International Journal of Latest Research in Humanities and Social Science (IJLRHSS)
Volume 02 - Issue 11, 2019
www.ijlrhss.com || PP. 110-117

Phytogenetic study of dioscorea cultivated in the popokabaka region in the province of bandundu

S. Peta[1]*, J. Kwambanda[1], E. Kidikwadi[1] ; J. Azangidi[1],
T. Ntalakwa [1]; B. Mayanu ; C. Lubini[1]
[1]*Laboratory of Systemic, Biodiversity, Conservation of Nature and Endogenous Knowledge (LSBCSE) / Department of Environmental Sciences, Faculty of Sciences, University of Kinshasa, B.P. 190 Kinshasa X (R.D.Congo),*

Abstract: Sociocultural and economic surveys were conducted on the identification and characterization of edible species of the genus Dioscorea in the Popokabaka region of Kwango province. The purpose of this plant genetic study was to invent species (varieties) of the genus Dioscorea grown by the population living in the Popokabaka region and to assess the importance they place on them in their daily meals. The methodological approach adopted is observation supported by the investigative technique. As a result of this study, the results obtained are : We have identified 14 edible species of the genus *Dioscorea*. Of all, Congolese Guineo species dominate (9 species, or 52.49%), continental Afro-tropical species (5 species, or 29.41%), pantropical species (2 species, or 11.76%) and Afro-Malgache species (one species, 5.88%);*Dioscoreaceae* multiply by tuber head (63%), tuber fragment (18%) and peeling (9%);*Dioscoreaceae* are grown for sale (66%);For more than half of the respondents, 60%, the yam tuber has lower nutritional values than cassava;In the Popokabaka region, precisely the centre and its surroundings, the utilitarian value of *Dioscreaceae*, especially food or nutritional, is unknown because *Dioscorea*are not on the family food list.
Of all the species inventoried, *D.cayenensis, D.rotundata ,D.alata , D.esculenta, D. dumentorum,* and *D.bulbifera* are the most cultivated, preferred and consumed by the local population due to their organoleptic characteristics and their potential performance that is better.
The results of our study can serve as a useful document to begin the phase leading up to a decision-making process in the development, promotion of culture and conservation of *Dioscoreaceae*.

Resume: Des enquêtes socioculturelle et économique ont été menées sur l'identification et la caractérisation des espèces comestibles du genre *Dioscorea* la région de Popokabaka en province du Kwango. Cette étude phytogénétique avait pour but d'inventorier les espèces (variétés) du genre *Dioscorea* cultivées par la population habitant la région de Popokabaka et évaluer l'importance qu'elle accorde à celles-ci dans leurs repas quotidiens. La démarche méthodologique adoptée est l'observation appuyée par la technique d'enquête. A l'issu de cette étude, les résultats obtenus sont les suivants : nous avons recensé 14 espèces comestibles du genre *Dioscorea*. De toutes, les espèces guinéo congolaises dominent (9 espèces, soit 52,49%), les espèces afro tropicales continentales (5 espèces, soit 29,41%), les espèces pantropicales (2 espèces, soit 11,76%) et les espèces afro malgaches (une espèce, soit 5,88%) ; les *Dioscoreaceae* se multiplient par la tête de tubercule (63 %), par le fragment de tubercule (18 %) et l'épluchure (9 %); les *Dioscoreaceae* sont cultivés pour la vente (66 %); pour plus de la moitié de sujets interrogés, soit 60 %, le tubercule d'igname a des valeurs nutritives inférieures par rapport au manioc; dans la région de Popokabaka, précisément le centre et ses environs, la valeur utilitaire des *Dioscreaceae* notamment alimentaire ou nutritionnelle est méconnue car les *Dioscorea* ne figurent pas sur la liste d'aliments familiaux. Des toutes les espèces inventoriées, *D.cayenensis, D .rotundata , D.alata , D .esculenta, D. dumentorum, et D.bulbifera* sont les plus cultivées, préférées et consommées par la population locale suite à leurs caractéristiques organoleptiques et leur potentiel rendement qui est meilleur.Les résultats de notre étude pourront servir de document utile pour entreprendre la phase conduisant à un processus décisionnel en matière de valorisation, promotion de la culture et conservation des *Dioscoreaceae.*

1. Introduction

The Democratic Republic of Congo has a rich biodiversity, but family meals have an increasingly restricted range of foods and eating habits are changing.

