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Peasant Perception of Sweet Varieties of Cassava (*Manihot esculenta* Crantz) in the Republic of Congo

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Abstract: Given the negative impacts of the bitter *Manihot esculenta* Crantz varieties on the health of consumers and although retting techniques improve the nutritional quality of these bitter varieties, it is necessary to encourage *Manihot esculenta* Crantz producers to grow also sweet varieties. This study which set the aim of knowing how the farmers producing *Manihot esculenta Crantz* perceive cultivation of sweet varieties in the Republic of Congo, revealed after investigation in the departments of high production of *Manihot esculenta Crantz* that: 95% of the respondents know the sweet varieties and 65% know the negative impacts of bitter varieties However, only 20% make the choice of cultivating sweet varieties compared to 77.5% which would prefer bitter varieties. This attitude is justified by several major constraints such as the sweet taste that exposes these varieties to wild animals (24.7%), susceptibility to pests (31.8%), the short cycle that would justify poor conservation in the soil (29.9%). A low appreciation of products made from sweet cassava varieties is also worth noting (60%). Indeed, the lack of products resulting from the transformation of sweet cassava into products corresponding to the eating habits of the populations and the low appreciation of products such as “chikwangue” and “foufou” resulting from the transformation of sweet varieties of cassava, limit the cultivation from these sweet varieties to a subsistence and non-commercial crop.

INTRODUCTION

Manihot esculenta Crantz is a plant cultivated for its tuberous roots and edible leaves. Cassava roots are a good source of energy, thanks to the quality and quantity of starch ranging from 80-90% that they provide[1]. Cassava is consumed by half a billion people around the world. Tuberous roots are part of the daily diet of >200-250 million people in Africa[2].

Manihot esculenta Crantz exists in sweet varieties and in bitter varieties. Tubers of bitter varieties contain a high amount of cyanide[3].

In Congo the tuberous root of cassava is used in the form transformed in "chikwangue" and "foufou" which constitutes the staple food of the Congolese. It is also used in the raw or uncooked and boiled form[4]. "Chikwangue" is a dense paste produced by wet processing of the retted cassava root. The "foufou" is a lighter paste prepared from the flour of cassava root retted and dried[4].

The presence of cyanide in cassava is one of the problems posed for its direct consumption and is a limiting factor. It is imperative to eliminate this hydrocyanic acid during the different stages of preparation and processing of cassava, even to cultivate only varieties with a lower content of hydrocyanic acid, that is to say the sweet varieties.

A hypothesis has been put forward that these sweet varieties do not meet the usual practices and expectations of farmers during processing.

To better discern this problem, a field survey was carried out in certain farming communities in the departments with the highest cassava production in the Republic of Congo. This study set out to find out how peasant producers perceive sweet varieties of cassava in Congo.

MATERIALS AND METHODS

Equipment: A survey sheet was used for data collection in the field. All of the questions asked revolved around knowledge of sweet varieties and the negative impacts of bitter varieties; the strengths and weaknesses of sweet varieties; the availability of cuttings of the sweet varieties, the main constraints of growing sweet varieties; the appreciation of products made from sweet varieties on the market.

Survey area: The area of investigation concerned three departments of the Republic of Congo namely pool, plateaux and cuvette. The data were collected from the population of peasant localities, namely:

- Department of pool: Locality of yié in Ignié district and Ntoula locality in Goma Tsétsé district
- Plateaux department: Locality of Alouna in the district of Ngo and the locality of Ollombo center in the district of Ollombo
- Cuvette department: Locality of Ately in the district of Boundji and the locality of Allembe in the district of Owando

These surveyed agricultural areas were chosen because of their high productivity in cassava tuberous roots[5].

Target population: The target population is made up of peasant producers from *Manihot esculenta* Crantz from the departments of pool, plateaux and Cuvette, during the period of major cassava production activities, namely the period of the dry season (July-August).

The choice of the producer as the statistical unit made it possible to collect the desired information (information on the cultivation of sweet varieties) by interviewing only the owner of a field in full activity during the survey. There were no exclusion criteria for a producer to be eligible.

Type of survey: This is a cross-sectional sample survey.

Data collection method: Data were collected through questionnaires using the interviewer-assisted method with on-site interview.

Survey frame: In the absence of data on the number of peasant producers of *Manihot esculenta* Crantz, the only information available and usable for the survey was that of the head of the agricultural sector in each district concerned. Indeed, two districts in each of these three departments were chosen because of one locality per district.

