% and 18% CP, 18.50% FM and 19.00% FM, was statistically comparable ($p>0,05$) but significantly ($p<0.05$) higher than that from Cavis fed ration containing 16% CP (17.00% FM). In females or independently of sex, no significant difference ($p>0.05$) was observed between the rations pertaining to the protein content of the thigh muscle. In males, the protein content of the shoulder muscle from animals containing 14% and 16% CP in their rations were statistically comparable ($p>0.05$), 11.50% FM and 10.50% FM, but significantly ($p<0.05$) lower than that of Cavis fed diet containing 18% CP (16.00% FM). In females or independently of sex, no significant difference ($p>0.05$) was observed between the rations pertaining to the protein content of the shoulder muscle.

With respect to or independently of sex and regardless of the part of Cavis meat, no significant difference ($p>0.05$) between the rations was presented by the ash content.

3.2 DIFFERENT MUSCLE CONTENTS IN MACROELEMENTS FOR CAVIS AGED 8 WEEKS WITH RESPECT TO RATIONS AND SEX

Different muscle contents in macroelements for Cavis aged 8 weeks with respect to rations and sex are presented on Table 3. This table depicts that, the contents in calcium, sodium, potassium and magnesium have evolved consistently regardless of the muscle part and the sex. In fact, in males, the statistical analysis shows that the calcium content of the loin muscle from animals subjected to rations containing 14% and 16% CP were comparable ($p>0.05$) but significantly ($p<0.05$) lower than that from animals fed diets containing 18% CP. In females, the calcium content of the loin muscle from Cavis fed ration containing 18% CP were comparable ($p>0.05$) to that from animals subjected to diets containing 14% and 16% CP; but that of animals fed diet containing 14% CP was significantly ($p<0.05$) higher than that of animals fed diet containing 16% CP. Otherwise, in females the Calcium content of the thigh muscle from animals subjected to ration containing 14% CP was significantly ($p<0.05$) higher than that from Cavis fed diet containing 16% and 18% CP; that from animals fed diet containing 16% CP was significantly ($p<0.05$) higher than that of animals subjected ration containing 18% CP. Independently of sex, the calcium content of the thigh muscle from Cavis receiving 18% CP in their ration was comparable ($p>0.05$) to that of animals subjected to diet containing 14% and 16% CP; but that of animals fed diet containing 14% CP was significantly ($p<0.05$) higher than that from animals fed diet containing 16% CP. In males, the calcium content of the shoulder muscle from animals fed rations containing 14% and 16% CP was statistically comparable ($p>0.05$) but significantly ($p<0.05$) lower than that of Cavis receiving diet containing 18% CP. In females, the calcium of the shoulder muscle from Cavis subjected to ration containing 14% CP was comparable ($p>0.05$) to that of animals fed diet containing 16% and 18% CP; but that of females subjected to ration containing 16% CP was significantly ($p<0.05$) higher than that of their mates receiving diets containing 18% CP. Independently of sex, no significant difference ($p>0.05$) was observed between the treatments pertaining to calcium content of the shoulder muscle.

Otherwise, regardless of the sex, the sodium content of the loin muscle does not present any significant difference ($p>0.05$) between the rations. Independently of sex, the sodium content of the loin of Cavis subjected to ration containing 14% CP was comparable ($p>0.05$) to that of animals fed ration containing 16% and 18% ; but that of animals fed ration containing 18% CP was significantly ($p<0.05$) higher than that from animals receiving 16% CP in their feed. In females or independently of sex, the sodium content of the thigh muscle had no significant difference ($p>0.05$) between rations. In males, the sodium content of the thigh from animals fed diet containing 14% and 18% CP were comparable ($p>0.05$) but significantly ($p<0.05$) higher than

that from animals subjected to ration containing 16% CP. Otherwise, regardless of the sex, the sodium content of the shoulder presented no significant difference (p>0.05) between the rations.

In males, the potassium content of the loin muscle from animals receiving 14% and 18% CP in their diet were comparable (p>0.05) but significantly (p<0.05) higher than that from animals fed rations containing 16% CP. Meanwhile, in females, the analysis reveals that the potassium content of the loin muscle from animals fed rations containing 14% and 16% CP were statistically comparable (p>0.05) but significantly (p<0.05) higher than that from animals fed diet of 18% CP. Independently of sex, the potassium content of the loin muscle presented no significant difference (p>0.05) between the rations. In males, the potassium content of the thigh from animals subjected to rations containing 14% CP was significantly (p<0.05) higher than that from Cavis fed diet containing 16% and 18% CP ; but that from animals fed ration containing 16% CP was significantly (p<0.05) higher than that of Cavis fed diets containing 18% CP. In females, the analysis shows that the potassium content of the thigh muscle from animals fed rations composed of 14% CP was significantly (p<0.05) higher than that of Cavis subjected to diets of 16% and 18% CP ; but the potassium content of the thigh muscle of animals fed diet of 18% CP was significantly (p<0.05) higher than that of cavis subjected to diet of 16% CP. Independently of sex, the analysis reveals that the potassium content of the thigh muscle from animals fed rations containing 16% and 18% CP were comparable (p>0.05) but significantly (p<0.05) lower than that from cavis fed diet containing 14% CP. In males, the analysis shows that potassium content of the shoulder muscle from animals subjected to rations containing 14% and 18% CP were statistically comparable (p>0.05) but significantly (p<0.05) higher than that from cavis fed diet containing 16% CP. Meanwhile, in females, the statistical analysis reveal that the potassium content of the shoulder muscle from animals fed diets of 16% and 18% CP were comparable (p>0.05) but significantly (p<0.05) higher than that from cavis fed diet containing 14% CP. Independently of sex, the potassium content presented no significant difference (p>0.05) between the rations.

Table 3 : Different muscle contents in some macroelements for Cavis aged 8 weeks with respect to rations and sex

Characteristics		Treatments			SEM	Prob
		RC1(14%CP)	RC2(16%CP)	RC3(18%CP)		
Calcium content (mg/g of dry matter)	Loin					
	♂	16.50^{b}	15.50^{b}	21.00^{a}	1.09	0.005
	♀	14.00^{a}	10.50^{b}	12.50^{ab}	0.72	0.007
	♂♀	15.25^{a}	13.00^{a}	16.75^{a}	1.02	0.347
	Thigh					
	♂	35.50^{a}	23.50^{b}	33.00^{a}	2.33	0.002
	♀	30.50^{a}	27.00^{b}	22.50^{c}	1.50	0.009
	♂♀	33.00^{a}	25.25^{b}	27.75^{ab}	1.45	0.008
	Shoulder					
	♂	23.00^{b}	20.95^{b}	31.00^{a}	2.12	0.009
	♀	18.50^{ab}	21.00^{a}	18.00^{b}	0.65	0.006
	♂♀	20.75^{a}	20.50^{a}	24.50^{a}	1.35	0.437
Sodium content (mg/g of dry matter)	Loin					
	♂	50.00^{a}	67.00^{a}	138.00^{a}	17.95	0.031
	♀	63.00^{a}	29.00^{a}	66.00^{a}	8.40	0.090
	♂♀	56.50^{ab}	48.00^{b}	102.00^{a}	10.63	0.007
	Thigh					
	♂	158.00^{a}	70.00^{b}	184.00^{a}	23.08	0.035
	♀	94.00^{a}	123.00^{a}	122.50^{a}	7.64	0.226
	♂♀	126.00^{a}	96.50^{a}	153.25^{a}	12.15	0.164
	Shoulder					
	♂	107.00^{a}	54.00^{a}	76.00^{a}	11.92	0.194
	♀	50.00^{a}	75.00^{a}	49.00^{a}	8.32	0.452
	♂♀	78.47^{a}	64.47^{a}	62.47^{a}	7.64	0.682
Potassium content (mg/g of	Loin					
	♂	7.33^{a}	4.20^{b}	7.62^{a}	0.76	0.014
	♀	3.11^{a}	4.19^{a}	1.03^{b}	0.56	0.006
	♂♀	5.25^{a}	4.00^{a}	4.25^{a}	0.71	0.785

dry matter)	Thigh					
	♂	13.00[a]	6.00[b]	2.50[c]	1.96	0.000
	♀	10.00[a]	6.00[c]	6.97[b]	0.76	0.000
	♂♀	11.50[a]	6.00[b]	4.73[b]	1.00	0.001
	Shoulder					
	♂	5.50[a]	1.50[b]	6.50[a]	0.99	0.011
	♀	1.50[b]	4.50[a]	4.00[a]	0.62	0.026
	♂♀	3.50[a]	3.00[a]	5.25[a]	0.58	0.276

a, b and c:the means carrying the same letters on the same line are not significantly different at a threshold of 5% ; RC1, RC2,RC3 : 14% ; 16% ; 18% rates of dietary protein respectively ; MF= fresh matter ;DM=dry matter ; MSE=mean standard error ; Prob= Probability ; ♂= male ; ♀= female; ♂♀= male and female

3.3 DIFFERENT MUSCLE CONTENTS IN OLIGOELEMENTS FOR CAVIS AGED 8 WEEKS WITH RESPECT TO RATIONS AND SEX

Table 4 presents different muscle contents in oligoelements for Cavis aged 8 weeks with respect to rations and sex**.** The table depicts that, with respect to or regardless of sex and the portion of meat, no significant difference (p>0.05) was observed between the treatments pertaining to iron content.

Otherwise, in males, the Zn content of the loin muscle from Cavis of batch RC3 was significantly (p<0.05) higher than that of animals from batches RC1 and RC2; that of cavis from batch RC1was significantly (p<0.05) higher than that of animals from batch RC2. In females, the Zn content of the loin from animals of batches RC1 and RC3 were comparable (p>0.05) but significantly (p<0.05) higher than that from animals of batch RC2. Independently of sex, the Zn content of the loin from animals of batches RC1 and RC2 were statistically comparable (p>0.05) but significantly (p<0.05) lower than that of cavis from batch RC3. In males, the Zn content of the thigh of cavis from batch RC3 was significantly (p<0.05) higher than that from animals of batches RC1 and RC2; the Zn proportion of the thigh of cavis from batch RC1 was significantly (p<0.05) higher than that of animals from batch RC2. In females and independently of sex, the Zn content of the thigh muscle from animals of batches RC1 and RC2 were statistically comparable (p>0.05) but significantly (p<0.05) lower than that from batch RC3. In males, the Zn content of the shoulder of animals fed rations containing 18% CP was significantly (p<0.05) higher than that of their mates fed diets containing 14% and 16% CP ; that from animals fed rations containing 16% CP was significantly (p<0.05) higher than that of cavis fed diet containing 14% CP. In females, the analysis shows that the Zn content of the shoulder from animals subjected to diets containing 18% CP was significantly (p<0.05) higher than that of cavis subjected to diets containing 14% and 16% CP; the Zn proportion in the shoulder of animals subjected to rations containing 14% CP was significantly (p<0.05) higher than that of cavis fed diets containing 16% CP. Independently of sex, the Zn content of the shoulder of animals fed rations containing 14% and 16% CP were statistically comparable (p>0.05) but significantly (p<0.05) lower than that from cavis fed diets of 18% CP.