Currently, the staple food is cassava (more than 75%) in the DRC, also low in protein, it is a danger to the food security of the people.

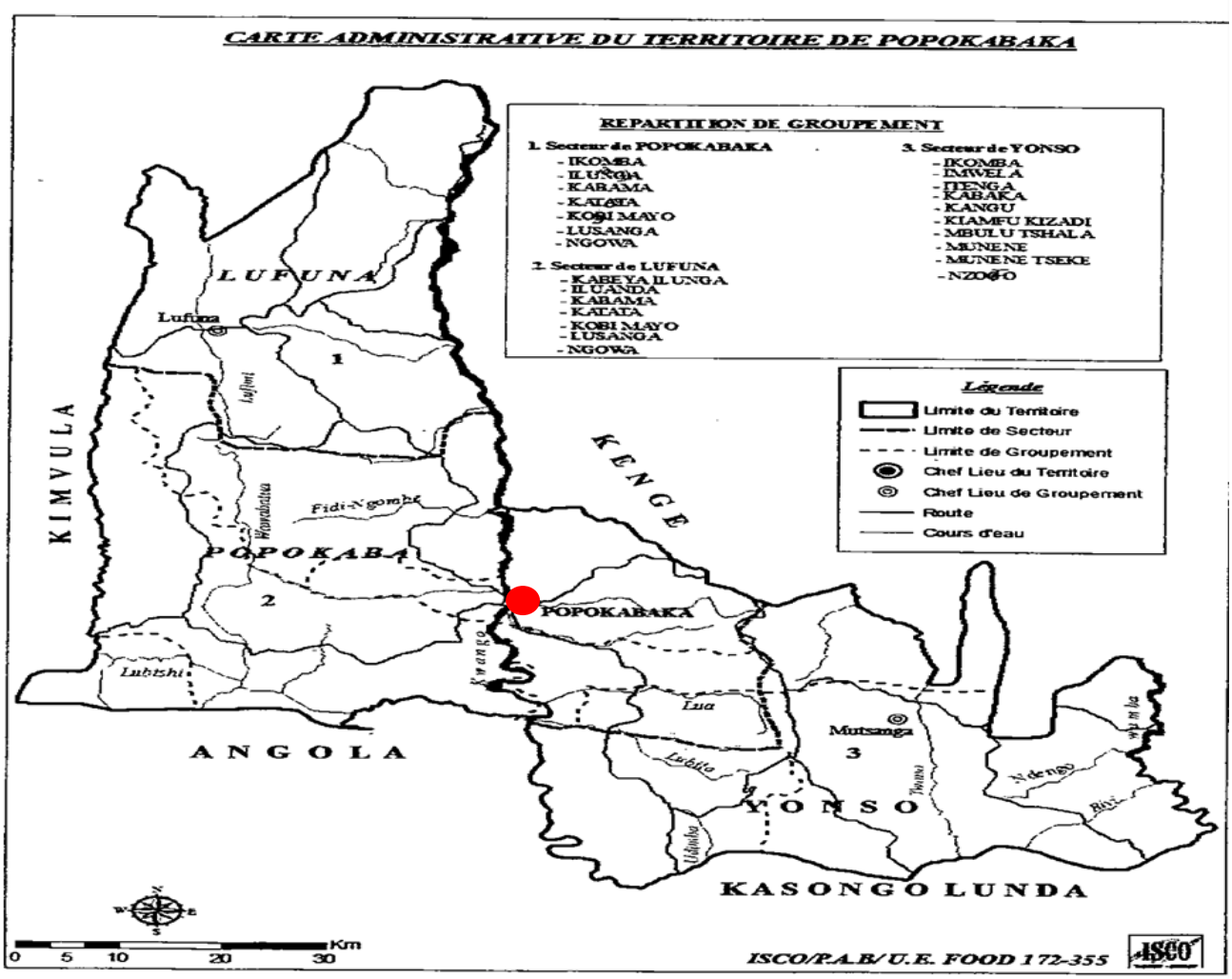
By cons, the Dioscorea are known since ancient times. Found in their natural state, they were the staple food of the populations, especially the forest regions of the DRC, well before the introduction of cassava by the Portuguese (Paulus, 2012)

Indeed, the population living in the region of Popokabaka gives less importance to the regular use of Dioscorea, either in food or in various other uses such as the manufacture of flour.

