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Original Research Article

Assessment of Phytogenetic Resources of Chili Pepper (*Capsicum annun* L.) in Yaounde-Cameroon and their Supply Areas

Likeng Li Ngue Benoît-Constant[1,2,3], Ngalle Hermine Bille[1], Molo Thiery[1], Madeunou Nkouekeu Olga Laure[2], Ntsomboh-Ntsefong Godswill[1], Ndiang Zenabou[4*], Kengne Notong Jules Léa[2], Bell Joseph Martin[1]

[1]Laboratory of Genetic and Plant Improvement of Department of Plant Biology, Faculty of Science, University of Yaounde I, Po. Box. 812, Cameroon
[2]Higher Institute of Agriculture for the Management of Vocations of Production. Po. Box. 11984 Yaoundé, Cameroon
[3]Higher Institute of Agriculture and Management of Obala. Po. Box: 233 Obala, Cameroon
[4]Plant Biology and Physiology Laboratory, Department of Botany, Faculty of Science, University of Douala, Po. Box. 24157, Cameroon

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Abstract: A survey was performed in order to characterize the available phytogenetic resources of Chili pepper (*Capsicum annun. L.*). A sample of one hundred and twenty-six (126) individuals was used in the study. They included 85 traders, 25 producers and 16 seed promotion institutions from Yaounde, (Cameroon) and its supply areas. Respondents described eighteen varieties of pepper by production zones (12.91%) and colours (19.35%), while 65.59% of the respondents have no idea of the varieties marketed. Most of the pepper sold in the market, generally comes from areas such as Foumbot (25.71%), Bangante (13.33%), Okola (8.57%), Mbouda (6.97%), Mfou (5.71%) and unknown origin (21.9 %). The pepper is taken out of their production areas without any varietal identity, due to negligence on the part of producers, who buy 30% of the seedlings from the market, or extract their own seeds (42.5%) without prior identification of the variety. This leads to the loss of the genetic resource, despite the presence of several marketing structures with several well-known varieties. The lack of proper characterization leads to erosion of the pepper plant genetic resources in Yaounde and its supply areas. Added to this is the lack of interest of sellers, the high price of seeds, and the extraction of seeds from fruits after a production season or the use of seeds from the market.

Keywords: *Capsicum annuun*, phytogenetic resources**,** seeds, varieties, Yaounde.

INTRODUCTION

The biodiversity of cultivated plants provides human societies with resources that are part of the gene pool of interest. The latter constitutes the genetic resource available to a country or a population. Indeed, plant genetic resources are defined as all plant genotypes that are used or potentially usable by humans. They condition the sustainability of production systems and constitute the keys to development. However, the destruction of these natural resources is linked to human pressure on land and inappropriate agricultural practices (Henson-apollonio, 2011). Thus, their availability in the market is related to the availability of foundation seeds, production constraints, and marketing of these seeds. The study of genetic diversity is an essential step in the conservation, evaluation, and use of these resources (Saleh *et al*., 2018). It provides useful knowledge in genetic improvement programs (Pujar *et al*., 2017). The preservation of the said resources, especially that of seeds in general proves to be essential in maintaining sustainable food security of populations (Akpavi *et al*., 2007).

Chili pepper is a vegetable of the Solanaceae family used mainly as a vegetable spice (Glodjinon *et al*., 2019). It is widely cultivated for its fruits which are highly valued both for direct consumption and for medicinal purposes (Saleh *et al*., 2018). It is rich in mineral elements, vitamins, and essential amino acids necessary for human health and growth (Saleh *et al*., 2018). Chili is grown in gardens, in the field or in association with several crops such as tomato, maize, groundnut, soybean and cassava (Glodjinon *et al*., 2019). Assessing and documenting the existing genetic diversity of a crop such as chili is essential to maintain

***Corresponding Author:** Ndiang Zenabou
Plant Biology and Physiology Laboratory, Department of Botany, Faculty of Science, University of Douala, Po. Box. 24157, Cameroon

an active base for exploiting genetic variability in breeding programs (Rao, 2004, Abebie, 2016).

