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RESEARCH ARTICLE

VALORIZATION OF AN INTERMEDIATE BANANA VARIETY (MUSA SPP.) CULTIVATED IN TOGO

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ABSTRACT

Bananas are a staple food in the tropics where they are widely consumed. In Togo, there are several varieties of banana trees which have been inventoried and classified into three groups: the first group consists of bananas whose fruits are eaten raw (dessert bananas), the second one is the cooking plantains or bananas and the last one is the intermediate group represented by the variety Abidjankodu which is the subject of the current study. This variety has been found in Litimé, in Akébou and in Kloto which are production area located at the western part of the Plateau Region of Togo. This work will allow highlighting of this cultivated variety in order to improve and spread it. Mass cultivation of this variety enriches biodiversity of the banana tree and the promotion of the elite varieties of the banana trees of Togo.

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INTRODUCTION

Bananas and plantains are a staple food for thousands of people around the world. They are the fourth most consumed food product in the world after wheat, maize and rice (Lassoudière, 2007). World production of sweet and plantains bananas was evaluated to 153,160,139 tons in 2017 (FAO 2019a). Bananas are the main source of food, employment and income in most of its production areas (Heslop-Harrison and Schwarzacher, 2007). Two other major advantages make bananas a vital food element in many poor rural areas: their high nutritional value (rich in vitamins A, C and B6, carbohydrates and potassium for example), and their uninterrupted production throughout the year. In importing countries, even if the food security of consumers does not depend on the availability of bananas, it is available on the stalls all year round. Apple is the first fruit consumed in France (market share in 2010: 22.6%) ahead of orange (12.3%) and banana (12.2%) according to surveys by (Frétillet, 2010).Bananas are fruits rich in carbohydrates, necessary for the energy production in human body. In addition, the banana tree is a plant whose each part is used according to Lassoudière (2011). Other uses have been reported: stem fibers are an absorbent of high porosity and capillarity, which are highly used in natural water purification systems or for oil absorption (CIRAD, 2001;Anirudhan and Shibi, 2007). Despite these virtues, it is noted that in Togo, bananas are mainly produced in certain areas of the plateau region, according to the particular ecological requirements of the plant and especially because of the lack of knowledge and motivation. The plateau region is a forested and mountainous area with annual rainfall averaging between 1400 and 1800 mm with an average temperature between 21 and 28°C. The banana tree is often cultivated in small plantations rarely exceeding one hectare, in box gardens, in enclosures or used as a fence for dwellings. This banana production is almost destined for own consumption, which is low compared to that of other sub-region's countries. The study therefore aims to show the specificity of this intermediate banana variety (Abidjankodu) grown in certain localities of Togo and to consider an improvement of its exploitation. It also makes it possible to meet the growing food needs of poor local populations by ensuring their food security. In addition, the study aims to export new varieties of bananas to Western countries where bananas are widely consumed and are a major source of cash income for producing tropical countries.

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MATERIAL AND METHODS

Study area: This research was conducted in Kloto, Wawa and Akébou prefectures which are located in the western part of the plateau region (Figure 1). These prefectures are the most

important areas of banana production in Togo. Most soils in this region are of the tropical ferruginous type with the presence of a rainforest and satisfactory agricultural properties as they are south of Togo (Mawussi *et al*., 2016). The area is characterized by a humid tropical climate. Annual rainfall ranges from 1200 mm to 1800 mm with an average temperature of 21°C to 28°C (Adjossou, 2000).

Organization of the study: We conducted a census of the different baked banana and sweet banana trees cultivated using the descriptors defined by (IPGRI-INIBAP/CIRAD, 1996). We proceeded to the morphobotanical description of the plant: size of the pseudo-trunk, inhibition of the rejections, the leaves, number of hands per bunch, number of fingers per hand, the length of the fingers, the color of the skin of the finger or the ripe banana, size and thickness of the banana, shape of the fruit, and the apex of the fruit. During this survey, forty-eight (48) producers in twelve villages were concerned and the Abidjankodu variety is found only among some producers in the Kloto, Wawa and Akébou.

RESULTS AND COMMENTS

Banana varieties producing sweet or dessert bananas commonly known as "Akodu" have been identified in farmers' fields and box gardens. But plantains commonly known as "Agbagba or Amanda" or cooking bananas are much more cultivated in plantations. The intermediate variety is grown in plantations and sometimes in some box gardens. This variety is called intermediate because it has the taste and culinary characteristics of a dessert banana and a plantain. The variety is also called Yerobia which is an Ashanti name (Ethnic group of Central and Western Ghana) by the Akébou people of Togo or Abidjankodu (which means in local language banana from Abidjan of Ivory Coast) by Ewe people (Kloto) of Togo. It is therefore a variety that came to the west of Togo (Ivory Coast or Ghana) as a result of exchanges of material or donations between producers. The intermediate variety Abidjankodu (Figure 2) has both the characteristics of a plantain and a sweet banana tree. It has a more or less large pseudo-trunk of about 4 to 5 m high with an average inhibition of the suckers.