Despite their nutritional values and favorable ecological conditions in the Popokabaka region, the cultivation and consumption of edible Dioscorea remains marginal.

Thus we undertook an inventory of species and varieties of the genus Dioscorea cultivated by the population Popokabaka and evaluate the importance it attaches to them in their daily meals.

2. Study environment



October 07, 2008 especially in its article 46, paragraph 4 (anonymous, 2014). Its population belongs entirely to the Yaka ethnic group, with the exception of other ethnic groups whose proportion must not exceed 2%. According to Köppen's classification, Popokabaka has a humid tropical climate of the AW4 type characterized by two distinctly clear seasons; one rainy and the other dry (Ntombi, 2014). The rigor of this long dry season is greatly mitigated by a marked reduction in temperature and atmospheric humidity due to the fogs produced by the cold current of the Kwango River. The average annual temperature is 23 ° C and the relief is generally composed of plains, plateaus and valleys as well as hills with steep slopes in which the Kwango, Ngowa and Lwayi rivers lie.

3. Material & Method

The realization of the present study needs in direct observations, surveys and field interviews with the main holders of information on Dioscorea. These are mainly peasants, farmers and the elderly. Extensive bibliographic searches were conducted to complete the useful information. Data collection took place during our

stay in Popokabaka, based on a socio-cultural and economic survey of 130 farmers of Dioscorea (farmers, peasants and old men) around the city of Popokabaka.

For this, a questionnaire on the aspects of consumption, market value, use, food recipes including organoleptic characteristics. Wild and toxic species have not been taken into account because of the objective we have set ourselves. These surveys and interviews were conducted in the following sites: Imbuku, N'kooso, Itsakala, Ikomba, Inzawu, Ingasi, Imbumba, Imbaluma, Makakala.

Most of these sites were selected because of the close relationship between the inhabitants and the surrounding ecosystems. Data on inventoried species, phytogeographic distribution, culture, types of seeds, food recipes are presented in this text in the form of figures and tables.

4. Results

After data analysis, we obtained the following results:

4.1 Floristic List

We recognized 14 edible species of the genus Dioscorea that we identified. Of all species; Dioscorea alata, D. cayenensis Lam., D. dumentorum, D. rotundata and D. bulbifera are the most cultivated. The others have small proportions.