Table 4 : Different muscle contents in oligoelements for Cavis aged 8 weeks with respect to rations and sex

Characteristics	Sex	Treatments			SEM	Prob
		RC1(14%CP)	RC2(16%CP)	RC3(18%CP)		
Iron content (mg/g DM)	Loin					
	♂	1.00[a]	1.00[a]	2.00[a]	0.21	0.650
	♀	0.50[a]	0.50[a]	1.00[a]	0.21	0.650
	♂♀	0.75[a]	0.75[a]	1.50[a]	0.17	0.121
	Thigh					
	♂	1.50[a]	2.00[a]	2.00[a]	0.17	0.465
	♀	1.50[a]	1.50[a]	2.00[a]	0.21	0.650
	♂♀	1.50[a]	1.75[a]	2.00[a]	0.13	0.323
	shoulder					
	♂	0.96[a]	1.23[a]	2.00[a]	0.21	0.650
	♀	0.74[a]	1.37[a]	1.14[a]	0.17	0.465
	♂♀	1.00[a]	1.25[a]	1.50[a]	0.13	0.323

Zinc content (mg/g DM)	Loin					
	♂	0.34[b]	0.07[c]	6.04[a]	1.27	0.009
	♀	1.36[a]	0.27[b]	1.90[a]	0.37	0.004
	♂♀	0.85[b]	0.17[b]	3.97[a]	0.65	0.005
	Thigh					
	♂	1.89[b]	0.28[c]	10.84[a]	2.14	0.009
	♀	0.86[b]	0.70[b]	3.77[a]	0.63	0.026
	♂♀	1.50[b]	0.50[b]	7.50[a]	1.12	0.005
	shoulder					
	♂	0.15[c]	3.48[b]	8.67[a]	1.57	0.002
	♀	2.33[b]	0.23[c]	5.92[a]	1.12	0.005
	♂♀	1.00[b]	1.75[b]	7.25[a]	0.94	0.001

a, b and c:the means carrying the same letters on the same line are not significantly different at a threshold of 5% ; RC1, RC2,RC3 : 14% ; 16% ; 18% rates of dietary protein respectively ; FM= fresh matter ;DM=dry matter ; MSE=mean standard error ; Prob= Probability ; ♂= male ; ♀= female; ♂♀= male and female

4 DISCUSSION

4.1 EFFECT OF THE LEVEL OF DIETARY PROTEIN ON WATER, LIPIDS, PROTEINS AND ASH CONTENTS OF CAVIS MEAT

In this study, the water content of the loin muscle was the highest in cavis subjected to rations containing 16% CP, either 92.00% was obtained; this value is higher than that of 72.59% reported by [17] with loin muscle from cavis receiving 10% of cassava leaves flour in their ration. The highest water content of the thigh muscle that is 91.00% was registered in animals fed rations containing 18% CP, meanwhile, no significant difference (p>0.05) was observed between this value and that of 88.50% registered with the thigh muscle of cavis fed ration containing 16% CP. Nevertheless, this rate is higher than the value of 74.31% obtained by [17] with the thigh muscle from cavis receiving 8% of cassava leaves flour in their ration. The highest water content of the shoulder muscle that is 92.00% was obtained in cavis fed ration containing 14% CP, meanwhile, no significant difference (p>0.05) was observed between this value and that of 71.00% registered with shouldre muscle of animals subjected to rations containing 16% CP. Nevertheless, this rate is higher than that of 72.93% reported by [17] with shoulder muscle from cavis receiving 8% of cassava leaves flour in their ration. Otherwise, the water content of muscles has been higher in males as in females ; in fact, they varied from 80.00% to 91.00% in males and from 51.00% to 94.00% in females. The same observations were made by [17] in cavis receiving cassava leaves flour in their rations. These authors obtained varying water contents of muscles from 70.45% to 75.39% in males and from 65.56% to 73.23% in females. On the contrary, comparable results for the two sexes were observed by [18] ; in fact, these authors obtained water contents of 75.05% in ewe and 75.96% in the ram at the level of the *Longissimus dorsi* muscle. Also, the differences observed in this study could be as a result of the animal species. Likewise, all the rates obtained in cavis during this study, are higher than values of 70% and 67% respectively registered by certain authors [19 ; 20 ; 21] with muscles fom rabbit and by others [20; 21] with chicken muscles.

The highest lipid content of the loin muscle, that is 2.150% FM was obtained from cavis subjected to ration containing 14% CP ; meanwhile, this value is statistically comparable (p>0.05) to that of 1.75% MF registered with the loin muscle of cavis fed ration containing 16% CP ; it is nevertheless lwer than that of 7.27% FM reported by [17] with the loin muscle from cavis receiving 0% of cassava leaves flour in their ration. The highest lipid content of the thigh muscle, that is 3.49% FM, was registered in animals fed rations containing 18% CP ; meanwhile, this value is statistiaclly comparable (p>0.05) to that of 3.00% MF noted at the level of the thigh muscle from animals subjected to rations containing 16% CP ; it is nevertheless lower to the rate of 8.17% FM obtained by [17] with the thigh muscle from cavis receiving 0% cassava leaves flour in their ration. The highest lipid content of shoulder muscle, that is 3.44% FM, was obtained in cavis fed with ration RC3 (18% CP) ; meanwhile, this value is statistically comparable (p>0.05) to that of 2.50% FM registered with the shoulder muscles from animals fed ration containing 16 % CP ; nevertheless, it is lower than that of 12.90% FM reported by [17] with the shoulder muscle from animals receiving 10% of cassava leaves flour in their ration. The low rates observed during this study, will be in comparison with the results of [17] in cavis aged 22 weeks, linked to age of animals at slaughter. In fact, the lipid content of the muscle increases with age and weight of the animal [22]. Therefore, when body weight increases from birth to slaughter of the animals, variations in the composition of the carcass are observed [23]. In the same light, [23] have mentioned that the increase in slaughter weight engenders a drop in the proportions of muscle and bone, and an increase in the fat content of the carcass. According to [22], the lipid content of the muscle increases with increase in weight, whether or not the animals are fed at will or restricted feeding.

Likewise, the highest lipid content of muscles was observed in males as in females ; in fact, they were varying on a dry matter basis (MF) from 0.36% to 3.22% in males and from 1.50% to 4.10% in females. The same observeation were made on the same basis by [17] who reported that the lipid content of cavis muscles varied from 5.26% to 12.73% in males and from 6.24% to 15.95% in females. On their part, [18] had on the same basis reported on the intramuscular lipid content of the *Longissimus dorsi* varying from 2,74% to 3,54% in ewe of the Lacha species and from 1,87% to 3,15% in rams of the same species. According to [24], females have a lower growth potengtial than males entirely, but have a more rapid adipose tissue development. It is therefore at the same liveweight that females present high adipose deposits than males [24]. In the same light, studies carried out by [17], on cavis muscles on the same basis, have shown that the lipid content varied from 5.26% to 12.73% in males and from 6.24% to 15.95% in females. The higher lipid content in female muscles is explained by the effect of hormones such as oestrogenes [24]. In fact, oestrogenes stimulate the fatty mass in the pelvian cavity and the thigh.

In the present study, the higher protein content in the loin muscle, that is , 10.50%MF, was obtained from cavis receiving ration containing 18% CP ; meanwhile, it is statistically comparable ($p>0.05$) to the value of 8.00% FM of the loin muscle of cavis subjected to ration containing 16% CP. Nevertheless, this value is lower than that of 21.49%FM reported by [17] with longe muscle from cavis receiving 10% of cassava leaves flour in their ration. The protein content of the thigh muscle, either 16.00%FM, was registered in all the animals regardless of the ration. This rate is nevertheless close to that of 16.73%FM obtained by [17] with the thigh muscle from cavis receiving 10% of cassava leaves flour in their ration. The highest protein of the shoulder muscle, either 12.00%FM, was obtained from cavis fed rations containing 18% CP; meanwhile, this value is statistically comparable ($p>0.05$) to that of 10.50%FM of shoulder muscle from cavis fed ration containing16% CP. Nevertheless, this value is lower than that of 15.10%FM reported by [17] with the shoulder muscle from cavis receiving 10% of cassava leaves flour in their ration. Likewise, the protein content was highest in males than in females; in fact, they varied from 8.50%MF to 19.00%MF in males and from 6.59%MF to 15.00%FM in females. The same observation was made by [25] who registered the protein rate of pork expressed as a percentage of the dry extract, significantly higher ($p<0.001$) in males (88.70%) than females (86.50%). On the contrary, [17] reported that the protein content of muscles is not influenced by the animal's sex. In fact, these authors have obtained oscillating muscle protein of cavis between 13.64%MF and 21.68%MF in males and 13.58%MF and 22.89%MF in females; [26] have equally registered rates of muscular proteins of pork of 22.78%MF in males and 22.87%MF in females ; on their part, found out that there was no significant difference ($p>0.05$) in the pork protein in males (21.09%MF) and in females (21.27%MF). The protein content at the level of the loin, either 18.35%MF is closer to that of 18.20%MF and of 18% MF obtained respectively by [28] with *Semispinalis* muscle of cavis and by [21] with sheep muscles ; the value of 19.43%MF obtained from the thigh muscle is closer to that of 20%MF and of 19.5-20%MF respectively, registered by [21] with beef muscles and by other authors [20]; [21] with chicken muscle ; while the value of 17.34%MF obtained from the shoulder muscle is comparable to that of 17%MF and of 16.60%MF respectively, registered by [20] in rams and by [19] in pigs. Protein variations observed at the level of different muscles could translate the implication of protides in the normal functioning of the tissues in metabolic processes [24].

In this study, the highest ash content, that is 4.00%DM, was obtained in the cavis subjected to ration containing 18% CP; meanwhile, this value is statistically comparable ($p>0.05$) to that of 3.25%DM of the loin muscle of cavis subjected to ration containing 16%CP. This value, nevertheless is closer to that of 4.01%DM reported by [15] with loin muscle from cavis receiving 8% of cassava leaves flour in their ration. The highest ash content of the thigh muscle, that is 6.25%DM, was registered in animals fed ration containing 14% CP ; meanwhile, it is statistically comparable ($p>0.05$) to that of 5,50%DM of thigh muscle fed ration containing 16%CP. This rate is nevertheless comparable to that of 5.42%DM obtained by [15] with thigh muscle from cavis receiving 10% of cassava leaves flour in their ration. The highest ash content of the shoulder muscle, that is 4.75%DM, was obtained from cavis fed ration containing 18% CP; meanwhile, it is statistically comparable ($p>0.05$) to the value of 4.25%DM of shoulder muscle from cavis fed ration containing 16% CP. This value is closer to that of 4.71% DM reported [15] with shoulder muscles from cavis receiving 8% of cassava leaves flour in their ration. Likewise, the ash content of muscles has been higher in males than in females; in fact, they varied from 4.00%DM to 7.00%DM in males and from 2.50%DM to 5.50%DM in females. On the contrary, the investigations of [15] have revealed that there is no significant difference ($p>0.05$) between the two sexes pertaining to the ash content of the muscles ; in fact, this author registered varying ash contents from 4.11%DM to 5.64%DM in males and from 3.90%DM to 5.79%DM in females. In this study, regardless of the sex or muscle type, there was no significant difference ($p>0.05$) observed between the ash content of the cavis muscle; these observations were also made by [15].

4.2 MUSCLE CONTENTS IN MACROELEMENTS FOR CAVIS AGED 8 WEEKS WITH RESPECT TO RATIONS AND SEX

In this study, the highest calcium content of the loin muscle, that is 16.75mg/gDM, was obtained from cavis subjected to ration containing 18% CP ; meanwhile, this value is statistically comparable ($p>0.05$) to that of 13.00mg/gDM noted with the loin muscle from cavis subjected to ration containing 16% CP. Nevertheless, this value is lower than that of 20.21mg/gDM obtained [15] with the loin muscle from cavis receiving 10% of cassava leaves flour in their ration. The highest calcium content of the thigh muscle, that is 33.00mg/gDM was registered in animals subjected to rations containing 14% CP; meanwhile, this value is statistically comparable ($p>0.05$) to that of 27.75mg/gDM noted with thigh muscles from cavis subjected to rations containing 18% CP ; the latter is statistically comparable ($p>0.05$) to that of 25.25mg/g/DM obtained with thigh muscles from rations containing 16%CP. This rate is higher than that of 20.67mg/gDM obtained by [15] with thigh muscles from cavis receiving 12% of cassava leaves flour in their ration. The highest calcium content of the shoulder muscle, either 24.50mg/gDM, was obtained in cavis fed ration containing 18%CP; meanwhile, this value is statistically comparable ($p>0.05$) to that of 20.50mg/gDM noted with shoulder muscles from cavis fed rations containing 16%CP. These values are higher than that of 13.66mg/gDM reported by [15] with the shoulder muscle from cavis receiving 10% of cassava leaves flour in their ration. Likewise, the calcium contents of the muscles has been higher in males than in females ; in fact, it varies from 15.50mg/gDM to 35.50mg/gDM in males and from 10.50 mg/gDM to 30.50 mg/gDM in females. Contrary results were registered by [15] who reported calcium contents of muscles varying from 3.37 mg/gDM to 22.19 mg/gDM in males and from 3.40 mg/gDM to 36.95 mg/gDM in females. The calcium content noted with the loin muscle in this present study, either 16.75mg/gDM is closer to the value of 17mg/gDM and 11-19mg/gDM respectively obtained [19] with beef muscle by [29] with chicken ; the calcium content registered with the shoulder muscle, in the course of this trial, either 20.50mg/gDM, is comparable to the value of 20mg/gDM reported by [21] with rabbit muscle.