Sampling: In order to formulate inferences about the population, taking into account the observations to be drawn from the sample, the type of probability sampling was used in this work and particularly the stratified sampling type. During stratified sampling, the population is divided into mutually exclusive homogeneous groups called strata (departments) and independent samples (localities) are then selected in each stratum.

Sample size: Close of this process, the sample size was 40 producers. This sample made it possible to obtain a reasonable precision of the production of *Manihot esculenta* Crantz given the size of the producer population which cannot exceed twenty in each of the localities.

Conduct of the investigation: The investigation was reported to the administrative services (sub-prefectures, police, village chiefs) and received authorization. To raise awareness among the populations surveyed, meetings with the authorities of the localities to be surveyed took place before the survey was carried out. These meetings made it possible to explain the objectives and the interest of the study as well as the method and criteria for choosing the locality. This process helped to facilitate the different levels of collaboration desired with producers.

The interviews were carried out in vehicular languages (Lingala or Kituba) and sometimes in the vernacular languages using an interpreter when necessary.

Information collected: The identity of the people surveyed and the production methods of *Manihot esculenta* Crantz were assessed by means of a sample questionnaire survey. These were direct and indirect observations, then interviews conducted in the different localities.

The questions focused on knowledge of sweet varieties, preference between sweet and bitter varieties, negative impacts of bitter varieties, cultivation of sweet varieties, products based on sweet varieties, etc.

Data processing and analysis: Sphinx Plus software version 5.1.0.7 was used for questionnaire elaboration, data processing and analysis.

As a prelude to their statistical analysis, the data collected on the survey sheets were entered into the sphinx software. Subsequently, flat and cross tables were generated.

From the flat tables generated, the analyzes were deepened according to the nature of the variable: qualitative (mean and standard deviation, χ^2-test), quantitative (minimum, maximum, mean and standard deviation).

From the cross-tabulations, the analyzes were deepened according to the nature of the variables. The χ^2-test was carried out in order to establish a possible correlation between two qualitative variables. For two quantitative variables, the regression line and the correlation coefficient between the two were determined from a scatter plot. For a qualitative variable crossed over to a quantitative variable, the Analysis of Variance test (ANOVA) was performed supplemented by a comparison of means in the event of significant differences. The results are presented by histograms resulting from the statistical processing.

RESULTS

The results of the survey on the peasant perception of sweet cassava varieties resulting from the statistical processing of data collected from respondents from the different departments are presented by the following histograms:

Knowledge of sweet varieties of cassava: Figure 1a and b, respectively present the results concerning Knowledge of the existence of sweet varieties and the identification criteria for sweet varieties.

Significantly, the majority of respondents (95.0%) say they are aware of the existence of sweet varieties of cassava (Fig. 1a), they would identify them (Fig. 1b) by the color of the often yellow stalk (28%) and the slightly sweeter taste of the tuberous roots (36%).

Regarding the knowledge of the negative impacts of bitter varieties on health, respondents knowing the negative impacts of bitter varieties on human health represent 65% against 27.5% who ignore them (Fig. 2a). The most cited negative impacts are the various diseases. It should be noted that nearly 28.1% of the people surveyed are unable to concretely describe these impacts (Fig. 2b).

Comparison between sweet and bitter cassava varieties: The results on the preferences between sweet and bitter varieties as well as the constraints on sweet varieties of cassava are presented in Fig. 3a and b.