In Peru, accessions are already being used for commercial production due to their high productivity and the interest shown by entrepreneurs. There are still many opportunities to further screen and evaluate genetic resources from the *Capsicum* center of diversity (Meckelmann *et al*., 2015). Apart from these two traits of interest, chili is also subject to numerous diseases and pests that may explain its low productivity and high prices in the Yaounde markets during periods of low production. All this may be the reason for the diversity observed in some countries. To the best of our knowledge, there is no reliable information on the genetic diversity of chili in Cameroon, despite the presence of several highly commercialized varieties in small and large markets, as well as in grocery stores. Yet, in some countries such as Ethiopia and China, research has revealed a high diversity of chili pepper (Xiao-min *et al*., 2016, Belay *et al*., 2019). In order to contribute to chili cultivation in Cameroon, this prospective study aims to analyze the chili genetic resources available in Yaounde and its supply areas.

MATERIALS AND METHODS

Target populations

The target population for this study constituted of actors involved in or closed to the Chili production and marketing circle. Traders were identified and surveyed in large markets of Yaounde for chili fruit and in seed marketing structures for chili seeds. In addition to that, the producers were those encountered in the study area at the time of the survey. We obtained information on the sources of supply of chili in the city of Yaounde. In total, one hundred and twenty-six (126) individuals including 85 traders, 25 producers and 16 seed promotion institutions were interviewed (Table I). The study population consisted of the population of the chili supply areas encountered in the city of Yaounde and those settled in Yaounde either for the marketing of chili fruit or seeds, or for the production of market garden produce.

Survey methods

Data were collected in the different markets in Yaounde using participatory research evaluation tools and techniques (Orobiyi *et al*., 2013, Akpavi *et al*., 2007). Semi-structured interviews were conducted with the aim of identifying popular knowledge on the diversity of Chili plant genetic resources in the city of Yaounde. The survey was conducted from April to June 2020 in the major markets of the Department of Mfoundi divided into 7 council areas (Yaounde 1, Yaounde 2, Yaounde 3, Yaounde 4, Yaounde 5, Yaounde 6 and Yaounde 7) selected because they constitute the main Western, Northern, Eastern and Southern entrances to supply the markets with food products (Table 1). Thus, a questionnaire was produced for chili pepper traders, another addressed to market gardeners who may include or not chili pepper among their crops, and a third addressed to seed promotion actors.

Table 1: Traders, producers and seed sales structures interviewed by locality

No	Localities	Number of traders	Number of producers	Number of seed sales structures	Total
1	Yaounde 1	07	-	02	09
2	Yaounde 2	21	04	08	32
3	Yaounde 3	5	-	-	05
4	Yaounde 4	12	-	01	13
5	Yaounde 5	12	-	04	16
6	Yaounde 6	15	01	-	16
7	Yaounde 7	13	05	01	19
8	Nkolbot	-	01	-	01
9	Soa	-	03	-	03
10	Sa'a	-	02	-	02
11	Leboudi	-	04	-	04
12	Nkoteng	-	01	-	01
13	Mefou et Akono	-	01	-	01
14	Dschang	-	01	-	01
15	Bangou	-	01	-	01
16	Lobo	-	01	-	01
Total		**85**	**25**	**16**	**126**

Data processing and analysis

The data obtained were analyzed using descriptive statistics (average, percentage, etc.) and presented in the form of figures. The validation of the information was done on the basis of the percentages of the answers.

III. RESULTS

III.1 Availability of Chili seeds at the sale points

Eighteen varieties of chili pepper were sold in the districts of the Mfoundi Division (Figure 1). The SAFARI variety (18.60%) was the most marketed,

followed by the ‘‘varieties Bec d'oiseau’’ (9.30%), Antiais (6.98%), ‘‘jaune doux’’ (6.98%), American Hybrid seed (6.98%), ‘‘Rouge Africain’’ (6.98%) and Big sun (6.98%). The least marketed varieties were SAS red (2.33%), ‘‘Jaune fort’’ (2.33%), ‘‘Jaune du Burkina’’ (2.33%), ‘‘Bombardier’’ (2.33%), Kani (2.33%), Hot pepper (2.33%) and composite (2.33%).