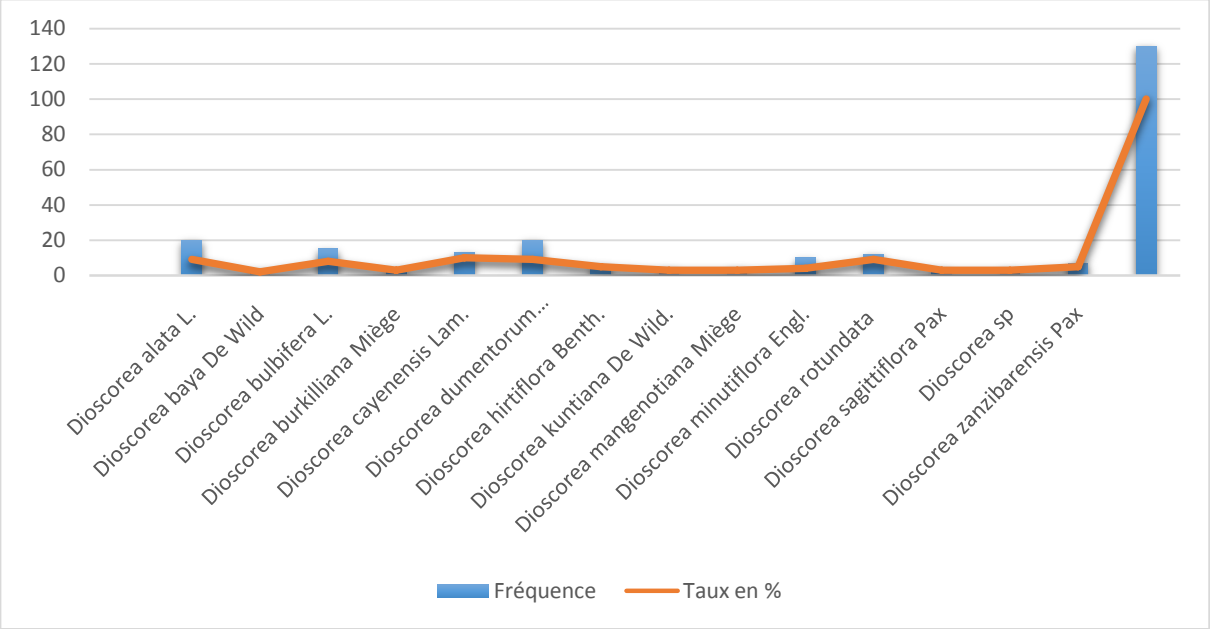


Figure 1. Dioscorea species inventoried in the region of Popokabaka

4.2 Phytogeographic distribution

For phytogeographic distribution we identified the species: Guineo-Congolese, Afro-tropical, Pantropical, and Afro-Malagasy species. The reading of Figure 1 shows the predominance of Guinean-Congolese species (GC) with 47%, followed by continental Afro-tropical species (AFC) 29.4% and Pantropicales (11.8%). The rest of categories poorly represented.

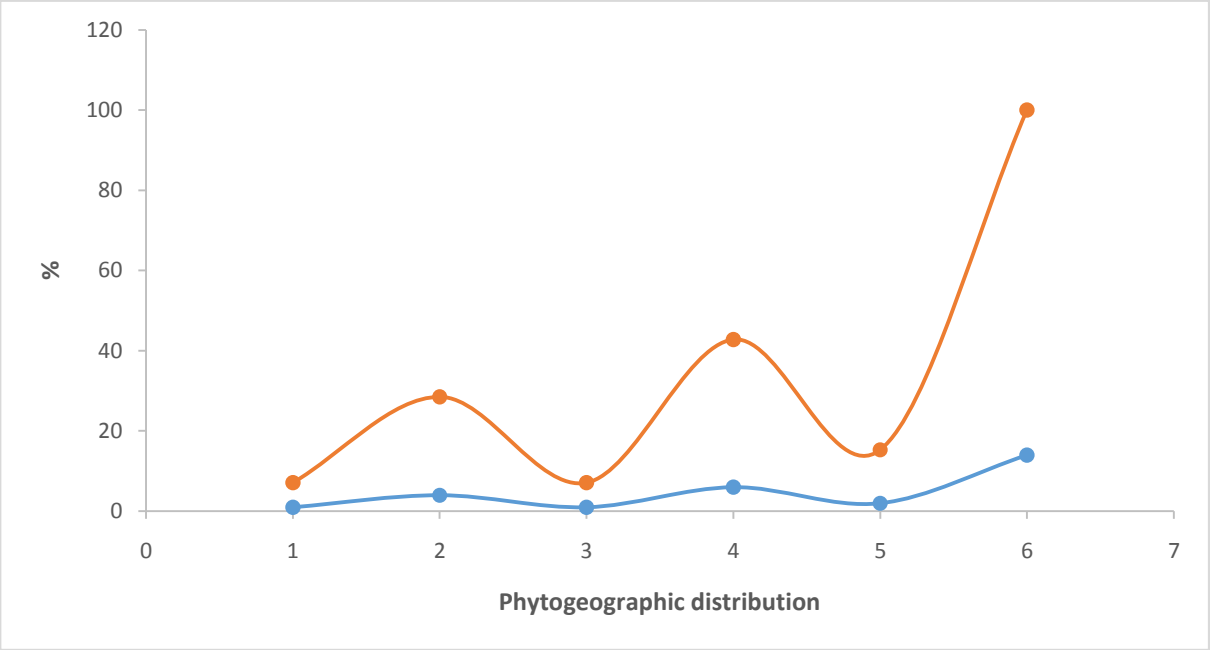


Figure 1. Phytogeographic Groups of Dioscoreaceae of the Popokabaka Region

Caption: AFM: Afro-Malagasy, AT: Afro-Tropical, FC: Central Forestier, GC: Guinean-Congolese, Pan: Pantropical.

4.3 Brief description of the most cultivated and preferred species in the Popokabaka region and their habitat.

The best yield potential and organoleptic characteristics motivate the cultivation of the 6 species of Dioscoreaceae by local communities.

1. Dioscorea Alata L

This species is characterized by green or purple quadrangular stems with four wavy wings. The numerous simple leaves, heart-shaped sagittate with long petioles, are opposed. The stems are vigorous and dexterous. D. alata gives single tubers or compounds weighing 20 kg. The color is usually white, sometimes purple. The species grows best in the tree fallow.