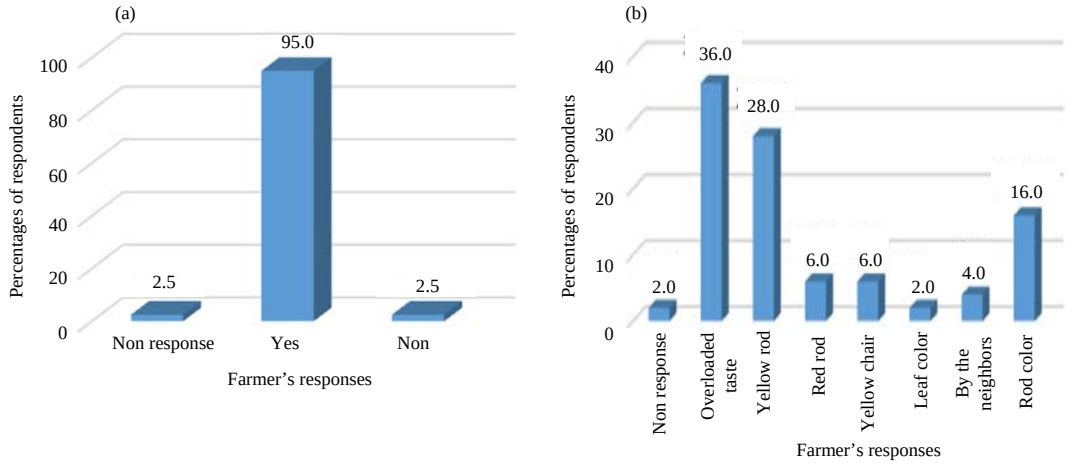

Fig. 1(a, b): Knowledge of the existence of sweet varieties and (b) Criteria for identification of sweet varieties of cassava

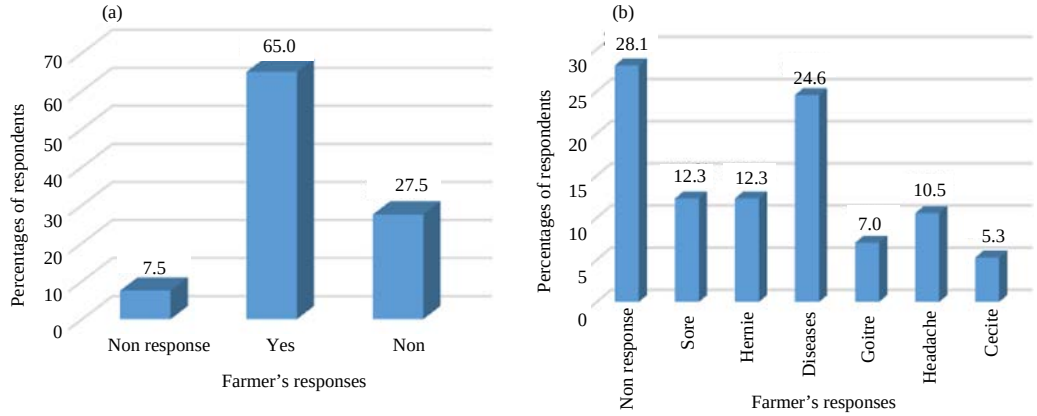

Fig. 2(a, b): (a) Knowledge of the impacts of bitter varieties on health and (b) Negative impacts of bitter varieties on health

