



Research Paper

Assessment of the organoleptic qualities of chips, fries, porridge and pancake prepared from tubers of nine sweet potato cultivars (*Ipomoea batatas* L.) in Kisangani, Democratic Republic of the Congo

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ABSTRACT

This research was initiated to assess the organoleptic qualities of chips, fries, porridge and patties made from the tubers of nine sweet potato cultivars (*Ipomoea batatas* L.) grown in Kisangani, namely Carotte, Damu, Elengi, Kandolo, Kilomoya, Mambokolo, Monde, Mugande and Muganderva. By observing parameters such as flavor, taste, odor and consistency.

A total of twenty people were appointed to assess the parameters for observing the recipes studied. The results obtained showed that the sweet potato cultivars tested generally lend themselves well to chips and fries; as do the cultivars Elengi, Mambokolo and Muganderva which, in addition to being good for chips and fries, are also suitable for porridge.

Key words: Appreciation, organoleptic qualities, flavor, taste, odor, consistency.

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I. INTRODUCTION

Sweet potato (*Ipomoea batatas* L.) is the world's seventh most important food crop after wheat, rice, maize, potato, barley and cassava (Hironori et al., 2007). It is the second root and tuber crop after cassava in tropical countries (FAO, 2006) and the third in sub-Saharan Africa after cassava and yam (Karyeija, 1998). It is a widespread crop in all tropical and subtropical regions, where it is adopted mainly for its edible, starch-rich tubers (Janssens, 2001).

In 2009, of the 102.32 million tonnes of potatoes produced worldwide, only 188,794 tonnes (or 0.18%) were exported to the world market (FAO, 2015). Tubers are consumed mainly in developing countries, notably Papua New Guinea, the Solomon Islands and some East African countries such as Burundi, Uganda, and Rwanda, where they are a staple food (Kana et al., 2015).

According to Anses (2017), Asia records the world's largest sweet potato production (75%), with the preponderance going to China with 72,000 tonnes of the tubers per year, or 64% of global production. Africa records 20% of global production, America 4%, Europe 1% and Oceania less than 1%. In terms of annual production, FAO (2015) reports that Tanzania is the leading African sweet potato producer (3.47 million tons), followed by Nigeria (3.45 million tons), Uganda (2.59 million tons), Kenya (1.15 million tons), Madagascar (1.13 million tons) and Rwanda (1.08 million tons).

The sweet potato is still considered an exotic plant in most countries around the world, particularly in the West. It remains little known, not because of the difficulties involved in marketing and preserving it, but because of the low level of investment in it. It is mainly consumed by the producer countries themselves. In

Africa, sweet potato marketing is limited and often short-distance (Osci-Opare, 1991). Sweet potato leaves are richer in protein, beta-carotene, calcium, phosphorus, iron and vitamin C than spinach. They are also rich in fiber and help prevent certain types of cancer. FAO ranks them among the top ten antioxidant vegetables (Afuape et al., 2014).

In the Democratic Republic of the Congo, sweet potatoes are eaten in boiled, fried or grilled form, and their leaves are the vegetable of choice in many households (Bonkena et al., 2018). The rich beta-carotene content of its tubers can make it a substitute food for carrots in tropical regions Anses (2017).

In fact, despite the above-mentioned significant importance of sweet potatoes, consumers do not know how to match the tubers of sweet potato cultivars to recipes, due to a lack of information focusing on the culinary orientation of each cultivar.

And yet, the organoleptic qualities and culinary orientation of the cultivars are the local criteria for integrating sweet potato cultivation into the food habits of the riverside population (Kana et al, 2015). The results of TAAT's Technical Coordination Office studies in 2020, showed that sweet potato tubers are consumed after cooking, ground into flour or pureed for use in a range of products, including breads, fried foods, cakes, juices and porridge.

With this in mind, the present research was carried out with a view to establishing opinion on the question of the culinary orientation of tubers from nine sweet potato cultivars grown in Kisangani, which to date remains a concern for sweet potato producers and consumers in this part of the country.

This study attempted to answer the main question: do the tubers of sweet potato cultivars have specific organoleptic qualities in relation to the following recipes: chips, fried, boiled and galette?