2. Dioscorea Cayenensis Lam

Leaves opposite alternate, heart-shaped, acuminate, light green in color. The flesh of the tubers is usually yellow. The conservation is less good due to a dormancy of reduced duration. The species is better adapted to forest areas with a long rainy season. This species is dexterous.

3. Dioscorea Rotundata

The species is characterized by a cylindrical stem, often thorny and dexterous. The leaves are opposite, simple, cordate, acuminate and dark green in color. The tubers, white in flesh, are generally long and cylindrical, with brown epidermis and rounded ends, can be preserved long enough thanks to a prolonged dormancy. This tuber weighs 2 to 5 kg. This species is grown mainly in regions with a fairly dry season.

4. Dioscorea Esculenta

Leaves alternate, simple, with rounded sinuses with usually a pair of spines at the base. The spiny and cylindrical stem, climbing and sinister. The ovoid tubercles, 15-20 cm long, are numerous. They have a brown and thin epidermis. This characteristic is a disadvantage for their conservation. The flesh is white, slightly fibrous, sweetish taste, without toxicity. This species is coated with a hair visible to the naked eye.

5. Dioscorea Dumentorum (Kunth) Pax

The stems are strong, thorny and senestral. The leaves are trifoliate, it is the only species with compound leaves. Tubers are usually fused and often toxic. The species is coated with a hair visible to the naked eye and is found in the secondary forest.

6. Dioscorea Bulbifera L.

The leaves are big and simple. Round and senescent lianas, the species produces generally toxic aerial bulbs with a weight of about 100 to 500gr. Their flesh has a pleasant taste, but requires a long enough cooking to destroy the toxicity. The conservation is excellent. The species grows best in the landscape remodeled by man, clearings and in gallery forests

4.4. Culture of Dioscorea in the region of Popokabaka

In the region of Popokabaka the Dioscoreaceae are cultivated for sale, the care of the most destitute widowers and widows) and self-consumption. As described in the following figure, culture is more motivated first by the sale which accounts for 66%, then the gift to widows and widowers with 21% and finally self-consumption with a low proportion, or 13%.

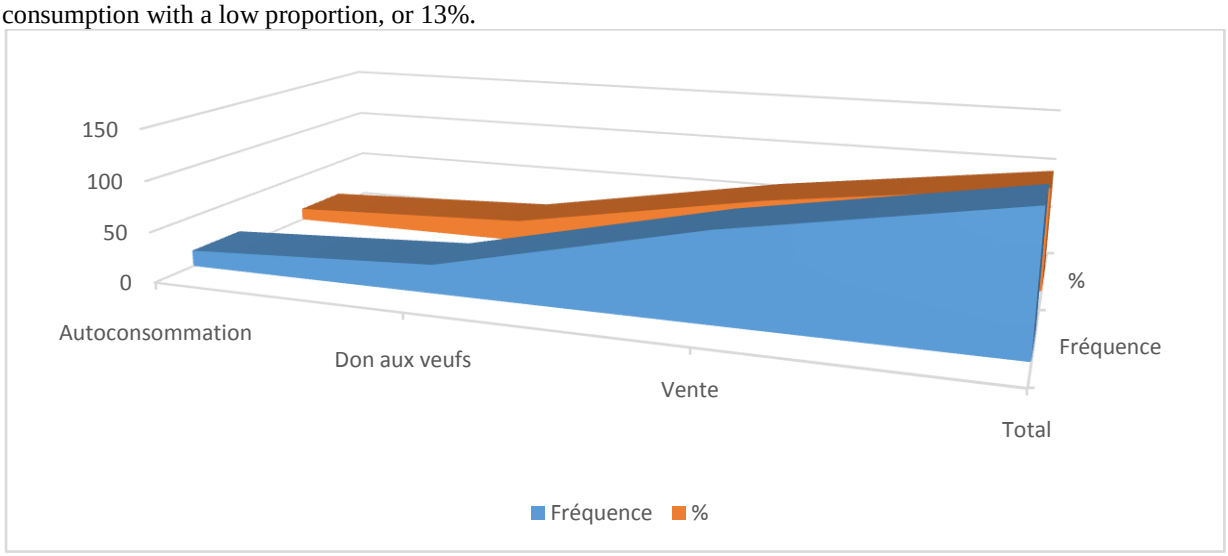


Figure 2. Importance given to the Dioscorea culture in the Popokabaka region

4.5. Types of seeds used for growing Dioscorea in the Popokabaka region

For the reproduction of Dioscoreaceae, the values shown in the following figure indicate that the heads of the tubers are frequently used (70%) in traditional culture.