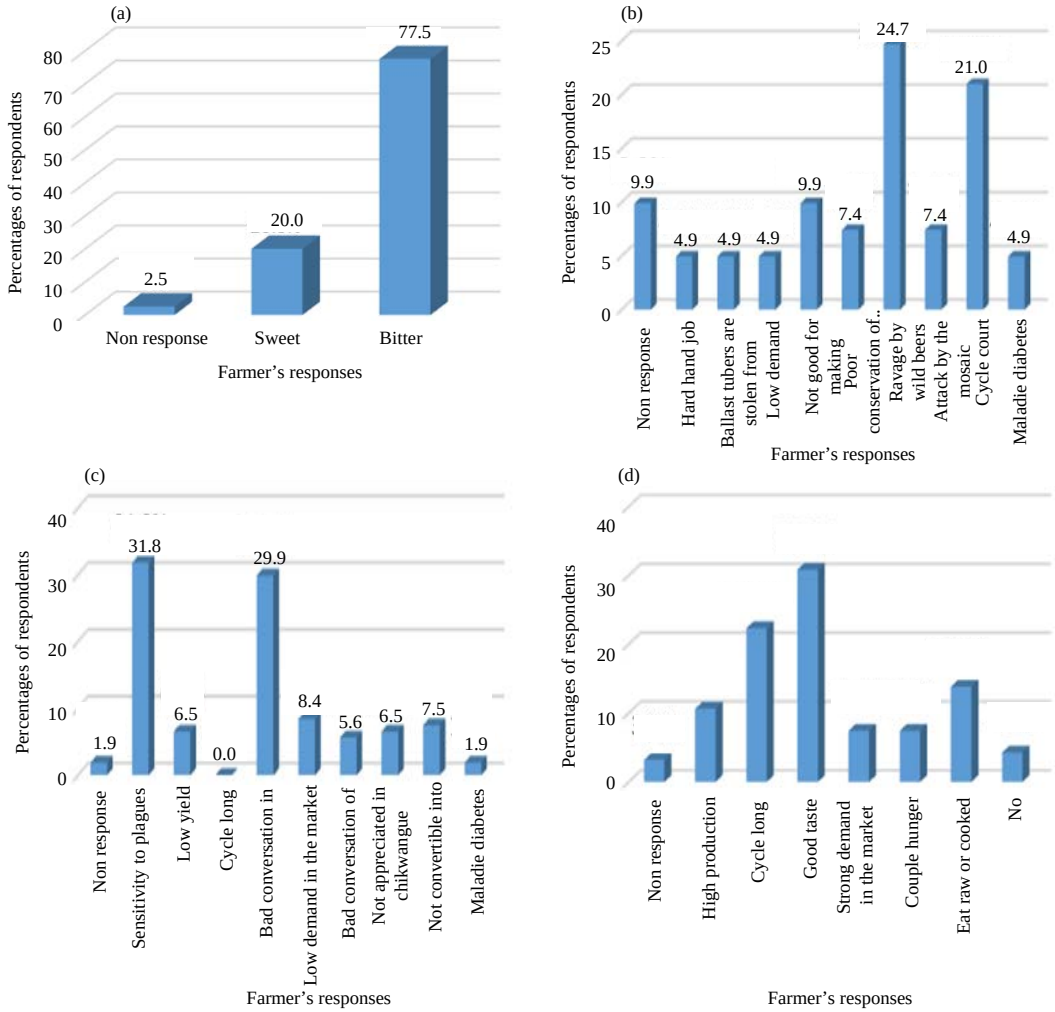

Fig. 3(a-d): (a) Preference between sweet and bitter varieties, (b) Constraints on sweet cassava varieties, (c) Weak points of sweet cassava varieties and (d) Strong points of sweet cassava varieties

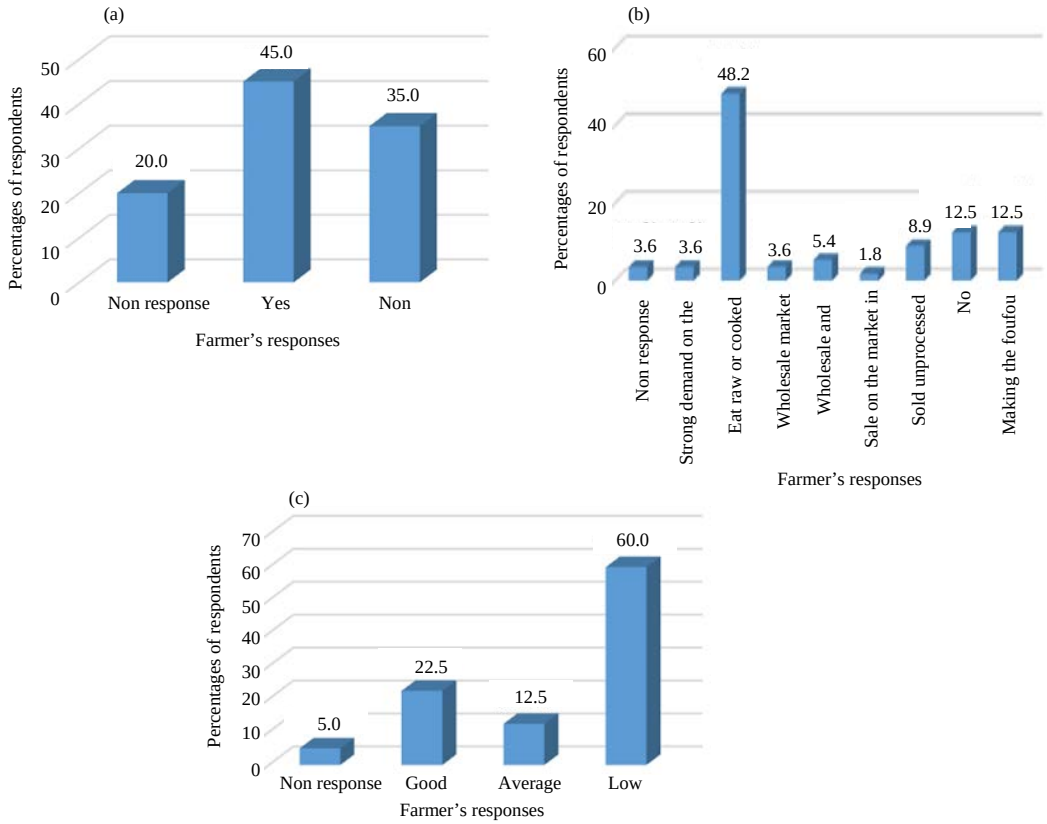

Fig. 4(a-c): (a) Acceptance to plant sweet varieties of cassava, (b) Uses of sweet cassava varieties and (c) Appreciation of products based on sweet cassava varieties

When asked about their preference between sweet and bitter varieties, the strong majority of respondents (77.5%) opt for the latter (Fig. 3a). Only 20% choose the sweet varieties. The difference with the reference distribution is very significant (χ^2 = 36.95, df = 2.1, p≥99.99%).