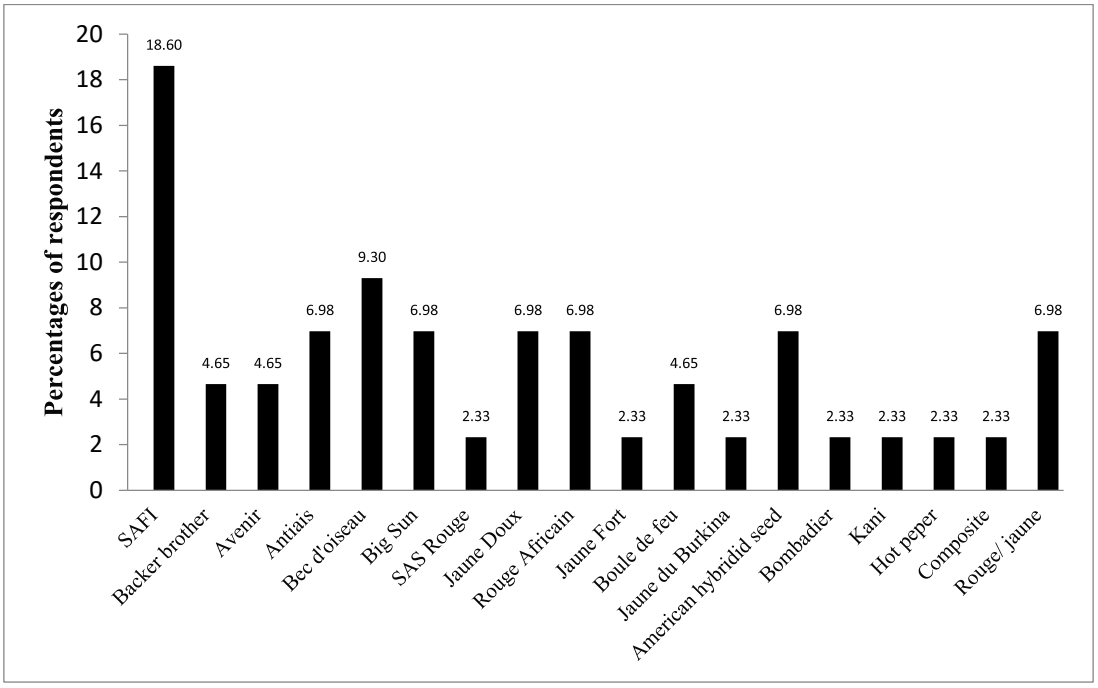

Figure 1: Chili varieties marketed in Yaounde stores

III.2 Origin of chili varieties sold

Pepper sold in Yaounde markets come from production areas such as Foumbot (25.71%), Bangante (13.33%), Okola (8.57%), Mbouda (6.97%) and Mfou (5.71%). Some origins were unknown (21.70%) by respondents (Figure 2).