With this question in mind, the aim of this study was to assess the organoleptic qualities of potato chips, French fries, porridge and patties made from the tubers of nine locally-produced sweet potato cultivars.

II. MATERIALS AND METHODS

Environment

The present study follows encouraging results obtained from the morphological, agronomic and nutritional characterization of nine sweet potato cultivars in Kisangani, Democratic Republic of Congo. The geographical coordinates taken by GPS are as follows: 0°30'46.152"N latitude; 25°9'54.16236"E longitude and 404 m altitude.

Kisangani belongs to the Af climate type of the Köppen classification. The average annual temperature hovers around 25°C, and annual rainfall exceeds 1,800 mm (Alongo et al., 2013a). Average annual insolation is 1957 hours and relative humidity varies between 80 and 90% (Alongo, 2013b).

Materials

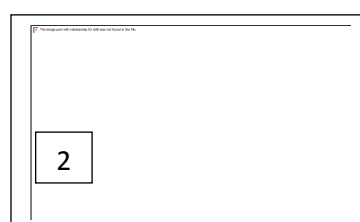
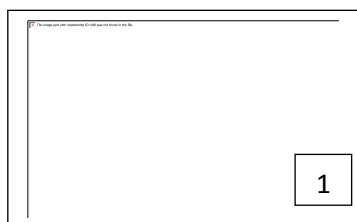
Tubers from the following nine sweet potato cultivars: Carrot, Damu, Elengi, Kandolo, Kilomoya, Mambokolo, Monde, Mugande and Muganderva constituted the biological materials used in this study.

Methods

The tubers were used in four culinary processes leading to chips, fries, porridge and patties, following the procedures below:

1. Chips: Washing, peeling and cutting the tubers, followed by toasting with vegetable oil;
2. Fries: the same procedure as for French fries is used to produce fries, the only difference being that here the tubers are cut lengthwise;
3. Boiled: after peeling, the tubers are cooked to form a more or less viscous paste;
4. Galette: the tubers are cut into small pieces, dried in the sun and ground into flour. This flour is used to make the galettes.

The images below illustrate recipes prepared according to the above procedure.



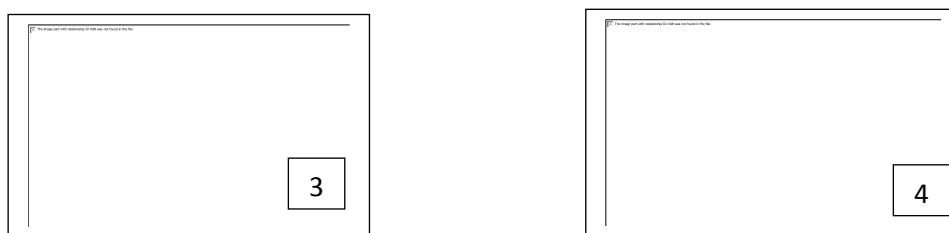


Figure 1 : Chips (1), Fries (2), Porridge (3) and Pancake (4) (Photos Mambokolo, 2022).

The twenty people selected helped analyze the four recipes, rating each parameter out of 10. The following parameters were selected: flavor, taste, smell and consistency.

At the end of this rating, the culinary orientation was made for each recipe, using the following signs to reveal the ratings: 0: Fairly good, +: Good, ++: Very good, +++: Excellent.

III. RESULTS AND DISCUSSION

Results

Organoleptic qualities of potato chips

The organoleptic qualities (flavor, taste, odor and consistency) of potato chips are recorded in Table 1.

Table 1: Flavor, taste, odor and consistency of potato chips

Variety	Sweetness	Taste	Odor	Consistency
Carotte	6,0	5,0	5,5	Hard
Damu	6,0	5,5	5,0	Hard
Elengi	5,0	6,0	5,0	Soft
Kandolo	5,0	5,0	5,0	Soft
Kilomoya	4,5	5,5	4,0	Hard
Mamboloko	6,0	7,0	5,0	Hard
Monde	0,5	0,5	0,5	Hard
Mugande	5,5	5,5	5,0	Very hard
Muganderva	5,5	6,0	5,0	Hard