The highest sodium content of the loin muscle in the present study, either 102.00mg/gDM, was obtained from cavis subjected to rations containing 18%CP ; meanwhile, this value is statistically comparable ($p>0.05$) to that of 56.50 mg/gDM registered with loin muscle from cavis fed ration containing 14%CP. The former value is nevertheless higher than that of 87.45 mg/gDM and of 52 mg/gDM respectively reported by [15] with muscle from cavis receiving 12% of cassava leaves flour and by [19] with beef muscle. The highest sodium content of the thigh muscle, either 153.25mg/gDM, was registered from animals subjected to rations containing 18%CP; meanwhile, no significant difference ($p>0.05$) was observed between the rations pertaining to the sodium content of the thigh muscle. This rate is nevertheless higher than that of 105.82mg/gDM obtained by [15] with thigh muscle from cavis receiving 12% of cassava leaves flour in their ration and those of 70mg/gDM, 76 mg/gDM, 78 mg/gDM and 65 mg/gDM reported by [19], respectively with ram muscle, chicken, guinea fowl and pig. The highest sodium content of the shoulder muscle, either 78.47mg/gDM, was obtained in cavis fed ration containing 14%CP, meanwhile, no significant difference ($p>0.05$) was observed between the rations. This value is nevertheless lower than that of 128.58mg/gDM reported by [15] with the shoulder muscles of cavis receiving 12% of cassava leaves flour in their ration. Likewise, the sodium content of muscles was higher in males than in females ; in fact, it varied from 50.00mg/gDM to 184.00mg/gDM in males and from 29.00mg/gDM to 123.00mg/gDM in females. The same observations were made by [15] who registered varying sodium contents of muscles from 68.77mg/gDM to 161.95mg/gDM in males and 66.93mg/gDM to148.01mg/gDM in females.

In the present study, the highest potassium content of the loin muscle, either 5.25mg/gDM, was obtained from cavis receiving 14%CP in their ration ; meanwhile, no significant difference ($p>0.05$) was observed between the three (03) rations pertaining to potassium content of the loin muscle. Nevertheless, this value is comparable to that of 3.82mg/gDM reported by [15] with the loin muscle from cavis receiving 12% of cassava leaves flour in their ration. The highest potassium content of the thigh muscle, either 11.50mg/gDM was observed in cavis fed ration containing 14%CP ; it is statistically ($p<0.05$) higher than that of 6.00mg/gDM and 4.73mg/gDM noted with the thigh muscles from cavis fed rations containing 16% and 18%CP respectively. This rate is close to the value of 11.97mg/gDM obtained by [15] with the thigh muscle from cavis receiving 8% of cassava leaves flour in their ration, but higher than that of 5.03mg/g/DM registered by this same author with thigh muscles from cavis consuming rations containing 10% of cassava leaves flour. The highest potassium content of the shoulder muscle, that is 5.25mg/gDM, was obtained in cavis fed ration containing 18%CP ; meanwhile, no significant difference ($p>0.05$) was observed between the three (03) pertaining to potassium content of the shoulder muscles. This value is lower than that of 9.80mg/gDM reported by [15] with the shoulder muscle from cavis receiving 10% of cassava leaves flour in their ration. Likewise, it varied from 1.50mg/gDM to 13.00mg/gDM in males and 1.00mg/gDM to 10.00mg/gDM in females. Contrary observations were made [15] who reported variations from 3.89mg/gDM to 20.76mg/gDM in males and 3.03mg/gDM to 23.95mg/gDM in females.

4.3 MUSCLE CONTENTS IN OLIGOELEMENTS FOR CAVIS AGED 8 WEEKS WITH RESPECT TO RATIONS AND SEX

In this study, the highest iron content of loin, thigh and shoulder muscles that is 1.50mg/gMS, 2.00mg/gMS and 1.50mg/gMS respectively were registered with cavis fed ration containing 18%CP ; meanwhile, no significant difference ($p>0.05$) was observed between the three rations pertaining to iron content of the different muscle parts. The iron content of the loin muscle (1,50 mg/gDM) is comparable to the value reported by [29] (0.8-2.3 mg/gDM) and by [30] (0.9-1.2 mg/gDM) with the veal muscle ; by [30] (1.1-1.5 mg/gDM) with the ram muscles; by [29] with the rabbit muscles (1.1-1.3 mg/gDM) and from chicken (0.6-2.0 mg/gDM). The iron content of the thigh muscle (2.00 mg/gDM) is higher than that registered by [21] (1.50 mg/gDM) with sheep muscles; by [32] (1.6 mg/gDM) with the ram muscles and by [29] (1.4-1.7 mg/gDM) with pig muscles. The iron content of the shoulder muscle (1.50 mg/gDM) is comparable to that registered by [19] (1.30 mg/gDM) with feasant muscle. Likewise, the iron contents of muscles were higher in males than in females; in fact, it varied from 1.00 mg/gDM to 2.00 mg/gDM in males and from 0.50 mg/gMS to 2.00 mg/gDM in females. The highest (3.97 mg/gDM) Zn content of the loin muscle , in the present study was obtained from cavis fed 18%CP. This rate is closer to the value of 4.50mg/gDM obtained by [15] with the loin muscle from cavis fed 8% of cassava leaves flour in their ration, and from 3.5-6.8 mg/gDM and 2.6-4 mg/gDM registered by [30] respectively from beef and veal muscles. Likewise, it higher than the value of 2.90 mg/gDM reported by [31] with the ram muscle. The highest Zn content of the thigh and shoulder muscles respectively from 7.50mg/gDM and 7.25mg/gDM were registered in animals fed rations containing 18%CP. These values are higher than that of 5.93mg/gDM and 6.62mg/gDM obtained by [15] respectively with the thigh and shoulder muscles from cavis receiving 12% of cassava leaves flour in their ration. Likewise, the Zn contents of the muscles were higher in males than in females; in fact, it varied from 0.07mg/gDM to 10.84mg/gDM in males and from 0.23mg/gDM to 5.92mg/gDM in females.

5 CONCLUSION

From this study, it springs out that:

- The level of dietary proteins have influenced the chemical characteristics of cavis meat;
- The ration containing 16%CP has seemingly ameliorated the chemical composition of cavis meat in the western high plateau of Cameroon than the other rations of 14%CP or 18%CP.

REFERENCES

[1] UICN. 2005. Lessons Learned from Micro-Grant Experiences in the Conservation-Development Sector.

[2] Tandzong M. C. L. 2014. Influence of a food with the inclusion of cassava leaves (*Manihot esculenta*) on the physico-chemical characteristics and technological properties of guinea pig meat (*Cavia porcellus*). Thesis of Master of Science in Biochemistry. University of Dschang. 86p.

[3] Deen L. J., Funk M., Guevara C. V., Saloojee H., James Y., Doe Y. J., Palmer A., Weber Z. M. 2003. Implementation of WHO guideline on management of severe malnutrition in hospitals in Africa. Bulletin of the World Health Organization, 81: 237 – 243.

[4] Nkidiaka O. 2004. Livestock farming practices in urban and peri-urban areas of the city of Kinshasa: general synthesis of the surveys. *Troupeaux et Cultures des Tropiques* 3:50-52.

[5] Pamo T. E, Boukila B, Fonteh F A, Tendonkeng F. et Kana J. R. 2005. Chemical composition and effect of supplementation with *Calliandra calothyrsus* and *Leucaena leucocephala* on dairy production and growth of West African dwarf goats. *Livestock Research for Rural Development. Vol. 17, Art. #30.* Retrieved November 7, 2012, from http://www.lrrd.org/lrrd17/3/tedo17030.htm.

[6] Bindelle J. et Picron P. 2013. The guinea pig, a small herbivore easy to feed in small plots. *Troupeaux et Cultures des Tropiques :* Spécial Elevage de Rongeurs, Kinshasa, RDC. CAVTK., 1-10.

[7] Anye, N.H., Manjeli, Y. and Ebangi, A.L. 2010. Principal component analysis (PCA) of body measurements in local Guinea pigs (*Cavia porcellus* L.) in the Western Highlands of Cameroon*. Livestock Research for Rural Development. Volume 22 (9): Article #164; available from*: http://www.lrrd.org/lrrd22/9/anye22164.htm

[8] Ministere De L'agriculture Des Ressources Animales (MINAGRA), 1999. Abidjan Agricultural and Animal Resource Fair: Ivorian agriculture at the dawn of the 21st century, Abidjan, Côte d'Ivoire. 292-309.

[9] Niba A.T, Meutchieye F., Fon D., Laisin A.G., Taboh H., Njakoi H., Bela T.A., Maass B.L., Djikeng A. and Manjeli Y. 2012. Current situation of cavy production in Cameroon: Challenges and opportunities. *Livestock Research for Rural Development. Volume 24, Article #194.* Retrieved March 17, 2013, from http://www.lrrd.org/lrrd24/11/niba24194.h.

[10] Tchoumboué J., Niba, A.T. et Kenfack, A. 2001. Comparative study on the influence of supplementation with two legumes (*Arachis glabrata* Benth. and *Desmodium intortum*) on the reproductive and growth performance of guinea pigs (*Cavia porcellus* L.). *Bulletin of Animal. Health and Production. 49:74-83.*

[11] Kouakou N'G.D.V., Thys E., Danho M., Assidjo E.N. et Grongnet J.F. 2012. Effect of *Panicum maximum* on the productivity of primiparous females during the breeding cycle in guinea pigs (*Cavia porcellus* L.). *Tropicultura*, 30 (1) : 24-36.

[12] Kouakou N'G.D.V., Kouba M. et Thys E. 2016. Comparative study of the *in vivo* digestibility of guinea grass (*Panicum maximum* Jacq.) Associated with sweet potato leaves and stems (*Ipomea batatas* (L.) Lam) or milk grass (*Euphorbia heterophylla* L.) in the rabbit (*Oryctolagus cuniculus* L.) and the guinea pig (*Cavia porcellus* L.). *Tropicultura*, 34 (2) : 158-165.

[13] Miégoué E. 2016. Three forage legumes (*Arachis glabrata, Calliandra calothyrsus* or *Desmodium intortum*) as a source of proteins associated with two grasses (*Pennisetum purpureum* and *Panicum maximum*) in the feeding of guinea pigs (*Cavia porcellus* L.). PhD thesis in Biotechnology and Animal Production, University of Dschang. 158p.

[14] Noumbissi M. N. B., 2016. Evaluation of the production performance of guinea pigs (*Cavia porcellus* L.) subjected to different levels of supplementation with *Tithonia diversifolia*. Doctoral Thesis (PhD) in Biotechnology and Animal Production. University of Dschang. 163p.

[15] Mweugang N. N. 2016. Use of cassava leaves (*Manihot esculenta* Crantz) as an alternative source of protein on the production performance of guinea pig (*Cavia porcellus* L.) and the chemical composition of its meat. Doctoral Thesis (PhD) in Biotechnology and Animal Production. University of Dschang. 166p.

[16] AOAC (Association of Official Analytical Chemist). 1990. Official method of analysis 15th edition. AOAC. Washington D.C. 10 p.

[17] Tandzong M. L. C., Mbougueng P. D., Womeni H. M., Mweugang N. N. 2015. Effect of Cassava Leaf (*Manihot esculenta*) Level in Guinea –Pigs (Cavia porcellus) Meal on the Physico-Chemical and Technological Properties of Its Meat. Scientific Research Publishing. Food and Nutrition Sciences, 6, 1408-1421. http://www.scirp.org/journal/fns

[18] Horcada A., Beriain M. J., Purroy A., Lizaso G., Chasco J. 1998. Effect of sex on meat quality of Spanish lamb breeds (Lacha and Rasa Aragonesa). *Journal of Animal Sciences*, 67: 541-547.

[19] Ducluzeau P. H. 2004. Hunting and Nutrition. www.gibier-de-chasse.com

[20] Fraysse J. L., Darre A. 1990. Produce meat on what economic and biological basis? Edition Lavoisier, Technique et documentation, 1 : 347p.