Table 1. Characteristics of an Abidjankodu banana tree

VARIETY	PSEUDO-TRUNK	LEAF/PETIOLE	BUNCHES/FRUIT	USE OF FRUIT	VEGETATIVE CYCLE (MONTH)
Abidjankodu or Yérobia	Pseudo-trunk large and medium, green, 4 to 5m high Average inhibition of suckers	Large leaves Leaf petiolar channel III closed with curved margins	A bunch gives 10 hands; a hand carries 13 fingers; Size of the fruit: 12 cm; the skin of the fruit with some brown beaches; ivory pulp when ripe. Watery fruit like Tsikodu	Cooking or Dessert	20

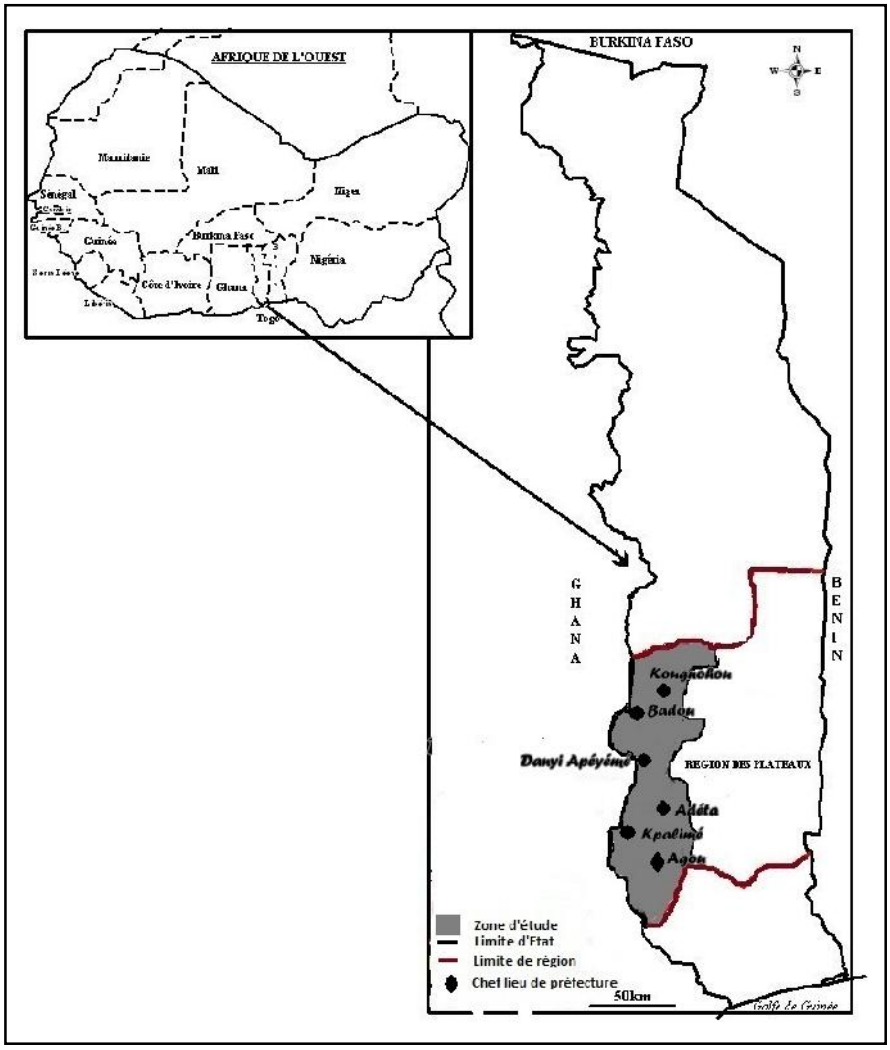

Figure 1. Togo map with the study zone

As with most plantains, there is a sharp decrease in the number of functional leaves at flowering. A foot of Abidjankodu banana tree gives 10 hands and each hand carries 13 fingers or bananas fruits which correspond to 130 fruits per bunch (Table 1);this represents a high productivity compared to most plantains encountered in the area. It has smaller fruits than plantains. This variety has the advantage of gradually ripening the fingers of the same bunch from the top to the base (Figure 3). Thus, these bananas could be eaten over a much longer and longer period without noticeable loss except that they contain a lot of water like Tsikodu, a dessert banana (Odah *et al.*, 2012). The harvest is therefore gradual. From to ptobottom, the hands are removed one after the other on the bunch as the fingers mature. It is very little cultivated. It is found in some producers in the Kloto, Litimé (Wawa) and Akébou.

Figure 2. Bunch of unripe bananas on Abidjankodu tree

Figure 3. Bunch of ripening bananas on Abidjankodu tree

These bananas are shorter like dessert bananas, and full of water. The vegetative cycle of the variety Abidjankodu is 20 months which seems longer than in most plantains where it varies from 11 to 15 months except in the variety Apim where it is 18 months depending on (Koukouma, 2005). The fruits of Abidjankodu are eaten cooked as the plantain just after their maturity or raw as the sweet banana when they are well ripe (yellow).The banana especially the plantain is a staple food in the Western of Plateauregion of Togo where the largestbanana plantations of the country are located. They are eaten in association with tuber plants such as yam or taro. These are support foods in times of need while awaiting new harvests. Dessert bananas are eaten raw. Plantains, on the other hand, are cooked, fried or boiled bananas. Their high starch content makes them indigestible when eaten raw. Plantains are usually eaten cooked or fried as a food. The Abidjankodu variety produces fruits that can be eaten raw or cooked. It has both the character of a dessert banana and a plantain.