Table 1 shows that the flavor, taste, smell and consistency of the chips varied from one cultivar to another. Chip tasters rated tubers from the Mamboloko, Carrot and Damu cultivars as sweeter than tubers from other cultivars, and scored 6 out of 10 for this parameter. The Kilomoya tuber has a sweetness rating of less than 50% (4.5/10), while the Monde tuber has only trace sweetness, with a rating of 0.5 out of 10. Table 1 shows that the flavor, taste, smell and consistency of the chips varied from one cultivar to another. Chip tasters rated tubers from the Mamboloko, Carrot and Damu cultivars as sweeter than tubers from other cultivars, and scored 6 out of 10 for this parameter. The Kilomoya tuber has a sweetness rating of less than 50% (4.5/10), while the Monde tuber has only trace sweetness, with a rating of 0.5 out of 10.

Organoleptic qualities of French fries

The organoleptic qualities (flavor, taste, odor and consistency) of French fries are listed in Table 2.

Table 2: Taste, odor and consistency of French fries

Variety	Sweetness	Taste	Odor	Consistency
Carotte	5,0	5,0	5,0	Hard
Damu	5,0	6,0	4,5	Soft
Elengi	5,5	5,5	5,0	Soft
Kandolo	4,5	5,0	5,0	Soft
Kilomoya	5,0	5,0	5,0	Hard
Mamboloko	6,0	6,0	5,0	Soft
Monde	0,5	0,0	0,5	Hard
Mugande	5,5	5,0	6,0	Soft
Muganderva	5,0	5,0	5,5	Soft

Looking at the results in Table 2, Mambokolo tuber fries contain a sweet taste (rating 6 out of 10), superior to that of the other cultivars which do not exceed a rating of 5.5 out of 10. The same trend is observed for the fried taste, where the tuber of cultivar Damu has joined Mambokolo, and both occupy the lead with a score of 6 out of 10. In terms of smell, the Mugande tuber came out on top with a score of 6 out of 10. From all the assessments made, it is clear that the Monde cultivar is not suitable for frying, given that the scores obtained for the three frying parameters (flavor, taste, smell) are less than 1 out of 10.

Organoleptic qualities of porridge

In the course of this study, the organoleptic qualities (flavor, taste, odor and consistency) of the slurry were studied, and the results are shown in Table 3.

Table 3: Flavor, taste, odor and consistency of porridge

Variety	Sweetness	Taste	Odor	Consistency
Carotte	4,5	4,5	5,0	Soft
Damu	5,0	4,5	3,0	Soft
Elengi	5,5	5,0	4,0	Soft
Kandolo	4,5	4,0	5,0	Soft
Kilomoya	5,0	5,5	4,0	Soft
Mamboloko	6,0	5,0	4,0	Soft
Monde	0,5	0,0	0,5	Hard
Mugande	6,0	4,5	4,0	Soft
Muganderva	5,5	5,0	5,0	Soft

The results in Table 3 show that tubers from the Mamboloko and Mugande cultivars give a much sweeter porridge than tubers from other cultivars, which scored 6 out of 10. Tubers from the Elengi, Mamboloko, Muganderva and Kilomoya cultivars scored between 5 and 5.5 out of 10.

Looking at the results for porridge production, it emerges that the Mamboloko and Muganderva cultivars are appreciated for their sweet taste. As for taste, apart from the tubers of the Carotte, Kandolo, Damu, Mugande and Monde cultivars, the others presented an average taste, with a rating of 5 out of 10. Their consistency was soft, except for Monde tubers, which were consistently hard.

Organoleptic qualities of Pancake

The organoleptic qualities of galette were the focus of this research, and the results are shown in Table 4.

Table 4: Flavor, taste, odor and consistency of Pancake

Variety	Sweetness	Taste	Odor	Consistency
Carotte	3,0	3,0	4,0	Hard
Damu	3,0	2,0	3,0	Hard
Elengi	3,0	3,0	3,0	Hard
Kandolo	3,0	3,0	3,0	Hard
Kilomoya	3,0	3,0	3,5	Hard
Mamboloko	4,0	4,0	3,0	Hard
Monde	0,5	5,0	6,0	Hard
Mugande	4,0	3,5	3,0	Hard
Muganderva	5,5	3,0	3,0	Hard

The results in Table 4 show that the tubers of the nine sweet potato cultivars studied are unsuitable for making patties. The ratings attributed to the observed parameters are below 5 out of 10, with the exception of the tuber flavor of cultivar Muganderva (5.5/10) and the taste of cultivar Monde.