[21] Ouhayoun J., Gidenne T., Demarne Y., Batailler V., Sanchez V., Segura M., Lapanouse A. 1985. Postnatal evolution of lipid fatty acid composition [27] Fraysse J. L., Darre A. 1990. Producing meat on what economic and biological basis? Edition Lavoisier, Technique et documentation, 1 : 347p.

[22] Candek-Potokar M., Zlender B., Bonneau M. 1995. 41th International Congress Meat Science and Technology, 1995, San Antonio, USA.

[23] Lister D., Perry B. N., Wood J. D. 1983. Meat production. In J; A. F. Rook et P. C. Thomas (Eds.), Nutritional physiology of farm animals. London and N. Y. Longman. Pp 476-537.

[24] Micol D., Robelin J., Geay Y., 1993. Body Composition and Biological Characteristics of Muscles in Growing and Fertilizing Cattle. INRA Production Animale, 4, 287-295.

[25] Zullo A., Barone C. M. A., Colatruglio P., Girolami A., Matassino D. 2003. Chemical composition of pig meat from the genetic type "Casertana" and its crossbreeds. *Meat Science*, 63: 89-100.

[26] Pugliese C., Calagna G., Chiofalo V., Moretti V. M., Margiotta S., Franci O., Gandini G. 2004. Comparison of the performances of nero siciliano pigs reared indoors and outdoors: 2. Joints composition, meat and fat traits. Meat Science, 68: 523-528.

[27] Minvielle B., Boutten B., Alviset G., Deschodt G., Goureau L., Boulard J., Le Etrat P., Houix Y. 2002. Chemical composition of the muscles of fresh hams and cooked hams: influence of age at slaughter and ultimate pH class. Journées de la Recherche Porcine en France. 34 : 7-13.

[28] Niba A.T, Djoukam J., Teguia A., Kudi A.C. and Loe J.O. 2004a. Influence of level of cotton seed cake in the diet on the feed intake, growth performance and carcass characteristics of guinea pigs in Cameroon. *Tropicultura*. 22(1): 32-39.

[29] Pirigi Bini R., Xiccato G., Cinetto M., Dalle Zotto A. 1992. Effetto dell'età e peso di macellazione e del sesso sulla qualità della carcassa e della carne cunicola. 2. Composizione chimica e qualità della carne. *Zoot. Nutr. Anim*., 18, 173-190.

[30] AFSSA-CNERNA-CNRS, 2001. Recommended nutritional intakes for the French population. Tec. Et Doc, 3è éd. Paris.

[31] WCRF (World Cancer Research Fund / American Institute for Cancer Research), 2009. Food, Nutrition, Physical Activity, and the Prevention of cancer: a Global Perspective. 537p.

International Journal of Innovation and Scientific Research
ISSN 2351-8014 Vol. 34 No. 2 Jan. 2018, pp. 96-102

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

TERRITORIAL DECENTRALIZATION IN THE DEMOCRATIC REPUBLIC OF CONGO: A NEW LEVEL OF DEVELOPMENT OF DECENTRALIZED TERRITORIAL ENTITIES

Christophe LOTIKA MALOMALO

Head of Works at ISTM- Kisangani and Lawyer at the Kisangani Bar, RD Congo

ABSTRACT: Our research is entitled: territorial decentralization in the Democratic Republic of Congo: a new lever for the development of the Decentralized Territorial Entities.
However, in conducting this study, we have pursued the following objectives:- Demonstrate the impact of territorial decentralization on the development of decentralized territorial entities in the Democratic Republic of Congo;- Analyze the factors that will underpin the development of decentralized territorial entities;- Identify practices that block the development process of local entities.
At the end of our investigations, we arrived at the result according to which there are certain practices which hinder local development although the Democratic Republic of Congo has opted for the new management mode which is the territorial decentralization. Finally, in order to conclude this reflection, we felt that, in order for local development to take place within the framework of territorial decentralization, the Congolese political and administrative authorities must change their mentalities in order to trace a new path of development The basis of the other countries of the world.

KEYWORDS: Decentralization, Development, Territorial Entity, Local development, Territorial Decentralization.

1 INTRODUCTION

Decentralization is a form of administrative organization aimed at transferring the decision-making process as close as possible to the citizens. It is the technical process of conferring decision-making powers on autonomous local bodies distinct from those of the State.

Thus, the new Constitution of the Democratic Republic of Congo, as revised by Act No. 11/02 of 20 January 2011 revising certain provisions of the Constitution of the Democratic Republic of Congo, creates a unitary but decentralized state composed of Today of 26 Provinces with free administration and management autonomy, administered by a provincial executive and a provincial assembly. These institutions will be financed by own resources provided by a withholding tax of 40% of national revenue. The State will also count on decentralized territorial entities (DTAs) enjoying the free administration and autonomous management of their economic, human, financial and technical resources as soon as the necessary legal framework is adopted.

Indeed, decentralization is a system of state organizations advocating a more or less extensive freedom of decision-making to local and regional authorities. It is for this reason that local authorities must have legal personality and financial autonomy in order to enable them to have the own resources necessary for their actions. They must also have executive and legislative bodies whose members are to be elected and not appointed by the central government, and must enjoy real autonomy with regard to the central government.

Decentralization thus emerges from the desire to personalize or individualize the interests to stimulate and make profitable the productivity of public services or local entities with a view to improving the living conditions of the population concerned. The latter, for its part, enshrines the role of the citizen in the management of local development through the organs of decentralized territorial entities. Development is understood as a qualitative and sustainable improvement of an economy

and its functioning. It is the combination of the mental and social changes of a population that make it capable of increasing, cumulatively and sustainably, its overall real product.[1]

Despite the division of powers established by the legal texts in the field of development.[2]

The social practice of decentralization in the DRC has shown that the local entities are struggling with the insufficiency of the revenues thus causing the exactions and the malversation.

Our reflection will focus on the following three points: Concept of decentralization in the DRC, the resources of decentralized territorial entities and relaunching the development of decentralized territorial entities.

2 CONCEPT OF DECENTRALIZATION IN THE DEMOCRATIC REPUBLIC OF THE CONGO

2.1 DEFINITION

Decentralization is understood as a form of administrative organization which consists of recognizing the legal personality of communities of interest or of public service activities and then entrusting them with decision-making power in certain matters.[3]

It is also a process of administrative organization which consists in entrusting the management of certain interests to agents who are the organs and representatives not of the central power but of a particular authority, Public body other than the State[4].

Thus, decentralization takes the form of administrative and political structures that preserve the interests of central agents in the remote regions of the capital.

2.2 DECENTRALIZATION: A POLICY OF TRANSFERRING THE ADMINISTRATIVE POWERS OF THE STATE

Decentralization is a possible answer to the question of the distribution of administrative functions between the State and other public authorities[5].

These communities are first recognized as legal entities: they are legal persons under public law and the State delegates to them by a solemn law a certain number of its powers. These powers are exercised autonomously by the said decentralized authorities. Subject to supervisory control: This strange term seems to equate decentralized communities with minors, incapacitated, prodigal or demented[6].

Nevertheless, it should be noted that this transfer of certain territorial powers requires three conditions for its implementation:

First of all, it is necessary to isolate, among the needs to be met by the administration, those which are primarily local in character. It is with regard to these that the transfer of competence may take place. It is excluded, in fact, from seeing the State renounce its decision-making power over regal powers;

It is then necessary to provide local authorities with legal personality and financial autonomy in order to enable them to have the own resources necessary for their action;

Finally, the executive organs of these communities must be elected from among themselves; And that they enjoy a real autonomy with regard to the central power.

[1] BIRANGAMOYA MAKOMBE, ''Décentralization and development in Zaire: the division of powers in development, in Zaire – Africa, N°181, January 1984.
[2] BREMOND, J., and GELEDAN, A., Economic and Social Dictionary, Paris, Hatier, 1990
[3] Microsoft, Encarta, 2013
[4] FLAMME, M.A, Administrative law, Volume I, Brussels, Noisy, 1989
[5] Microsoft, Encarta, 2013
[6] CADART, J., Political Institutions and Constitutionnal Law, Paris, ed Economica, 1990

2.3 DECENTRALIZATION: PRACTICE OF LOCAL DEMOCRACY

It remains clear that a democracy which truly attributes the entire power to the people can not tolerate the formation of a state, a differentiated whole and acting in accordance with its own interests. At best, it has representative institutions, a government to which it agrees to delegate a power it considers to control[7].

This is how the challenges of decentralization in democracy are measured. This will bring the decision-making centers closer to the citizens and thus increase the relevance of the decisions taken, based on a better knowledge of the terrain, avoiding errors due to ignorance of the data specific to local life[8].

However, decentralization can accentuate the natural inequalities between the rich and poor communities at their disposal: geographical location and density of transport networks, level of industrial development, natural resources and an obstacle to effective spatial planning policy[9].

It should be emphasized that control over decentralized entities comes in three forms: hierarchical control, supervisory control and judicial control.

Indeed, it should be noted that hierarchical control is exercised by state leaders over the leaders of decentralized entities, notably by the body of inspectors. It is also exercised by the leaders of the decentralized entities of the higher level on the leaders of the decentralized entities of the lower level through the body of provincial or regional inspectors.

It should be noted that the hierarchical control essentially aims at the better organization and the better functioning of the decentralized entities. In this regard, MULUMBATI NGASHA states that "From this perspective, and from the bodies of inspectors, state leaders provide advice and suggestions to the various leaders of the decentralized entities and the leaders of the higher-level entities give advice And make suggestions to the leaders of decentralized entities at the lower level for better organization and functioning of the decentralized entities "[10].

The supervision of guardianship may concern the acts of the decentralized entities and the organs. Control over acts can be done by authorization or prior approval. Supervisory control allows the State to oversee the development of decentralized entities, sometimes it paralyzes the functioning of the decentralized entities by taking decisions in their place. Supervisory control may also cover the organs of decentralized entities. It is exercised in several ways, including through suspension of the leaders of the decentralized entities.

Judicial review shall be regarded as an action for annulment for over-power in competent courts within the jurisdiction of the authority whose act is the subject of an action[11].

Finally, there are two kinds of decentralization: technical or functional decentralization and territorial decentralization.

Technical or functional decentralization or by service is one whose management of a specific public interest is entrusted to an organically autonomous authority[12].

Here, it is no longer local authorities that manage interests, but organically autonomous authorities.

Territorial decentralization is a form of administrative organization which consists in transferring certain attributions of the central authority, that is to say the State, to other legal entities[13].

Territorial decentralization concerns the territorial subdivision of a State and is based on the distinction between national and local affairs, only the latter falling under decentralization[14].

---

[7] Microsoft, Encarta, 2013
[8] GRAWITZ, M. et LECA, J., Political Science : Political Action,PUF, 1st ed., 1985
[9] Microsoft, Encarta, 2013
[10] MULUMBATI NGASHA, Introduction to political Science, Lubumbashi, ed. Africa, 2006, 2nd edition
[11] MULUMBATI NGASHA, op.cit, p.343
[12] RIVERO, J. et WALINE, J., Administrative law, Paris, Dalloz, 2004
[13] MPINGA KASENGA, Public Administration of Zaire, Paris, A. Pedone, 1973
[14] RIVERO, J. et WALINE, J., op.cit, p.37

Thus, this decentralization is provided for in Article 3 of the Constitution of 18 February 2006 and organized by Organic Law n ° 08/016 of 07 October 2008 on the composition, organization and functioning of decentralized territorial entities and their relationship with the " State and the Provinces, in Journal Official of the Democratic Republic of Congo, No. 49, special issue.

2.4 INTEREST OF TERRITORIAL DECENTRALIZATION IN THE DEMOCRATIC REPUBLIC OF CONGO

Decentralization is advocated for administrations pursuing development objectives, which is understood as a process whereby a community seeks to satisfy the basic needs of the majority of its members by constantly improving their standard of living[15].

The latter has the advantage of bringing decision-making centers closer to local realities, which it allows for a better grasp, against the administrative slowness and ignorance of the local realities characterizing administrative centralization.

Territorial decentralization also makes it possible to involve the citizens in the management of their entity. In this respect, it reflects the democracy which, moreover, is a requirement of all decentralization. Indeed, at the political level, to decentralize is to associate the people in the discussion and management of political affairs at the level that concerns them directly, and finally to promote the political training of the citizen, the elector and the citizen elected[16].