Indeed, major constraints are significantly reported (χ^2 = 36.65, df = 9.1, p = 99.99%) on sweet varieties by the people surveyed (Fig. 3b). This is because they are ravaged by wild animals, particularly rodents (24.7%) and often have a short cycle and therefore do not keep well in the ground (21.0% of respondents) (Fig. 3b).

Strengths and weaknesses of sweet cassava varieties: The reasons for choosing between sweet and bitter varieties are diverse, given the strengths and weaknesses of each group.

Figure 3c and d show that for the people surveyed, the sweet varieties are sensitive to pests and keep poorly in the ground but they have a pleasant taste and a short cycle.

Appreciation of sweet varieties of cassava: Figure 4a-c give the results on the assessment of sweet varieties as well as the products resulting from their processing. Regarding the acceptance of planting cuttings of sweet cassava varieties (Fig. 4a), 45.0% of respondents say they are interested compared to 35% who are not. The difference with the reference distribution is not significant (χ^2 = 3.80, df = 2.1, p = 85.04%).

The uses of sweet cassava are multiple according to the people surveyed (Fig. 4b) but the one that stands out significantly (χ^2 = 84.46, df = 8.1, p≥99.99%) concerns the use in human food raw or cooked (48.2% of respondents) against 12.5% of respondents for the manufacture of foufou.

Sweet cassava products do not seem to be popular on the market (60%) (Fig. 4c) with significant differences (χ^2 = 28.60, df = 3.1, p≥99.99%)

The presence of sweet varieties of cassava in the field is confirmed by 52.5% of respondents (Fig. 5a). The different cultivars mentioned are: 277, yellow tuber, Poutou 0029, Mboto, Mouambalé, Adele and 6 months. The Mouambalé variety (11.8% of respondents) is the most cultivated, followed by the Mboto, Adele and 6 month varieties (9.8% of respondents for each of these varieties) (Fig. 5b).

Figure 6a shows that the sweet varieties of cassava are only grown on small areas ranging from a few feet in the majority of cases (25% of respondents) to 2 ha (2.5% of respondents). The difference with the reference distribution is very significant (χ^2 = 91.81, df = 6.1, p≥99.99%). The reasons for non-cultivation of sweet varieties are reported in Fig. 6b and 3c.

Seed system: In Fig. 7a are given the responses of the persons surveyed on the availability of sweet cassava cuttings and in Fig. 7b the origin of these cuttings.

A high availability of cuttings of sweet cassava varieties is reported by the people surveyed in all the districts. About 27.5% of respondents consider this availability to be average and 27.5% consider it easy (Fig. 7a). Only a very small proportion of respondents (12.5%) consider this availability to be rare.

The difference with the reference distribution is not significant (χ^2 = 5.50, df = 4.1, p = 76.03%). Thus, cassava producers in the surveyed districts obtain their cassava cuttings mainly from other producers (Fig. 7b). The difference with the reference distribution is very significant (χ^2 = 56.67, df = 7.1, p≥99.99%).

Figure 8a shows that the majority of respondents (62.5%) recognize significantly (χ^2 = 15.35, df = 2.1, p = 99.95%) never having bought sweet cassava cuttings to put in place their cassava field.

Furthermore (Fig. 8b), in the opinion of the respondents, sweet cassava producers do not benefit from donations of cuttings from any structures whatsoever (65% of respondents). Only 27.5% of these have a contrary opinion. The difference with the reference distribution is very significant (χ^2 = 20.45, df = 2.1, p≥99.99%).

Abandonment of sweet varieties of cassava: The results of Fig. 9a show that in the districts visited, producers report cases of sweet varieties of cassava that are no longer cultivated (15.0%). The difference with the reference distribution is very significant (χ^2 = 35.45, df = 2.1, p≥99.99%).