Culinary orientation of cultivars

The results of the culinary orientation of the varieties studied are shown in Table 5.

Table 5. Culinary orientation

Variety	Chips	Fries	Porridge	Pacanke
Carotte	+	+	0	0
Damu	+	+	0	0
Elengi	+	+	+	0
Kandolo	+	+	0	0
Kilomoya	0	+	+	0
Mamboloko	++	+	+	0
Monde	-	-	-	+
Mugande	+	+	0	0
Muganderva	+	+	+	0

Legend: 0: Fairly good; +: Good; ++: Very good and +++: Excellent.

The results in Table 5 show that tubers from the Damu, Elengi, Kandolo and Mugande cultivars are suitable for chips and fries; tubers from the Elengi and Muganderva cultivars can also be used to prepare porridge; tubers from the Mabokolo cultivar are very good for chips and good for fries and porridge. In contrast to the other cultivars, the Monde cultivar lends itself well to pancakes.

IV. DISCUSSION

Appreciation of the organoleptic qualities of chips, fries, porridge and pancakes prepared from the tubers of nine sweet potato cultivars (*Ipomoea batatas* L.) in Kisangani, Democratic Republic of the Congo.

Of the four organoleptic qualities surveyed, only one or two met with the tasters' satisfaction. This is the case of the Mambokolo tuber cultivar, whose French-fry taste was appreciated by around 6 out of 10. This assertion was also backed up by a study of ten recipes for sweet potato fans, which found that the sweet potato pancake is a real delight for breakfast because of its taste.

As for the pancake, the ratings recorded were 5 out of 10 for the tuber of the Mambokolo cultivar, which means that this cultivar offers tubers suitable for making pancakes. These results corroborate those obtained by Kabore (2012), on the optimization of orange-fleshed sweet potato cookie production at Bourkifaso. According to him, the sweet potato pancake, French fries and cookies are highly appreciated because of their taste and shelf life.

In terms of potato chip taste, the Mamboloko cultivar scored 7 out of 10, followed by Muganderva, 6 out of 10. These results are similar to those obtained by Youssra (2021) on the manufacture of sweet potato chips in Soultan. The author maintains that sweet potato chips are appreciated by around 70% of consumers because of their taste.

It has been proven that the tubers of our cultivars have obtained a satisfactory rating for the various recipes. The assessment meets the finding of the TAAT Technical Coordination Office (2020) that the puree can be used to prepare breads, cakes, cookies, fried products such as fritters, as well as concentrated products such as baby food, porridge and soups. Orange-fleshed sweet potato puree has a high provitamin A content, and puree-based food products are more nutritious than common wheat-based foods. Sensory testing of processed purees and their manufactured end products has shown strong public acceptance of appearance, aroma, texture and taste.

Katherine (2005), for her part, has found that sweet potato tuber products have added value including flour and pancake mixes. Some restaurants on the U.S. coast, notably New York and Florida, offer sweet potato fries, probably prepared on site for breakfast.

V. CONCLUSION

The aim of the present work was to assess the organoleptic qualities of chips, fries, porridge and pancakes prepared from the tubers of nine locally-grown sweet potato cultivars, and to proceed by their culinary orientations by observing the following parameter: sweetness, taste, odour and consistency.

Data analysis and processing were based on calculation of mean, standard deviation and coefficient of variation. Four types of culinary product were selected: potato chips, French fries, porridge and pancakes.

The results show the following:

Tubers of cultivar Mambokolo are very good for making chips, good for frying and porridge; those of Carotte, Kandolo and Damu are good for making French fries and fry; on the other hand, those of cultivar Kilomoya are suitable for making fry and porridge; while those of cultivars Elengi and Muganderva are suitable for making chips, fry and porridge. Tubers from the Monde cultivar are ideal for making pancakes.

Recipe appreciation therefore varied according to sweet potato cultivar tubers.

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