2.5 TERRITORIAL ENTITIES DECENTRALIZED ACCORDING TO THE CONSTITUTION

With a view to its development, the Constitution of the Democratic Republic of Congo of 18 February 2006, as amended and supplemented by Act No. 11/002 of 20 January 2011 revising certain articles of the Constitution of the Democratic Republic of Congo instituted the decentralized territorial entities.

However, Article 3 of the Constitution states that "the decentralized provinces and territorial entities of the Democratic Republic of the Congo shall have legal personality and shall be administered by the local bodies.

These decentralized territorial entities are the city, the commune, the sector and the chieftaincy.

They shall enjoy free administration and autonomy in the management of their economic, human, financial and technical resources.

The composition, organization, functioning of these decentralized territorial entities and their relations with the State and the provinces are determined by an organic law ".

The decentralized territorial entities have legal personality and become autonomous vis-à-vis the central government, as BOB KABAMBA has written: "It is not a form of administrative organization that consists in concentrating public power In the hands of the central government and to assume by it the management of public services through hierarchical agents working under the direct authority of the government and in direct liaison with it, without the power of autonomous management. Nor is it a matter of centralizing public power, for there is no uniqueness of legal personality "[17].

3 THE RESOURCES OF DECENTRALIZED TERRITORIAL ENTITIES

To ensure the development of decentralized territorial entities in the Democratic Republic of the Congo, mobilization of significant financial, economic, human and technical resources will be required.

To this end, CADART states that: 'The financial resources are of four types: own resources, resources from national revenues, resources of the national equalization fund and exceptional resources'[18].

Nevertheless, it will be necessary to analyze these four resources separately as follows:

---

[15] ISSANGO idi WANZILA, « La décentralisation administrative pour le développement, quelques écueils à éviter », in Zaïre – Afrique, n°222, 1988, p.88

[16] VUNDUAWE TE PEMAKO, « Administrative Decentralization for developpement, Some Petifalls toAvoid'', in Zaire- africa, n°222, 1988

[17] KABAMBA, B., Decentralization in Democratic Republic of Congo, available at http://www.social protection03.be

[18] CADART, J., Op.cit, p.63

3.1 OWN RESOURCES

Own resources include:

- Minimum personal interest which is collected for the exclusive benefit of the communes of the sectors or chiefdoms;
- Income from participation, consisting of profits, or income from their participation in capital in public undertakings, semi-public companies and temporary associations for economic purposes;
- Local taxes and charges which include common taxes (such as special road traffic tax, annual licensing fee, various beer and tobacco consumption taxes, area tax on Forest concessions, mining, sales tax on artisanal precious materials, etc.); The taxes specific to each decentralized territorial entity are: taxes levied on local materials not imposed by the central government[19].

3.2 RESOURCES FROM NATIONAL INCOME

Decentralized territorial entities are entitled to 40% of the share of national income allocated to the provinces. However, the distribution of these resources among these entities depends on the production capacity, the area and the population of each of them. And it is the edict that determines the mechanism of distribution[20].

3.3 THE RESOURCES OF THE NATIONAL EQUALIZATION FUND

The Constitution of the Democratic Republic of Congo of 18 February 2006, as amended and supplemented by Act No. 11/002 of 20 January 2011 revising certain articles, established a national equalization fund. This fund is endowed with legal personality. Its mission is to finance public investment projects and programs in order to ensure national solidarity and to correct the imbalance in development between the provinces and among other decentralized territorial entities. It has a budget financed by the public treasury to start from 10% of the total national income returning to the State each year. It is placed under the tutelage of the Government[21].

3.4 EXCEPTIONAL RESOURCES

These resources come from the gifts and bequests that these entities can benefit from. And their value must be entered in receipt to the budget of the exercise of their acceptance[22].

Thus, the development of these decentralized territorial entities would depend on the good management of resources, that is, the channelling of financial resources by the decentralizing and decentralized authorities for the purpose of general interest.

4 ABOUT THE RELANCE OF THE DEVELOPMENT OF DECENTRALIZED TERRITORIAL ENTITIES IN THE DEMOCRATIC REPUBLIC OF DU CONGO

Before addressing this point, it will be better to define the concept of "development", which is understood to be the economic and social transformation of a country induced by its rate of growth[23].

It is also the combination of the mental and social changes of a population that makes it grow cumulatively and sustainably its overall real product.

---

[19] Organic law n°08/016 of 07 october 2008 on the composition, organization and functioning of territorial entities and their relations with the state and the provinces.

[20] Organic law and articles 115

[21] Constitution of 18 February 2006 as amended and supplemented by Act n°11/002 of 20 January 2011 revising certain articles.

[22] Article 118 and 119 of the Organic Law, op. Cit., P.168

[22] Le petit Larousse illustrated, ed. Larousse, Paris, 2014

[23] BREMOND, J., GELEDAN, op.cit, p.339

To trace the itinerary towards its development, the constituent of 18 February 2006, instituted decentralization as a mode of management of decentralized territorial entities. To this end, Article 3 of the Constitution grants legal personality to these decentralized entities (city, commune and chieftaincy), which delegates real power to the local authorities.

It should be noted that decentralization has an impact on the development of decentralized territorial entities as we have listed above, politically, administratively, economically, socio-culturally and legally.

What matters is to analyze these different indicators as follows:

- From a political-administrative point of view, decentralization develops the organization of decentralized territorial entities (ETDs) by promoting the emergence of the rule of law, democracy and the promotion of human rights within the framework of a democracy of proximity. From the administrative point of view, it develops the organization and the management of the human resources of the decentralized entities in the sense that it allows the approximation of the citizens with the administration;
- From an economic point of view, decentralization improves the organization and management of the natural, financial and technical resources of local entities in that it enables local populations and local authorities to take charge of their own needs, Creativity to establish the development of their local entities;
- From a legal point of view, since the local authorities will be elected by the local population, their decisions will be executed without much problem or resistance on the part of the litigants, because the latter (population) accepts their legitimacy;
- On the socio-cultural level, the development of decentralized territorial entities in the Democratic Republic of Congo will also depend on the cohesion of the different members of the local community who know each other and their culture. Decentralization therefore permits the emergence of certain local cultural values, since the decentralized entity becomes a framework for the expression of these values. It also enables culturally and socially marginalized groups to participate in decision-making. To this end, as underlined by the participant's training vademécum in human rights, citizenship and local democracy: "the inclusive participation of all citizens in the work of collective development is a democratic principle at the heart of local democracy"[24].

The development of local entities will be effective when decentralized and decentralized authorities decide to break down all obstacles to its development by using good governance, combating impunity, corruption, tribalism, nepotism, regionalism, Diversion, etc. Which are considered as antivirals, a virus to be eradicated.

In the same vein, LUNDA BULULU paraphrases the following: "The Democratic Republic of the Congo is a state characterized by megestion, misappropriation of public funds on a large scale, corruption practically institutionalized in the public sector, Sanction ".[25]

For the development of the DRC to be carried out on the basis of decentralized territorial entities, economic and social welfare concerns must be internalized by the central and local authorities.

5 CONCLUSION

In order to properly administer or manage the national territory, the grantor of 18 February 2006 chose the decentralization he provided for in Article 3 of the Constitution.

Decentralization, which gives the provinces a central role, will contribute, through a gradual transfer of powers, to the development of local democracy in order to allow the provinces to gradually assume their new responsibilities and to help the administration The public.

Finally, decentralization is not simply an addition of reforms. It is above all a state of mind, a will to go further in the deepening of democracy; Decentralization is the policy that has been chosen by the Congolese constituent and concretized by the legislator in the framework of a policy of redistribution of the administrative competences[26] of the State with a view to good governance and the development of the grass-roots basis. Which underpins the territorial division and the free

[24] Vademecum, Participant Training in Human Rigths, Citizenship and Local Democracy, UNESCO Chain, Kinshasa, February 2006
[25] LUNDA BULULU, V.P, Conducting the first transition in Congo Zaire, Paris, Harmattan, 2003
[26] CONAC, G., Africa in transition to political pluralism, economica, Paris, 1993

administration of provincial and local governments, because democracy and development are the implementation of national and international solidarity, they characterize the system of public companies, Of those who have the concern to cooperate with each other while respecting their differences[27].

REFERENCES

[1] BIRANGAMOYA MAKOMBE, "*Decentralization and development in Zaire*: The division of powers in development", in Zaire-Africa, No. 181, January 1984.
[2] BREMOND, J., and GELEDAN, A., *Economic and Social Dictionary*, Paris, Hatier, 1990.
[3] CADART, J., Political Institutions and Constitutional Law, Paris, ed. Economica, 1990.
[4] CONAC, G., Africa in transition to political pluralism, economica, Paris, 1993.
[5] Constitution of 18 February 2006 as amended and supplemented by Act No. 11/002 of 20 January 2011 revising certain articles.
[6] DEGNI-SEGUI, R., Administrative Law, Abidjan, 1990.
[7] EKILI TABU and OTEMIKONGO MANDEFU, "Zairean administrative decentralization and public finances, the case of the Upper Zaire region", in Zaire-Africa, No. 242, February 1990.
[8] FLAMME, M.A., Administrative law, Volume I, Brussels, Noisy, 1989.
[9] GRAWITZ, M. and LECA, J., Political Science: Political Action, PUF, 1st ed., 1985.
[10] ISSANGO idi WANZILA, "Administrative Decentralization for Development, Some Pitfalls to Avoid", in Zaire-Africa, No. 222, 1988.
[11] KABAMBA, B., Decentralization in the Democratic Republic of Congo, available at http://www.social protection 03.be
[12] Le petit Larousse illustrated, ed. Larousse, Paris, 2014.
[13] Organic Law No. 08/016 of 07 October 2008 on the composition, organization and functioning of territorial entities and their relations with the State and the provinces.
[14] LUNDA BULULU, V.P., Conducting the first transition in Congo Zaire, Paris, Harmattan, 2003.
[15] MADIOT, Y., Techniques of corrections of competences between local authorities, RFDA, 1996.
[16] Microsoft, Encarta, 2013.
[17] MPINGA KASENGA, Public Administration of Zaire, Paris, A. Pedone, 1973.
[18] MULUMBATI NGASHA, Introduction to Political Science, Lubumbashi, ed. Africa, 2006, 2nd edition.
[19] RIVERO, J., and WALINE, J., Administrative Law, Paris, Dalloz, 2004.
[20] Vademecum, Participant Training in Human Rights, Citizenship and Local Democracy, UNESCO Chain, Kinshasa, February 2006.
[21] VUNDUAWE TE PEMAKO, "The Territorial Decentralization of Responsibility in Zaire, Why and How", in Zaire-Africa, No. 166, 1982.

[27] MADIO, Y., Techniques of corrections of competences betwen local authorities, RFDA, 1996.

International Journal of Innovation and Scientific Research
ISSN 2351-8014 Vol. 34 No. 2 Jan. 2018, pp. 103-114

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

PROBLEM OF REPRESSION AND COMPENSATION FOR SEXUAL VIOLENCE IN THE COURTS OF THE DEMOCRATIC REPUBLIC OF THE CONGO: CASE OF THE TRIBUNAL DE GRANDE INSTANCE OF KISANGANIDE FROM 2010 TO 2013

Christophe LOTIKA MALOMALO[1], Martin LIOLONGO LOMALISA[2], Jean-Chrétien INDANI REMO[3], and Jean-Claude NGALIA[4]

[1]Head of Works at ISTM- Kisangani and Lawyer at the Kisangani Bar, RD Congo

[2]Head of Works at ISTM - KISANGANI, RD Congo

[3]Head of Works at ISTM - KISANGANI, RD Congo

[4]Second Mandate Assistant at ISTM – KISANGANI, RD Congo

ABSTRACT: The objectives of this research are to identify the frequency of cases of sexual violence and the proportion of judgments rendered in relation to sexual violence, to determine the frequency of allowances by the number of judgments rendered in relation to sexual violence, Frequency of allowances by number of judgments rendered, executed and the applicability of Congolese laws and finally to highlight the strengths and limitations of the Congolese judicial procedure in matters of sexual violence before the High Court of Kisangani.
At the end of our analysis, we have the following results: several cases of sexual violence were registered before the District Court of Kisangani between 2010 and 2013 when the latter to better deal with all these files.
It should also be noted that there was a lot of campaigning, sensitization financed by the various partners and a repression at the zenith was observed during the pre-election period.
Finally, based on our findings, we also found that victims of sexual violence do not have easy and fast access to the courts. This has led to discouragement by victims who prefer to use customary negotiated solutions.