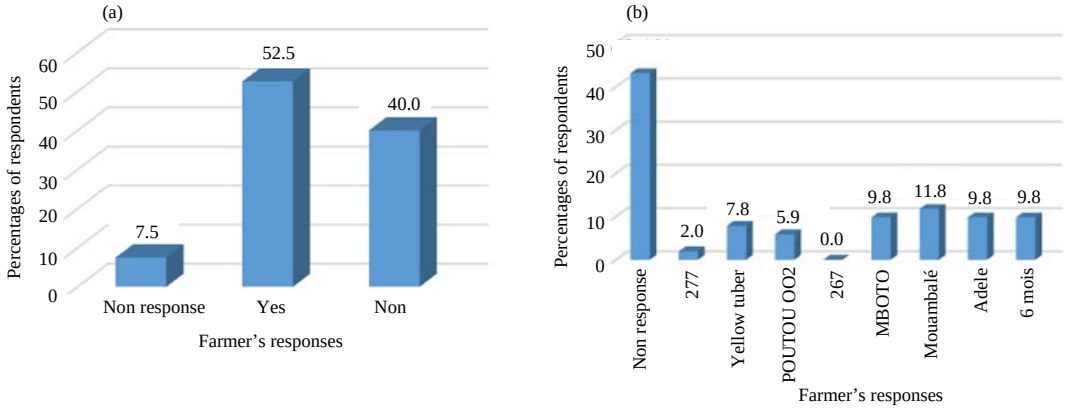

Fig. 5(a, b): (a) Presence of sweet varieties in the field and (b) Cultivated sweet varieties

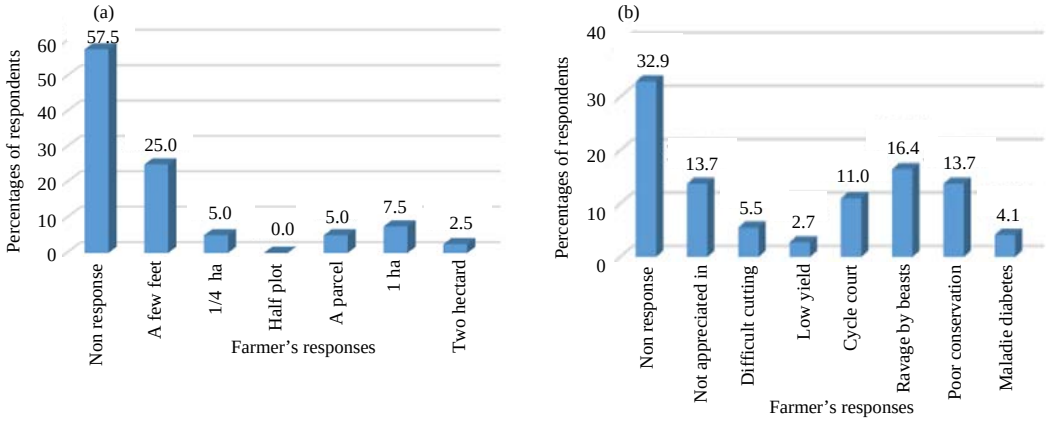

Fig. 6(a, b): (a) Cultivated area of sweet cassava and (b) Reasons for not growing sweet varieties of cassava

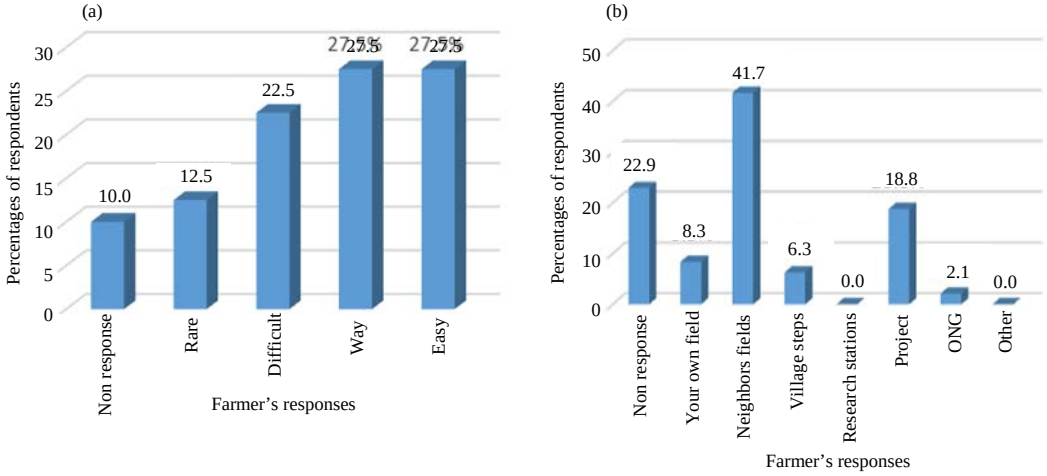

Fig. 7(a, b): (a) Availability of sweet cassava cuttings and (b) Origin of sweet cassava cuttings