DISCUSSION

The Western Plateau region of Togo is a suitable area for banana growing due to the high rainfall and better agronomic conditions. Despite favourable conditions, their exploitation faces many urgent challenges. The area cultivated by each producer is not known. Hoeing does not allow producers to grow more than one hectare of land. This is due to the small quantities of bananas produced that are self-summended by the local population (19,000 tons) according to FAO data (FAO, 2019). A study conducted in Togo on banana and plantains identified 57 varieties of dessert banana and 56 varieties of plantain banana (Koukouma *et al*., 2016).Synonymy does not assess the geographic distribution of a variety from one ethnicity to another or from one region to another (Agre *et al*., 2015). We do not have significant production data to assess both the cultivation practices and agronomic performance of each variety and to assess the yields of the plantations. There are phytopathological problems that disturb plantations and that deserve to be addressed for programmes to improve the cultivation of bananas, as noted by Daniells in 2000.The identification of the various varieties recorded was made using the descriptors of the banana tree according to (Tomékpé, 1996;Daniells*et al*, 2001; IPGRI-INIBAP/CIRAD, 1996);but given the high phenotypic variability often due to the environment, this description of different varieties is often difficult as reported by Bakhiet and Elbadri in 2004. However, it seems important to make a first inventory of the varieties of banana cultivated thanks to a morphobotanical description. This description makes it possible to make a rapid and easier differentiation of the various varietal phenotypes.

It then makes it possible to know and count the local varieties of sweet banana, plantains and intermediate banana cultivated to then evaluate their productivity, their agronomic performance and better predict their management. Abidjankodu bananas can be compared to Kalpatharu bananas grown in India where the fruit is eaten as dessert and culinary preparations (Lassoudière, 2011). Plantains are usually eaten cooked because of their high starch content which makes them indigestible.It is therefore important that biochemical studies be carried out on these varieties of eatenraw plantains to measure their organic content. The gradual ripening of the fruits of an Abidjankodu bunch from the apex to the base had already been emphasized by Coulibaly and Djédji (2004) who observed the same phenomenon of gradual ripening of the fingers of the same bunch in the hybrid CRBP-39 at the Banana and Plantain Research Centre in Cameroon. This ripening of the apex of the bunch towards the base represents a

specific character of this variety and this may be a good model for the study of the biochemical, biological and physiological phenomena that accompany the ripening of bananas.It could also make it possible to understand the filling of fruits in carbohydrates during their maturity. Dessert and plantain bananas are produced in more than 100 countries in the tropical and subtropical regions of the world and are the staple food for millions of people and are sources of income through local and international trade (Bakry *et al*., 2005, Odah *et al*., 2013). Almost 90% of production is consumed locally, particularly in the poorest countries of Africa, Latin America and Asia, according to Lassoudière (2011). Their banana fruits generally are rich in carbohydrates. They are also a major source of care because they have therapeutic properties such as lowering blood pressure, preventing and curing ulcers based on the work of (Valmayor and Dinh, 2002).For athletes, banana is particularly suitable, because of its high content in carbohydrate, vitamin B, potassium and magnesium, which are very important mineral elements for good muscle work. Since bananas are healthy and digestible, they contribute to the maintenance of immune defences, thanks to these intakes of vitamin C and B, minerals and various trace elements (zinc, copper, manganese iron, selenium, etc.) (INIBAP, 2001; CIRAD-GRET, 2002; Honfo *et al*., 2007). Iron and zinc deficiencies are commonly described in children and women of childbearing age in many developing countries (de Pee *et al*. 1996, Frossard *et al*. 2000, Gibson *et al.* 2000). Lack of iron is the major nutritional deficiency in the world and the leading cause of anemia (UN ACC/SCN, 1997; Halberg et Hulthén, 2000). Bunchary zinc deficiency is responsible for growth and reproductive disorders, often resulting in death, particularly in developing countries (FAO/WHO/IAEA, 1996; Brown *et al*. 2002). Banana fruit trade is a very important socio-economic activity for entire families and the problems of market opportunities and fair trade arise according to the work of (Lescot T., 2000).

Conclusion and Outlook

This work has allowed us to highlight this intermediate banana variety that has organoleptic qualities of dessert banana and plantain. It occurs only in this area of Togo and plays an equally important role in the bunch as other types of bananas. From the above, its peculiarity of having the two known characters of dessert and plantain bananas makes it an interesting model for studies. It is important that work be undertaken on the molecular characterization of this variety to confirm or not its hybrid character and to control the conditions of its cultivation and production. Biochemical, biological and physiological studies should be carried out on this intermediate variety to understand the behavior of the fruit at maturity and to confirm its hybrid character.

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