KEYWORDS: Rape, Sexual Violence, Compensation, Victim, Repression.

1 INTRODUCTION

Sexual violence is not only a serious problem of violations of fundamental human rights, but also a serious public health problem due to the adverse consequences for physical, mental and social health.

However, Africa has experienced many evils on its soil that have struck its population during this contemporary era. These evils included internal and international armed conflicts, which resulted in numerous casualties among civilians in total violation of the Geneva Convention of 17 August 1949.

The Democratic Republic of Congo, has not been spared by this scourge. It is among the African countries most affected by these deadly conflicts. The following statistical studies are eloquent:

- 32,353 cases of rape have been recorded by various structures in the DRC according to statistics carried by the 2008 Humanitarian Action Plan for the Democratic Republic of Congo;

Corresponding Author: Christophe LOTIKA MALOMALO

- 1,200 to 1,600 cases of sexual violence per month were recorded between 1 January and 31 December 2009, including an annual total of 8,000 cases of rape according to the United Nations fund for the population[1];
- 40 women were reported to have been on average daily rape victims in the eastern Democratic Republic of Congo during 2007 according to the report "Combating violence and impunity in the DRC, the experience of the joint Prevention and Response to Sexual Violence ", developed in LUBUMBASHI in June 2007, collecting data collected through provincial synergies and the United Nations Population Fund" UNFPA ".

However, sexual violence has not disappeared, but tends to increase. At present, many efforts are being made by courts and tribunals to put an end to them. Such violence is often the most serious cause of violations of human rights and fundamental freedoms, while almost all states combat their attachment to dignity.

However, all States have an obligation to take all appropriate measures, ranging from prevention to repression and compensation to combat this violence in the Millennium Development Index goal of The elimination of sexual violence as a public health problem.

Indeed, there is already an abundant literature on the problem of sexual violence.

The Association for Cooperation and Research for Development (ACORD) has oriented its research towards protection and reparation for victims of gender-based sexual violence in Congolese positive law and has resulted through its research with the following results:

The appropriation of the laws by the magistrates showed that the conditions of work of the magistrates are not good:

- failure to respect the confidentiality and dignity of victims;
- The delay in the procedure is not respected, the right to obtain the repairs is not respected, the judgment is not respected, the repair part almost non-existent.

Jean TOSSI notes that the amount of the compensation is fixed in the judgment, he claims that the damages must be fixed in such a way that the victim is fully compensated for the damage suffered.

KISEMBO DJOZA, was interested in the strengths and weaknesses of the mediation, the ordering and the penal composition in the repression of the offenses of sexual violence according to the current of victimism centrism. At the end of his research, the author concludes that the fight against offenses of sexual violence in Congolese criminal law through the new paradigms of mediation, composition and penal order remains possible by the fact that these paradigms allow victims to To obtain compensation more easily, quickly and cheaply, not as a result of lengthy trials, but rather as a result of negotiations with the guilty parties under the supervision of the prosecutor.

lastly, MUNTANZINI MUKIMAPA, in her book on the problem of the fight against sexual violence in Congolese law, has resulted in the following results, with regard to the DRC, the recent evolution of sexual violence was no longer limited to War zones, urban centers and adults alone, from now on they were ruralized, feminized and juniorized to the most active sections of our populations. Because of this, they make the country lose the sap necessary for its development.

In view of this grave peril, it is important to make a restrictive and bold legislative reform aimed at ensuring a better involvement of the judicial system for a rigid repression of sexual violence.

2 CONCEPT OF VIOLENCE AND SEXUAL VIOLENCE IN CONGOLESE LAW

2.1 RAPE

Any act of violence by which a person is forced into sexual intercourse or the penetration of a genital organ without the consent of the other party.

Under the new Congolese legislation, it is called rape.[2]

[1] UNFPA, Incident Statistics of Sexual Violence in the DRC, 2009.

[2] Law n ° 06/018 of 20 July modifying and supplementing the Decree of 20 January 1940 on the Congolese Criminal Code, Article 170

The fact, for a man of any age, to introduce no sexual organ, even superficially into that of a woman, or the fact for every woman, whatever her age, to compel a man to even superficially introduce his sexual organ into the body. His;

The fact that every man penetrates the anus, the mouth, or any other orifice of the body of a woman or of a man by a sexual organ by any other part of the body or by any object;

The fact for a person to even superficially introduce any other part of the body or any object into the vagina;

And finally, the fact of obliging a man or a woman to penetrate his anus, his mouth, or any other orifice of his body by a sexual organ, or any other part of the body, by any object, even superficially.

It is clear from these legal definitions that the concept of rape is then broadened. Rape is not only limited to the fact of the intromission of the female genital organ, which widens the scope of this offense and would increase the number of cases of sexual violence.

2.2 SEXUAL VIOLENCE

Lacour Pénale Internationale defines sexual violence as the penetration of any part of the body of the victim or of the perpetrator by a sexual organ or the anal or genital opening of the victim by any object or other part of the body by force, Coercive or put into use coercive context[3].

Sexual violence is of all forms of violence where there is a significant and significant difference between the sexes.

Existing statistics on the subjects show that women are more at risk than men. The most frequent acts of sexual violence are: rape, indecent assault, forced marriage, child prostitution, sexual harassment, the initiation of minors into debauchery, etc.

Women and girls are the most victims of sexual violence, hence the obligation of the Congolese state to protect this vulnerable segment of the population. The Democratic Republic of Congo through the gender, family and child minister, concerned about this situation as part of the efforts to eradicate this scourge, put in place in 2009 the national strategies to combat sexual violence in all its forms Forms.

This strategy is divided into several components:

- Enhancing law enforcement and combating impunity;
- Support for the reforms of the judicial police and the security forces;
- Responding to the needs of victims and survivors;
- The management of data and information related to sexual violence.

However, Article 15 of the Constitution of 18 February 2006 states: "The public authorities shall ensure the elimination of violence, without prejudice to international treaties and agreements, any sexual violence against any person with the intention of destabilizing, To dislocate a family and to make an entire people disappear is a crime against humanity punished by the law "[4].

Respect for international commitments, the fight against impunity and the trivialization of sexual violence are among the reasons for the legislative reform of 20 July 2006 and the adoption of subsequent legislation.

From the legal point of view of sexual violence; It is essentially speaking of the laws[5] that contribute to the fight against this scourge. For this reason we can cite:

- Act No. 06/018 of 20 July 2006 amending and supplementing the Decree of 30 January 1940 on the Congolese Penal Code;

[3] Rome Statute of the International Criminal Court, 2002.

[4] Constitution of the DRC of 18 February 2006 as amended by Act No. 11/002 of 20 January 2011 revising certain articles

[5] Association for Cooperation and Research for Development (ACORD) on Protection and Reparation for Victims of Sexual Violence based on Gender in Congolese Positive Law, Synthesis of an Audit on Judicial Practices in Sexual Violence In the Democratic Republic of Congo, June 2010.

- Act No. 06/019 of 20 July 2006 amending and supplementing the Decree of 6 August 1959 on the Code of Congolese Criminal Procedure;
- Act No. 08/011 of 14 July 2008 on the protection of the rights of people living with HIV / AIDS and infected persons;
- Act No. 09/001 of 10 January 2009 on the protection of the child;
- Law n ° 024/2002 of 18 November 2002 on the Congolese Military Penal Code.

2.3 THE BASIS FOR THE REPRESSION OF SEXUAL VIOLENCE IN THE DRC

The basis refers to the justifications which motivated the legislator to requalify the rape by adding various other incriminations that constitute the offenses of sexual violence.

A new form of large-scale crime has been developed around the world, usually justified by economic, social and political interests, namely sexual violence. The 1996 and 1998 wars in the Democratic Republic of the Congo provoked crimes of all kinds affecting the victims in their dignity, physical and moral integrity, but also in their lives. These acts had to be punished.

There was a need to prevent and severely punish offenses relating to sexual violence and ensure the systematic care of victims of such offenses. In order to do so, it was necessary to revisit certain provisions of the Penal Code to incorporate all the incriminations which international law had criminalized. The amendments deal mainly with the offenses of rape and indecent assault.

One of its investigations, the ICRC found that soldiers had asked women to have sexual relations with them in exchange for a few sous or a box of sardines. Women often sought such an alliance in order to obtain protection and assistance on their own and for their families, preferring to have a relationship with a man who would offer protection and assistance rather than run the risk of being raped Many times by many men.

In addition, various other reports corroborate the need to reclassify rape as such. Indeed, sexual violence is a particularly brutal act. Sexual violence has been used against women or members of their families as a form of torture, causing injuries, extorting information, degrading and intimidating, and as a form of punishment for actual or alleged acts.[6]

It was also used as a means of ethnic cleansing in a given area to respond to terror and force a population to leave an area and as a tool to destroy the identity of an ethnic group through massive and systematic rape And forced pregnancy. Some pregnant women were gunned down by members close to their families, which the assailants described as "mandatory C-section," while others saw their mutilated sexual organs.[7]

"During the conflicts, tens of thousands of women, girls and elderly women were raped, forced into sexual slavery, forced labor, tortured, buried alive or killed. These aggressions of six-year-old girls to 75-year-old women were committed by all the fighting forces "[8].

"According to the reports of the NGOs, all the armed forces involved in the DRC, including the government armed forces, those of Rwanda, Burundi and Uganda have committed acts of violence"[9].

"For some women, the assailants used their genitals to rape them or thrust stones, bits of stick, knives, rusty nails, glasses, bayonets, sharp pieces of wood, sand and chilli In their genitalia. Still others were repeatedly raped in the military camps where they were brought for sexual abuse, cooking and cleaning. "

"Sexual violence against girls and women has resulted in serious physical injuries to victims, according to surveys conducted at the OLAME (Association for Women and Family Activities through Different Services) Center in BUKAVU , Many

[6] MIGABO KALERE, J., Genocide in the Congo? Analysis of massacres of populations, Broederyk Delen, Brussels

[7] AMNESTY INTERNATIONAL, Report of October 2004, available at http://www.amnestyinternational.org consulted on 30 July 2014 at 10.15 am

[8] NDAYA KABULU, A., Congo: The right against sexual violence: What protection for women victims of violence in the east of the Democratic Republic of the Congo with regard to human rights? Report from January to June 2008, available at http: //www.universitédesfemmes.be, accessed on 02 August 2014 at 15 hours 30.

[9] AMNESTY INETRNATIONAL, Democratic Republic of Congo, Sexual violence: urgent need for adequate responses, Amnesty International, 26 October 2004, at http://www.amnestyinternational.org, accessed 30 July 2014 at 11.20

victims of rape suffer from recto-vaginal fistula, vesico-vaginal fistula for other victims, menstruation does not stop and can last for many months.[10] "

In the light of international legal instruments and in accordance with international humanitarian law, such acts are likely to be classified as crimes against humanity or war crimes.

By Decree-Law No. 003/002 of 30 March 2002, the DRC ratified the Treaty of Rome and by Law No. 024 of 18 November 2002 on the Congolese Military Penal Code, it incorporated it into its domestic legal arsenal . Can we, however, consider that there is protection for women victims of such violence? Taking the point of view of human rights defenders. This protection appears insufficient. "The perpetrators remained unpunished until a certain period of time, although the objective of resolution 1325 was to put an end to impunity for gender-based crimes.»[11]

That is why these offenses must be punished by sexual violence in order to discourage the perpetrators.

Finally, these various laws published in the DRC protect the population from all forms of violence, including sexual violence.

3 COMPENSATION IN COMMON LAW AND CUSTOMARY LAW

In its primary sense, compensation is financial compensation intended to compensate for damage.

Indeed, compensation, compensation and reparation are all synonymous, the use of these words refers to all kinds of settlement regardless of the type of damage suffered, be it corporeal, moral or patrimonial or the fact that the sum can find Its cause in a contractual, quasi-contractual or statutory relationship or in a tort situation.

CAPITANT, TERRE and LEQUETTE note that the law can never be considered without taking into account the experimental element which is none other than the sociological mentalities and civilizations of each people, otherwise the law becomes anachronistic and by no means sovereign being centered on Foreign customs and customs.