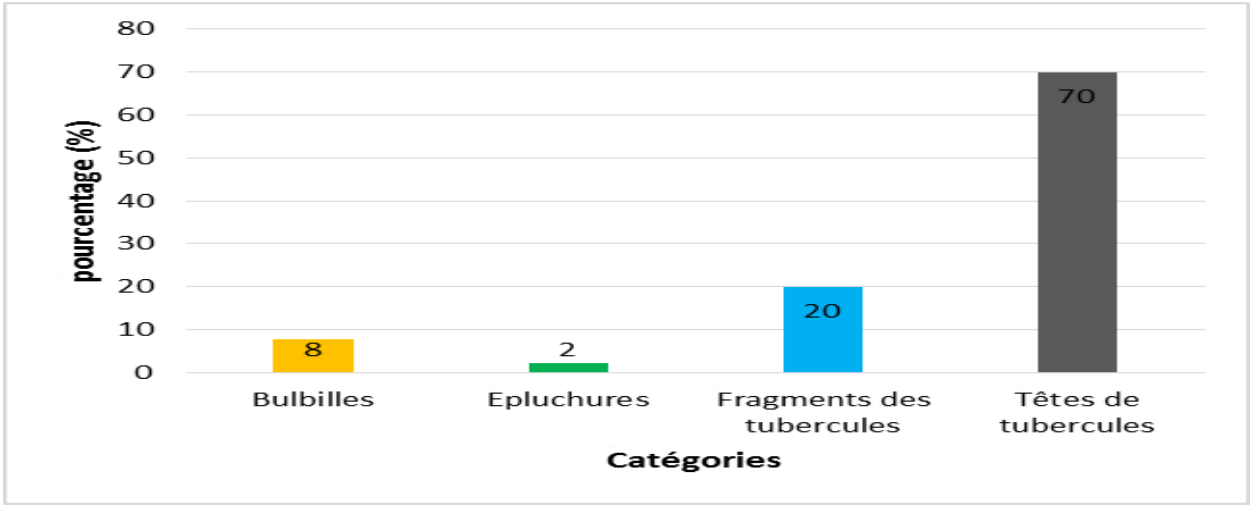


Fig. 3. Types of seed multiplication Dioscorea

Dioscorea food recipes in the Popobaka region

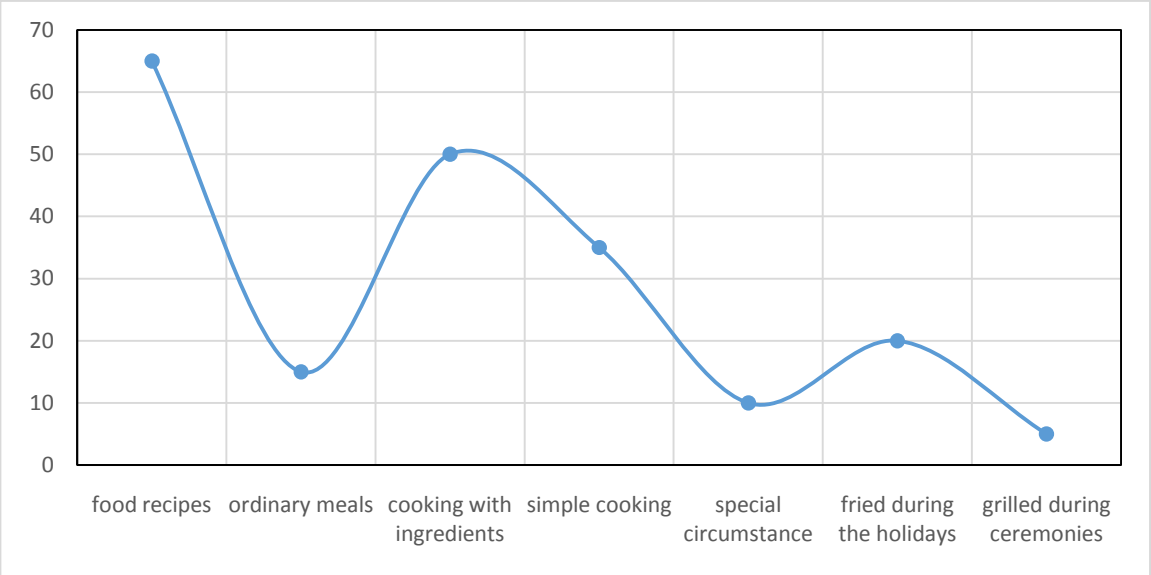


Figure 5 food recipes of species

For food recipes for both ordinary meals and special circumstances: the simple cooking (yams consumed as dessert) dominates, so for this population the dioscorea is considered a dessert. Only 15% consume it as staple food as indicated in Table 2.