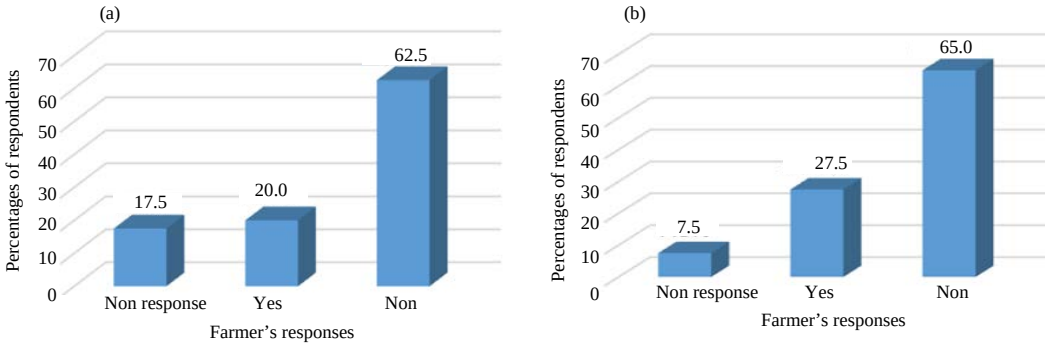

Fig. 8(a, b): (a) Purchase of cassava cuttings for planting and (b) Earlier receipt of cuttings from sweet varieties

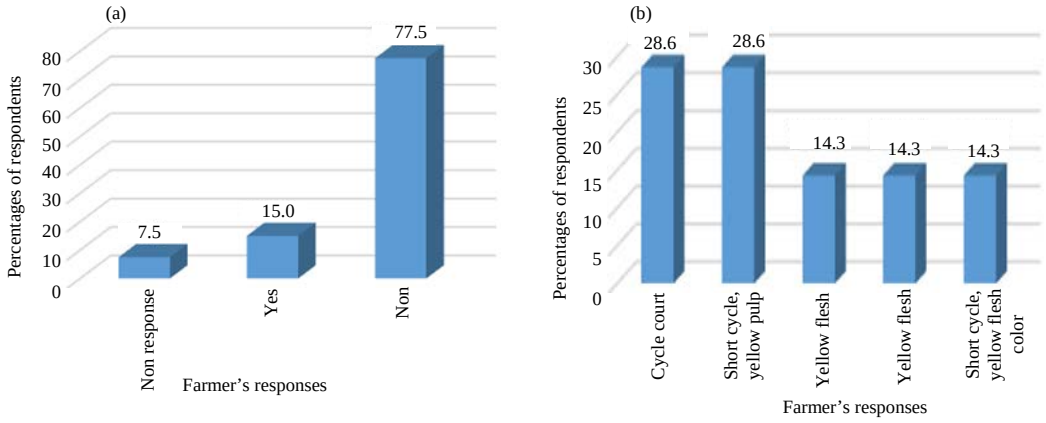

Fig. 9(a, b): (a) Abandonment of sweet cassava varieties and (b) Reasons for abandoning sweet varieties of cassava

Two major reasons are advanced by cassava growers to explain this situation: the short cycle, the yellow color of the tuber not very suitable for "chikwange" and "foufou" (Fig. 9b).

DISCUSSION

On the assumption of suggesting to the farmers to also cultivate low cyanide varieties or sweet varieties, it

was necessary to know the opinions or the problems of the farmers on the sweet varieties in Congo Brazzaville.

It emerges from these results that farmers significantly prefer bitter varieties (Fig. 3a). Many reasons have been mentioned by the latter to justify their choice. Sensitivity to plagues, ravages by wild animals, constitute a problem of non-cultivation of sweet varieties in the peasant environment.