It is thus fitting to note that a strong social current has crossed civil liability since the drafters of the code of 1804 were concerned with guaranteeing compensation for damages. In this sense, they had introduced a system that in many cases made it easier for the victim to seek redress. In 1804, it was the consecration of the idea of human freedom through individual ownership, the autonomy of the will in contracts and thus also individual commitments in responsibility. This was the first phase.

Thus they have posited as a principle which remains to this day, "civil liability is founded on fault. The victim shall be entitled to compensation only if he succeeds in proving fault on the part of the perpetrator of the damage ". However, with the emergence of machinery and the multiplication of traffic accidents, victims had great difficulty in providing evidence. Indeed, in a society, even following the coexistence of individuals, it is logical and inevitable that the damage will occur.

3.1 CIVIL LIABILITY IN COMMON LAW

Liability literally means "rehabilitating" can be understood as compensation or compensation for injury by the person who is civilly responsible or better such as restoring the balance destroyed by the injury and consisting of replacing, if possible the victim In the situation where it would be if the damage had not occurred.

In its classical acceptance, the concept of reparation refers to that of civil liability, which is the obligation of a person to compensate for damage suffered by others as a result of the event for which he is responsible.

Thus defined, it is opposed to criminal responsibility, which is the obligation to undergo punishment when the social order has been disturbed by its fault.

This remedy can take several of the most common forms of reparation: money or pecuniary compensation that is to say by the allocation of a sum of money or, on the other hand, compensation in kind which is affected by restoring the pre-injury situation.

[10] DOCTORS WITHOUT BORDERS, Operational Section Switzerland, Bunia / ITURI, Annual Activity Report, mid-December 2003
[11] NDAYA KABULU, A., op.cit, disponible sur http//www.universitédesfemmes.be consulting 02 August 2014

3.2 TRADITIONAL CIVIL LIABILITY

In customary law, civil liability is a legal reality that is experienced empirically and reveals whenever there is a problem of compensation for damage. Customary civil liability is therefore the obligation of an individual or his group to repair the damage caused by another person either by himself or by persons with whom he is related or by animals Custody or ownership. This customary civil liability is essentially collective.

The basis of traditional civil liability must therefore be sought in the permanent quest for social harmony, social balance and social solidarity and / or social and class cohesion.

Thus, in traditional societies, damage as well as reparation are not left to the charge of a single individual, even if he is capable, the perpetrator of the damage or the victim of the damage. It is the business of the community, the clan or the community.

4 METHODOLOGY

4.1 METHODS USED

All scientific work requires the use of research methods and techniques.

The guiding principle is that the choice of method depends on the configuration of the survey universe, the orientation of the work, the scope and the scope of the investigation, The researcher's preferences.

Thus, in order to carry out our study, we have found it useful to have recourse to the legal method of analysing and exposing positive law, but also to confronting facts and law. It aims to solve a problem of "dogmatism" or "legal casuistry".

This allowed us to analyze the legal texts (constitution, laws, ordinance, decree - law, order, decree, decrees, etc.) on procedural formalities for the repression and compensation of violence The High Court of Kisangani.

Finally, the sociological approach allowed us to grasp certain social facts related to sexual violence.

4.2 TECHNIQUES

Data Collecting Technique

To materialize this method, data collection was facilitated by the following techniques: documentary technique and interview.

- The first one allowed us to have data through some written documents related to our research. These are the books and any other written material appropriate to this reflection. Thus the reading of official texts, doctrine, better general and specific works as well as consultation of the Internet was indispensable;
- The second, that is to say, the free interview, was very important for our research insofar as it allowed us to talk with resource persons or privileged informants (judges, magistrates, lawyers, legal defenders, Clerks, etc.) who have helped to deepen this research further.

4.3 TREATMENT TECHNIQUE

For this technique, we used content analysis. This consists, according to Madeleine GRAWITZ, in a research technique for the objective, systematic and quantitative description of the manifest content of communications, with the aim of interpreting them.

5 PRESENTATION AND ANALYSIS OF RESULTS

5.1 OVERALL INCIDENCE OF RAPE VICTIMS REGISTERED AT THE KISANGANI DISTRICT COURT FROM JANUARY 2010 TO DECEMBER 2013

Table 1. Inventory of sexual violence cases by year

Année	Fréquence globale	Jugement en cours	Jugement rendus	Cas indemnisés	Cas non indemnisés
2010	149	101	48	8	40
2011	63	35	28	8	20
2012	181	102	79	17	62
2013	166	118	48	19	29
Total	559	356	203	52	151

Source: Registry Viol 2,3 and 4 of the District Court of Kisangani.

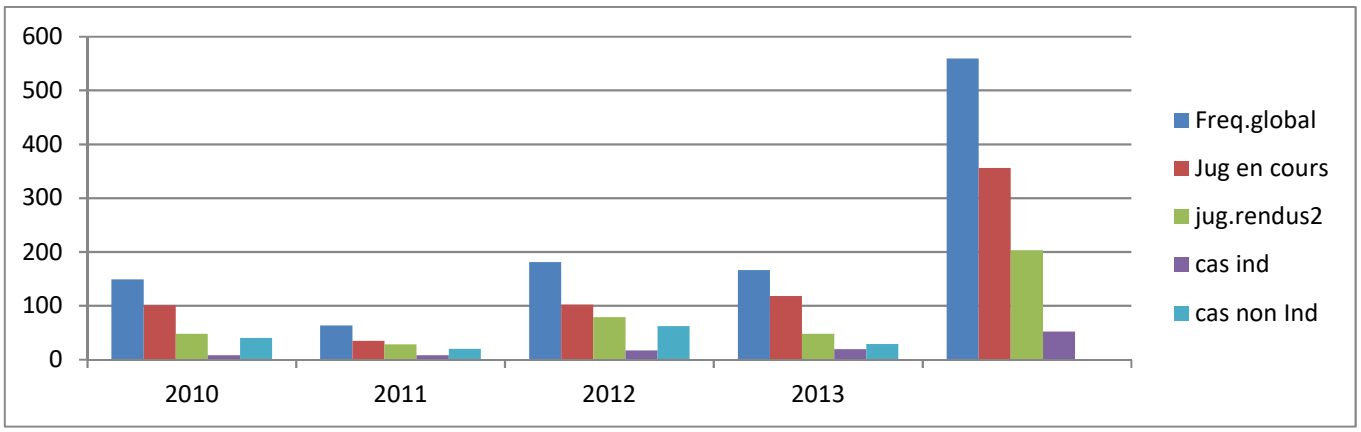


Fig. 1. Hitograms on sexual violence by years

Year Overall frequency Judgment in progress Judgment rendered Cases awarded Cases not compensated

It appears from Table 1 that after the compilation of various data focusing on the overall frequency of sexual violence victims, there was the highest frequency in 2012, ie 181 cases equivalent to 32.3% followed by The year 2013 with 166 cases or 23.2% and 149 cases in 2010 or 26.6% and finally 63 cases or 11.2%.

5.2 FREQUENCY OF JUDGMENTS RENDERED PER YEAR

Table 2. Proportion of judgments handed down

Tableau2 : Proportion des jugements rendus

	Fréquence des jugements		
Année	F. A	F. O	**%**
2010	149	48	32,2
2011	63	28	44,5
2012	181	79	43,6
2013	166	48	28,9
Total	**559**	**203**	**36,3**

Source: Registry Viol 2,3 and 4 of the District Court of Kisangani

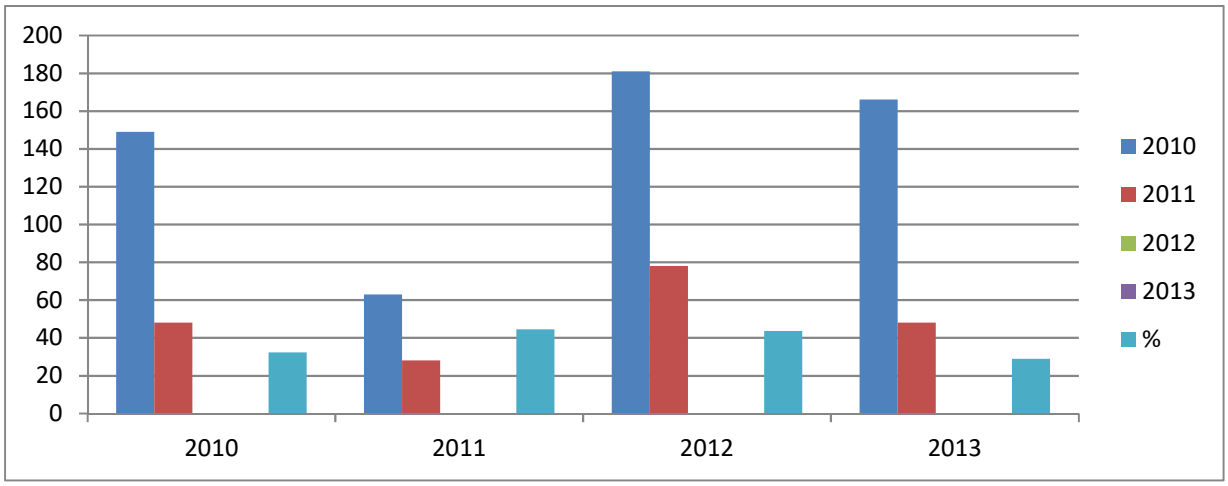


Fig. 2. Histograms on the proportion of judgments rendered

It emerged from the analysis in Table 2 that the proportion of cases of sexual violence per year was higher in 2012, ie 181 cases, including 79 judgments rendered, representing 43.6% in this case in 2011, 63 cases Of which 28 were judged to represent 44.5%.

5.3 PROPORTIONS OF ALLOWANCES BY NUMBER OF JUDGMENTS RENDERED AND EXECUTED

Table 3: Comparison of judgments

Tableau3 : Comparaison des jugements rendus

Année	Jugements rendus	Cas indemnisés	%	Cas non indemnisés	%
2010	48	8	16,6	40	83,4
2011	28	8	28,5	20	71,5
2012	79	17	21,5	62	48,5
2013	48	19	39,5	29	60,5
Total	203	52	25,6	151	74,4

Source: Registry Viol 2,3 and 4 of the District Court of Kisangani

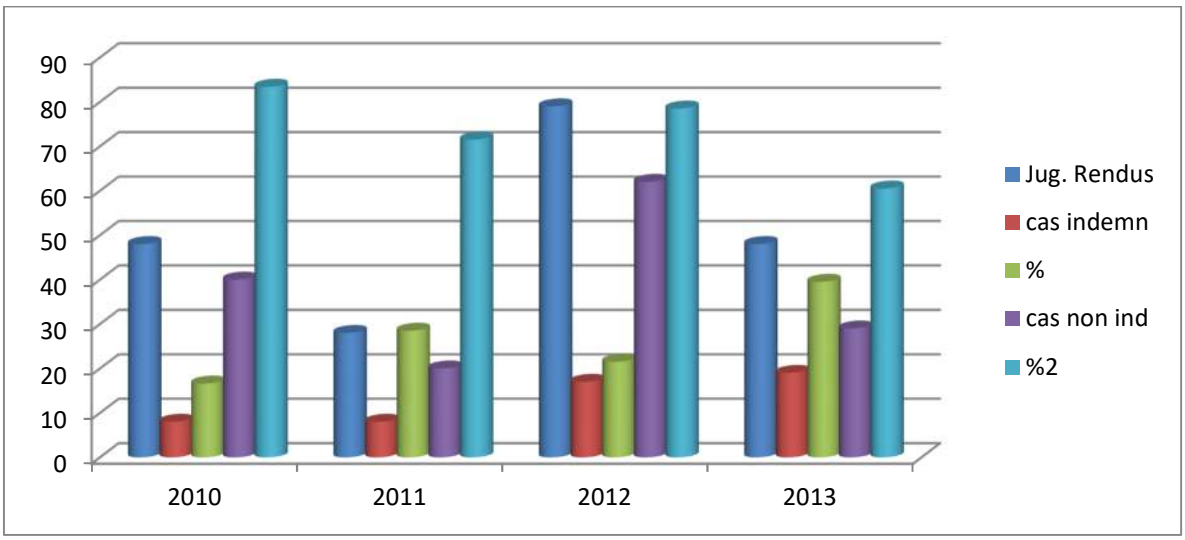


Fig. 3. Histogram on the comparison of judgments

As can be seen from Table 3, the range of judicial texts available to the judge on sexual violence, the number of judgments handed down for all cumulative years was 203 cases out of a total of 559 cases, Only 52 cases were compensated, ie 28.5%, while 151 non-compensated cases represented a high percentage of 74.4%.