4.6. Criteria preference for the consumption of Dioscorea by the local community

Each community has its eating habits. In the study area, it is the taste of the tuber that has the greatest influence on consumption at 53.3%. Sweet-tasting tubers are the most preferred and consumed. Then the color of the flesh of the tuber is a criterion of preference for some (30%) and finally the general appearance of tuber (14.6%). Some people prefer tubers that are familiar to them.

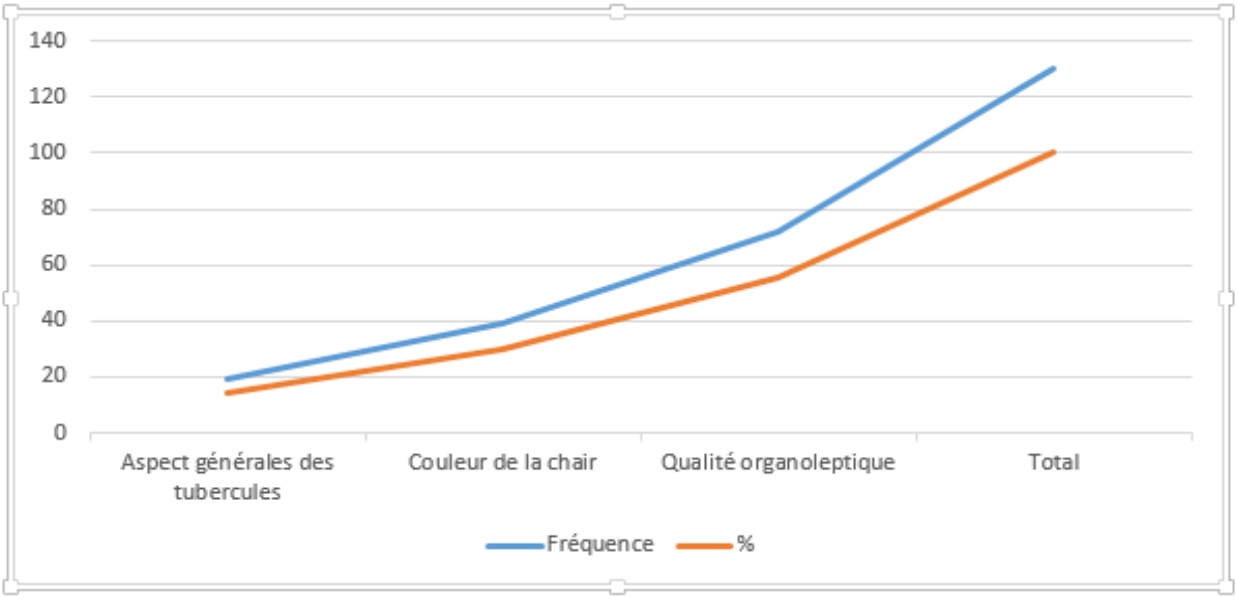


Figure: Dioscorea preferences criterion in the PPK region

4.7. Consumption of Dioscorea by local communities

In the study area, Dioscorea are a dessert compared to cassava, their staple food that they consider rich in protein compared to Dioscorea. Consumption of Dioscorea is occasional (customary marriage, bath of consolation etc.). Only a minority of households eat Dioscorea regularly during the harvest which often cover the months of February and March, May to September in the region of Popokabaka. The characteristics of

Dioscorea that may affect their acceptability by local communities are the general appearance of the tubers, the color of the flesh, the taste and shelf life of the tubers.

The appearance of the tubers is important because it evokes to consumers its past experiences of consumption: these communities generally prefer tubers whose form is familiar to them. For practical reasons, they particularly appreciate those whose shape allows easy peeling.

The color of the flesh is an important preference criterion for local communities: its determinism results from the presence of pigments, mainly carotenoids and glucosides, this is the case of D. alata white flesh sometimes purple, D. Cayenensis chair yellow and D. Bulbifera yellow flesh.