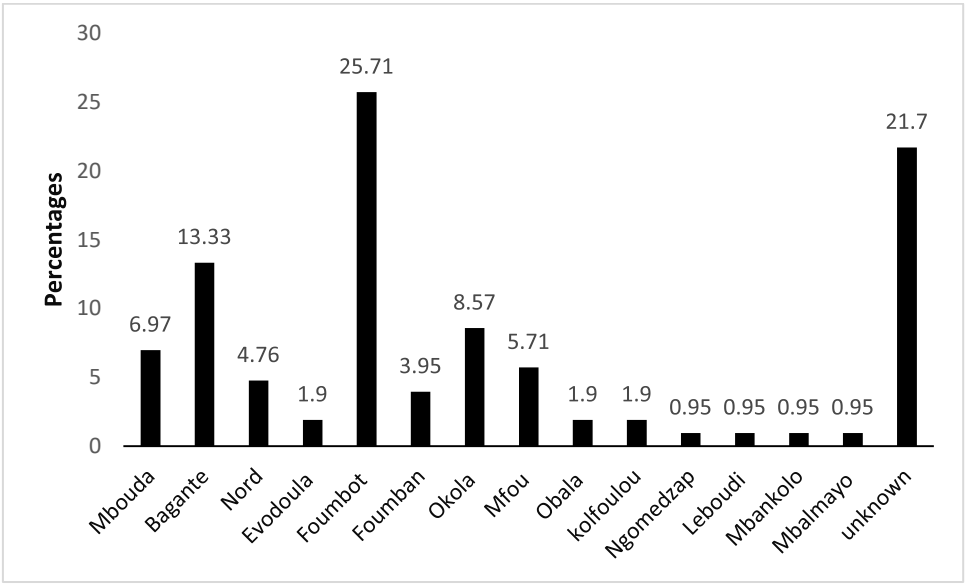

Figure 2: Production areas for chili sold in Yaounde markets.

III.3 Identification of chili varieties sold in Yaounde

The majority of traders (65.59%) do not have any information on the chili sold (Figure 3). Some respondents identified chili varieties according to their origin: northern chili (2.15%), western chili (3.23%) and village chili (5.38%). Other respondents distinguish varieties by color, such as "red" chili (10.75%) and "yellow" chili (8.60%) (Figure 3).

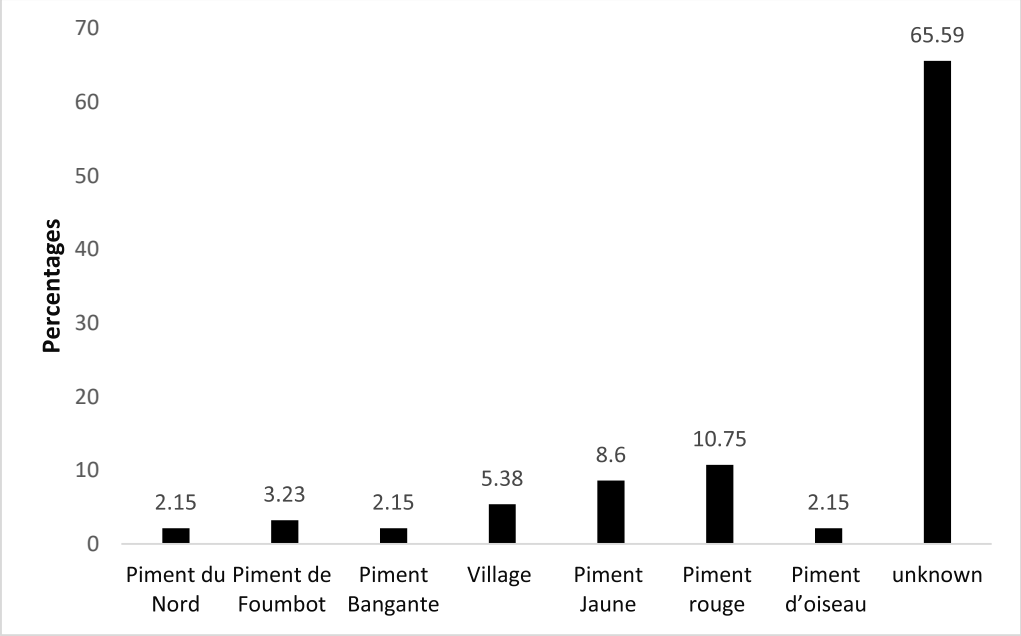

Figure 3: Names of Chili varieties according to traders.

III.4. Causes of the absence of certain pepper varieties in the markets

The causes of the lack of knowledge of chili varieties were their scarcity (17.07%), lack of interest on the part of customers and traders (62.2%), the very high price of seeds (2.44%), the abundance of other varieties on the market (2.44%), and lack of knowledge of varieties (1.22%) (Figure 4).