5.4 Frequency of outstanding judgments in relation to judgments rendered to the High Court of Kisangani

Table 4 Applicability of the Act

Année	Jugements encours		Jugements rendus		Total
	F.A	%	F.O	%	
2010	101	67,8	48	32,2	149
2011	35	55,5	28	44,5	63
2012	102	56,4	79	43,6	181
2013	118	71,1	48	28,9	166
Total	356	63,7	203	36,3	559

Source: Registry Viol 2,3 and 4 of the District Court of Kisangani

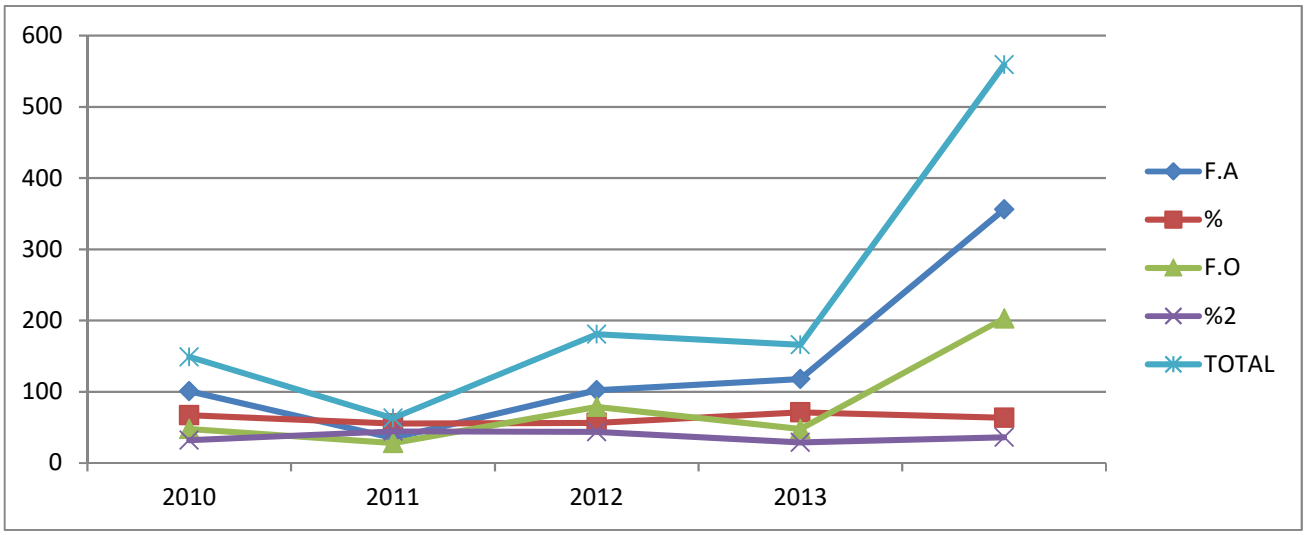


Fig. 4. Curve on the application of the law

The analysis of the various curves on the graph shows that during four consecutive years the Kisangani High Court had received 559 cases of sexual violence, of which 203 had led to the final judgment, ie 32.3% while 356 others Files were outstanding and / or filed without follow-up accounting for 63.7%.

It follows that, whatever the strengths and limitations of the Kisangani High Court in judicial proceedings, the effective and efficient applicability did not reach 50% of the judgments rendered. The curves per year bear witness.

6 Interpretation of results and discussion

6.1 Frequency and distribution of cases of sexual violence

The abundance of files by the judges of the district court of Kisangani did not make it possible to treat all the files better, so it is clear that they would process the files according to the order of preference, therefore several files are in progress; others are classified as non-existent. The distribution of justice at all levels would increase the expediency in the processing of cases by magistrates in order to realize the strengths and limitations of Congolese judicial procedures.

The proof being eloquent, for example only 2013; 166 cases of sexual violence only 48 have reached the judgments and 19 cases have been tried and executed with compensation for the victims. This does not appear to be consistent with the effectiveness and efficiency of judicial proceedings in relation to sexual violence.

Blaise who based his reflection on the legal framework on sexual violence in North Kivu had also found that women are subjected to enormous sexual violence but unfortunately do not win cases in the condemnation of the authors or less in their compensation. This seems to be equally justified in the present case.

6.2 PROPORTION OF JUDGMENTS

The proportion of judgments rendered was higher in 2012, ie 181 cases, 79 of which were judgments, whereas in 2011, 63 cases were registered, of which 28 were judged to be 44.5%. 'Explain that in 2011 there were several awareness campaigns financed by the various partners and a repression at the zenith was observed during the pre-election period.

6.3 FREQUENCY OF COMPENSATION BY NUMBER OF JUDGMENTS

The offense of sexual violence falls within the jurisdiction of the High Court, since its substantive jurisdiction extends to all offenses punishable by 5 to 20 years of criminal servitude and imprisonment.

However, since the number of courts is inadequate and far removed from litigants, victims are very embarrassed by reports of judgments. The table indicates that out of a total of 559 cases, only 203 cases were judged partially, of which 52 were compensated, representing 26.5% for four consecutive years, compared to 151 cases without compensation, ie 74.4%.

These frightening results seem to corroborate those of KISEMBO DJOZA[12] who made the round in courts (Peace Courts of Makiso and Kabondo / Kisangani, Military Garrison Court and High Court / Kisangani from 2006 to 2012) realized that out of 202 judgments 146 cases or 72.2% were not executed against 37 cases representing 18.3% executed totally and only 19 cases of the indemnified among the case

This demonstrates how victims of sexual violence do not have easy and timely access to the courts. This would depend on the discouragement of victims and the use of negotiated customary solutions.

6.4 FREQUENCY OF OUTSTANDING JUDGMENTS IN RELATION TO JUDGMENTS RENDERED, EXECUTED AND THE APPLICABILITY OF CONGOLESE LAWS

The slowness of the Congolese judicial system, particularly in the eastern province, is due to many factors leading to a dysfunction, such as the cost of justice and the corruption of judicial personnel, which means that Congolese justice is no longer Public service, but rather the sanction of the law, but a consumer good, which results from a crisis of confidence on the part of the victims in the judicial system, thus resorting to customary justice which allows the parties to obtain reparation Which is often difficult to obtain by judicial means following the non-execution of the judgments.

7 THE ADVANTAGES AND LIMITATIONS OF JUDICIAL PROCEEDINGS

From a legal point of view, talking about sexual violence is essentially about the laws that contribute to the fight against this scourge and the rules to guarantee the applicability and the effectiveness of the law in this matter. These include:

- Act No. 06/018 of 20 July 2006 amending and supplementing the Decree of 30 January 1940 on the Congolese Criminal Code;
- Act No. 06/019 of 20 July 2006 amending and supplementing the Decree of 06 August 1959 on the Code of Congolese Criminal Procedure;
- Act No. 09/001 of 10 January 2009 on the protection of the child;
- Act No. 024/2002 of 18 November 2002 on the Congolese Miliary Penal Code.

From the analysis of all these laws and with regard to what happens on the ground, we have noted some strength in the Congolese judicial procedure regarding the repression of cases of sexual violence. These include:

- Swiftness in repression, giving urgency to the investigation procedure in the event of flagrantness;
- the abolition of all possibilities of settlement by transactional almond;
- the abolition of the authorization for magistrates and other senior civil servants when prosecuting them for rape;

[12] *KISEMBO D., Op.cit.cit*

- The fact that the Congolese legal arsenal is more or less complete in view of the relatively large number of national laws, international conventions and treaties of which the DRC is a party and which represses sexual violence;
- The fact that the Congolese legislator provides not only penalties for servitudes and fines but also compensation for victims of sexual violence in order to discourage thugs.

It should also be pointed out that, as regards the limits, we have noted the following OBSERVATIONS:

- The very short deadline for handling cases of sexual violence, with the result that the OPJ seized of such a case has the obligation to transfer the file to the Public Prosecutor in 24 hours,
- The obligation to have recourse to a doctor or a psychologist to guarantee legal redress, in particular in the case of an offense committed in a remote corner of the Republic where, for example, it is difficult to find a doctor or a psychologist to To assist the judiciary;
- The insufficient number of magistrates to investigate the many cases of sexual violence.[13]

The debate is, of course, open to this important issue, of which we have contributed only to the outline.

8 CONCLUSION

At the end of our research: "From the repression and the compensation of sexual violence: cases of jurisprudence of the Tribunal de Grande Instance de Kisangani from January 2010 to December 2013", after analysis, we have produced the following results:

- The incidence of sexual violence was very high in all four years and the highest proportion in 2012 was 32.3%, while the lowest proportion was in 2011;
- The judgments rendered and executed were insufficient 36.3% for 4 years;
- The proportion of the recipients was low, ie 26.5%, while the non-compensated 74.6%;
- The applicability of the laws to the judgments in progress and those rendered is not effective and efficient, ie 63.7% against 36.3%.

Finally, in order to preserve families and communities, we suggest the following:

- Real reform in the Congolese justice sector;
- To raise awareness about denunciation of cases of sexual violence and to rehabilitate victims through effective and efficient compensation for the harm suffered.

[13] *Iinterview with Divisional Clerk and Criminal Clerk of the District Court of Kisangani*

REFERENCES

[1] AGREEMENT, synthesis of an audit on judicial practices in sexual violence in the Democratic Republic of Congo, for the effectiveness of the law, June 2010.

[2] KALONGO MBIKAYI, Civil Law of Bonds, PUC, UNIKIN-UPC, FD, 2002-2003.

[3] AMNESTY INTERNATIONAL, Report of October 2004, available at http://www.amnestyinternational.org consulted on 30 July 2014 at 10.15 am.

[4] AMNESTY INETRNATIONAL, Democratic Republic of Congo, Sexual violence: urgent need for adequate responses, Amnesty International, 26 October 2004, at http://www.amnestyinternational.org, accessed 30 July 2014 at 11.20 am.

[5] Association for Cooperation and Research for Development (ACORD) on Protection and Reparation for Victims of Sexual Violence based on Gender in Congolese Positive Law, Synthesis of an Audit on Judicial Practices in Sexual Violence In the Democratic Republic of Congo, June 2010.

[6] CAPITANT, H., TERRE, F. and LEQUETTE, the major judgments of the civil jurisprudence, T2 obligations, special contracts, secured, 11th edition, Dalloz, Paris, 2000.

[7] Constitution of the DRC of 18 February 2006 as amended by Act No. 11/002 of 20 January 2011 revising certain articles.

[8] GRAWITZ, M., Methods of the social sciences, 11th ed. Dalloz, Paris, 2001

[9] KISEMBO, D. The strengths and weaknesses of mediation, order and penal composition in the repression of offenses of sexual violence following the trend of victimism, DES, unpublished, UNIKIS, Faculty of Law, 2013-2014.

[10] DOCTORS WITHOUT BORDERS, Operational Section Switzerland, Bunia / ITURI, Annual Activity Report, mid-December 2003.

[11] MIGABO KALERE, J., Genocide in the Congo? Analysis of massacres of populations, BroederykDelen, Brussels.

[12] MPONGO BOKAKO, Political Institutions and Constitutional Law, Volume 1 "Des", ed. U.A, Kin, 2001

[13] MUNTAZINI, M., The problem of the fight against sexual violence in Congolese law, Media Paul, Kinshasa, 2001.

[14] NDAYA KABULU, A., Congo: The right against sexual violence: What protection for women victims of violence in the east of the Democratic Republic of the Congo with regard to human rights? Report from January to June 2008, available at http: //www.universitédesfemmes.be, accessed on 02 August 2014 at 15 hours 30 '

[15] SHOMBA KINYAMBA, Methodology of research. Strings and data analysis logic, Kin, ed. PUK, 2012.

[16] Rome Statute of the International Criminal Court, 2002.

[17] TOSSI, J., The Civil Law of Obligations in Senegal, New African Edition, Dakar, 1981.

[18] UNFPA, Incident Statistics of Sexual Violence in the DRC, 2009.