The preservation of the tubers before cooking has effects on the organoleptic qualities. There is an increase in sweetness with storage time. It should be noted that for local communities, bitter-tasting species such as D. Dumentorum, D. buldifera and D. Cayenensis are intended for sale.

5. Discussion

Compared to the results of other authors, Paulus (2010) points out that according to species and varieties, Dioscorea contain up to 8 times more protein than cassava as the FAO has already reported since 1991. Our results on the frequency of consumption of Dioscoreaceae in meals suggest that Dioscorea is not taken into account in dietary habits. This can be justified by ignorance, when one thinks that what is imported is better compared to what is local.

Given the nutritional value of Dioscorea, comparing the results recorded with those of other authors, Mbemba (2013) and Messiaen (1965), highlights the predominance of Dioscorea protein on cassava.

Table 3 compares the protein levels of Dioscorea and Cassava against the responses obtained in this study.

Board. 3 Protein content of Dioscorea and Cassava

Legend: A: relative to the fresh weight, B: relative to the dry weight.

MESSIAEN (1965)					MBEMBA (2013)	
Aliments	Manioc		Igname		Manioc	Igname
Teneur en protéine	A (%)	B (%)	A (%)	B (%)	1,2 g	2,76 g

This table is for information only and the values recorded in it are sufficient proof of the differences between Dioscorea and cassava. Thus, more than half of the surveyed population (60%) fall into ignorance, according to their understanding, the Dioscorea have lower nutritional values compared to cassava.

6. Conclusion

After the inventory of the main Dioscorea species cultivated in the Popokabaka region, we recognized 14 species and 3 varieties of the D. dumentorum species. The results show that indeed in the region of Popokabaka the cultivation and consumption of edible Dioscorea remain marginal. Dioscorea are not taken into account in the Yaka diet. For tubers, the massive dominance of cassava is a real danger. The resulting vulnerability is reflected in alarming levels of food insecurity. In view of all the above, we suggest the following: given the nutritional importance of Dioscorea for the intertropical regions, the census and autoecological study of species of the genus Dioscorea is an important fact to know the species consumed and their availability to popularize: education on improving nutrition; the increase and widening of the Dioscorea market, the on-site processing of Dioscorea flour, the cultivation of improved varieties, the nutritional value and consumption of Dioscorea, the conservation and protection of rare species and varieties, the development of local food resources and rehabilitate agricultural feeder roads.

Bibliographic References

[1]. ANONYMOUS (2011) Annual report of the city of Popokabaka
[2]. BOURRET, D. (1973) Ethnobotanical study of food dioscorea. Postgraduate PhD Thesis, specialty Plant Biology, Par
[3]. F.A.O. (1999) Yam cultivation and use to improve food security, reference text, 1999, F.A.O. Italy.
[4]. I.I.T.A. (1980) Cultivated and wild yams. Printed in France-Jouve, 11, bd de sibastopol, 75001 Paris n0312091 Y, - legal deposit: December 2002.
[5]. MBEMBA, M. (2013) Traditional foods and food from Bandundu in DR. Congo, Directory and composition in nutrients, Harmattan, 5-7, street of the Polytechnic school: 75005 Paris, 317p.
[6]. MESSIAEN, C.M. (1965) "The tropical vegetable garden" 3 special crops, Paris, PUF, pp. 429-454.
[7]. MESSIAEN, C.M. (1965) The tropical vegetable garden. MC MILLAN, 514p.
[8]. PAULUS, J.J. (2010) Advocacy for yams, ed. NGO JEEP, Kinshasa 2010.
[9]. PAULUS, J.J. (2012) Course notes of Ethnobiology and endogenous knowledge, L2 Env., Faculty of Sciences, Dep. of Env., UNIKIN, unpublished
[10]. SERPANTIE G., FILLONNEAU C., GERMAIN N., 1982. Presentation of a study of strategies for the production of peasant farms in the Central Region. Note presented at the GRES seminar "Food crops, a strategic element of Ivorian development" 1983 Act.
[11]. VANDEVENNE R., CASTANIE D., 1985. Growth and development of three varieties belonging to the species Dioscorea cayenensis, D. rotundata and D. alata in Côte-d'Ivoire. 7th Congress of the Soc. Intern. Tropic Tuber plants. (ISTRC) 12 typewritten pages, ed. INRA