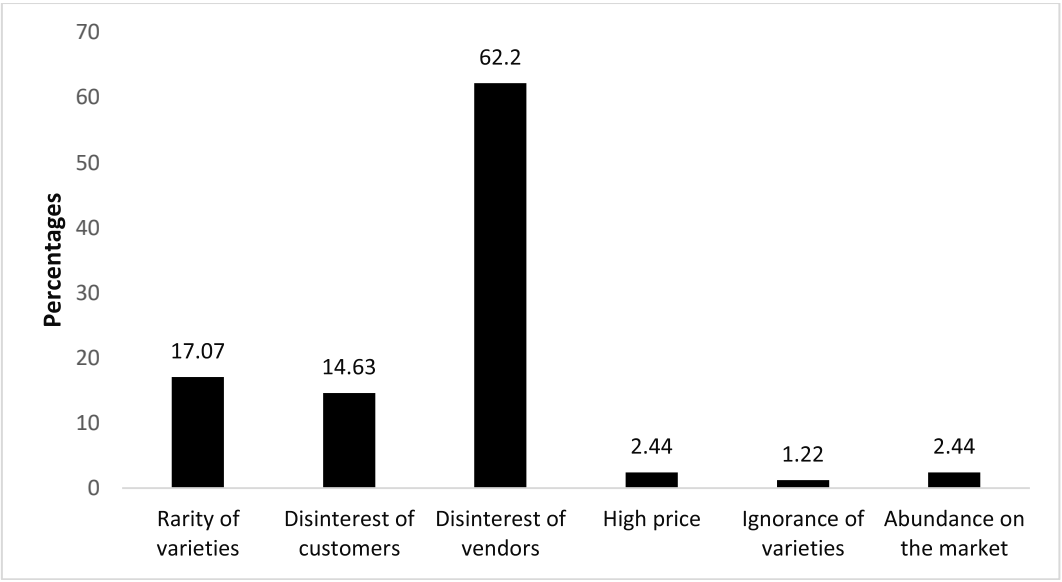

Figure 4: Causes of the non-availability of certain chili varieties in the markets

III.5. Origin of Chili seeds

Producers mainly grow the Chili varieties that are profitable for them regardless of their origin. However, seeds extracted from fruits seem to be the best source for obtaining the seed (42.5%). In addition, 30% of the respondents buy the seedlings ready to plant, 12.5% buy them from agrishops, and 15% buy them from market counters (Figure 5).