The same observation was made by the FAO[6] on the cultivation of cassava in the countries of sub-Saharan Africa. Poor conservation in soil, the short cycle of sweet varieties is also a problem of refusal of sweet varieties in the farming environment, especially since 91.8% of sweet varieties have a maturity period of <11 months[7]. The same observation was made in Togo by Kombote *et al*.[8] who found among the interviewed producers, 38% chose cassava varieties with 6 months of production cycle and 48% of cassava varieties with 12 months of production cycle. Older work by Empaire *et al*.[9] goes in the same direction by showing that the choice of varieties is part of production strategies that favor food security in a context of extreme mobility of individuals in multiple activities.

In Congo Brazzaville, the products resulting from the processing of cassava tuberous roots are “chikwangue” and “foufou”. Bitter cassava tuberous roots are more valued in processing into “chikwangue” and “foufou” than sweet cassava roots. The latter are eaten raw or cooked. They are not processed, as the products resulting from the transformation of sweet cassava roots into “chikwangue” and “foufou” have a low market appreciation (Fig. 4b and 5c). The lack of processed products made from sweet cassava roots corresponding to the dietary habits of the Congolese means that the sweet cassava root is not appreciated by peasant producers.

Because of its sweet taste, sweet cassava root is eaten raw or boiled in water and is therefore a subsistence crop, not a commercial one. Its high water content does not allow it to be kept fresh for at least two weeks and cannot enter the commercial circuit. Therefore not being cheap, it allows Congolese cassava producers not to appreciate it, unlike the bitter variety which can be transformed into “chikwangue” and “foufou”.

CONCLUSION

The survey on the peasant perception of sweet varieties of cassava among Congolese producers, showed that the latter are familiar with sweet varieties. However, they prefer bitter varieties without ignoring their negative impact on health. The lack of interest in the cultivation of sweet varieties is dictated by several reasons, the most significant of which are: the short cycle which does not allow the tuberous roots to be preserved in the ground, devastation by wild animals, the lack of sweet cassava processing products corresponding to the eating habits of the populations but also the low appreciation of products such as “chikwangue” and “foufou” resulting from the transformation of these sweet varieties. It therefore seems obvious that technological research on the transformation of sweet cassava into other new products which may correspond to the dietary habits of the populations, could bring greater interest to the cultivation of sweet cassava.

REFERENCES

01. Zannou-Tchoko, V., L. Ahui-Bitty, K. Kouame, K. Bouaffou and T. Dally, 2011. [Use of germ corn flour source of alpha amylases to increase the energy density of weaning porridge based on cassava and its derivative, Attieke (In French)]. J. Applied Biosci., 37: 2477-2484.
02. Harimalala, M.A., 2012. [Molecular epidemiology, genetic and phylogeographic diversity of begomoviruses responsible for cassava mosaic disease in Madagascar]. Food and Agriculture Organization, Rome, Italy. (In French)
03. Janssens, M., 2001. [Tuberous Plants]. In: Agriculture in Tropical Africa, Raemaekers, R.H. (Ed.). DGCI, Direction Generale de la Cooperation Internationale, Bruxelles, Belgique, pp: 195-217 (In French).
04. Treche, S., R. Tchiloemra-Poba, G. Gallon and J. Massamba, 1995. [Factor of Variation in the Quality of Cassava Flour Traditionally Produced in Congo]. In: Cassava Food Processing, Egbe, A.T., A. Brauman, D. Griffon and S. Treche (Eds.). ORSTOM Publisher, France, pp: 450-459 (In French).
05. OTF., 2009. [Study on agricultural marketing and investment in the domestic private sector: Cassava in the Republic of Congo]. The World Bank, Brazzaville, Congo. (In French)
06. FAO, 2014. [Farmer Field School on Cassava, Resources for Facilitators in Sub-Saharan Africa]. Food and Agriculture Organization, Rome, Italy, Pages: 233 (In French).
07. Mbuyamba, F., 2011. [Determinants of the Adoption of Improved Cassava Varieties]. In: Contribution to Food Security on the Plateau, Batekeen, R.D.C. (Ed.). Universite Protestante au Congo, Kinshasa, Democratic Republic of the Congo, pp: 1-3 (In French).
08. Kombote, K., C.P. Kpade, M. Edah, E.L.Y. Loko, R.A.F. Adjatin and A. Dansi, 2016. [Preference and factors of choice of cassava varieties (Manihot esculenta Crantz) in Togo (In French)]. Agronomic Res. Bull. Benin, 1: 1-27.
09. Emperaire, L., F. Pinton and G. Second, 1998. [Dynamic management of cassava varietal diversity in the North West Amazon (In French)]. Nature Sci. Societes, 6: 27-42.