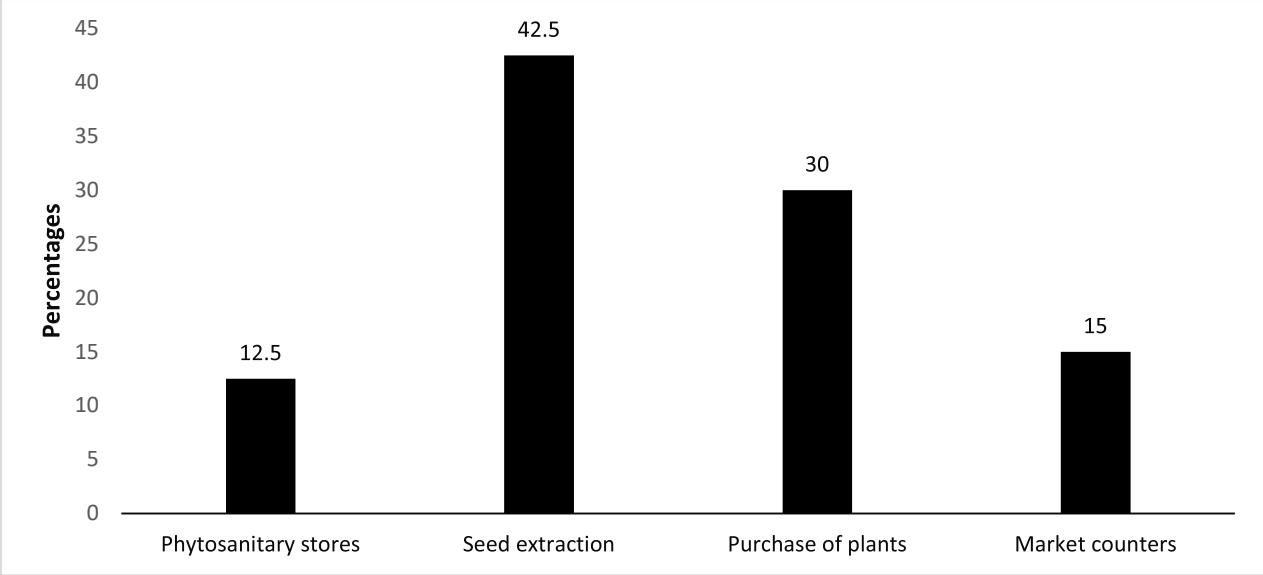

Figure 5: Origins of chili seeds marketed in Yaounde

DISCUSSION

Eighteen varieties of chili pepper whose description by respondents constitutes an important resource base were identified in some Yaounde markets and their Supply Areas. Indeed, some workers have also revealed the genetic diversity of this species in some countries (Karima Lahbib, 2012, Kumar *et al*., 2014, Garc e*t al*., 2016, Agyare *et al*., 2016, Maria *et al*., 2018). In this study, some chili varieties were not known by traders who prioritize them on regional bases (northern, western, and village varieties). The same observations have been made in similar studies where chili accessions were identified by their geographic origin (Kirti Patel *et al*., 2016, Castilla *et al*., 2019). In contrast, other authors identify them by genebank accession numbers (Maria *et al*., 2018) or by vernacular names based on origins or ethnic groups (M. Glodjinon *et al*., 2019). This study reveals that 65.69% of respondents have no idea on the origin of the commercialized chili pepper and the color of the fruits where the "red" and "yellow" chili pepper are the most popular. However, the work of Kirti Patel *et al.* (2016) revealed several other colors in the classification of chili in Peru. This could be the reason for the very low number of the plant genetic resource identified in this study compared to that identified by some authors (Xiao-min *et al*., 2016, Pujar *et al*., 2017, Belay *et al*., 2019).

Furthermore, seeds from these resources were demanded by producers based on their satisfaction with any variety or by the assurance received from the seller. This may justify the low number of resources identified in this work unlike other studies. The results demonstrate that traders sell varieties without characteristics. However, agronomic criteria were indicators of choice in pepper varieties. The results obtained by Orobiyi *et al*. (2013) showed that these accounted for 89.88% of responses. Disease and pest resistance (62.72% of responses) and productivity (9.25% of responses) are the most important problems. At the technological level, farmers were only interested by aroma and grind. These problems limit the availability of Chili resources in the study area. Several reasons, such as lack of interested sellers (62.20% of respondents) and high seed prices, may be responsible for the genetic erosion of chili pepper resources in the Mfoundi Division and its environs. In addition, production and conservation constraints exist in the study area. In central Benin, the main constraints listed by producers are early drop of reproductive organs, low productivity and insect attacks (Glodjinon *et al*., 2019). These constraints could be the causes of the reduced number of accessions identified in our study area. However, this observation could be better apprehended by a molecular study of these accessions by matching them to each other on the basis of similarity traits.

CONCLUSION

This study on the analysis of chili pepper plant genetic resources in the Mfoundi Division and its environs was initiated with the aim of making a contribution to pepper cultivation in Cameroon. It allowed the identification of 18 pepper varieties with distinct characteristics whose description by the respondents constitutes an important basis of the cultural and genetic diversity of this species. However, the seeds extracted from the fruits remain the best source for obtaining the good seeds (42.5%). Unfortunately, the lack of knowledge of these varieties is due to their scarcity (17.07%), the lack of interest of customers and traders (62.2%), the very high price of seeds (2.44%), the abundance of other varieties in the market (2.44%) and ignorance on the varieties by the population (1.22%). All these explain the lack of a true genetic characterization of the varieties identified that could be at the origin of the genetic erosion of chili pepper genetic resources in Yaounde and its environs.

In order to conserve the available resources, genetic characterization remains imperative in the *Capsicum annuun* breeding programs in Cameroon.

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