Characterization of Physicochemical & Sensory Product of Snack Made from the Pulp of the Fruit of Safou Tree (Dacryodes Edulis) in Brazzaville, Congo

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Abstract

The objective of this study is to characterize the pulp of fruit Dacryodes edulis (Safou Blanchi) to contribute to the underpinning knowledge required to master the organoleptic properties of the product. Methodology: A study was brought in 2018 on the safou fruit of the safou tree (Dacryodes edulis) 3 months old, plant product harvested in Makoua, urban community located in the central basin in the Republic of the Congo. Safou pulp manufacturing test and the addition of the ingredients were weighed according to the quantity while reaching a mass of 536.04 g. The mixture is made with lukewarm water. After kneading, comes the modelling then frying in a chip in a bath of oil heated to more than 170°C. The cooking lasted for 3 to 5 minutes. In the laboratory, we checked out the physicochemical and sensory characteristics (14 panelists were asked about the variables color, smell, taste, and texture) of the resulting product. Results: the physicochemical composition has been represented by different makers: water 9.73%, ash 1.22%, protein 20.25%, fat 34.86% and carbohydrate 43.67%. As tasters, the texture is the only descriptor best enjoyed with average 4.9 ± 0.28. The gap-type = 1.08, highest variance = 1.17 and the coefficient of variation = 38% reported the smell. The choice of the product of the sensory analysis the taster test 4 this has the highest average 6.9. The comparison of the coefficients, the difference was not significant $p \leq 0.05$. In conclusion: Although the ingredients have contributed to making the product obtained snacking, we say that it is good for consumption by humans or even the sprinter (athlete), allowing it to achieve good performance, to the marketing and commercialization of local products.

Keywords: Characterization of Physicochemical, Sensory, Snacking, Pulp of the Fruit, Dacryodes Edulis

I. INTRODUCTION

Safou tree (Dacryodes edulis), is a tree that grows as a wild and often planted by man where the fruit is consumed in various forms. It is one of the most interesting trees to plant when one wants to bring home a bit of wild life that normally prefers places little frequented by humans. Bees and butterflies, hummingbirds and orioles find there shelter and a food up to their expectations. The different parts of the tree are involved in traditional medicine [1].

The safou is the result of the safou tree. It comes from the Kikongo nsafou [2]. However, there are several varieties of safoutier, and can distinguish the variety of colors of a fruit to another, from light pink to Navy Blue to sky blue and violet. The Safou contains a nucleus and its flesh is often oily.

In Congo-Brazzaville, it is found almost in all departments. In Africa, it is naturally present in the countries bordering the Gulf of Guinea. It is cultivated for its fruits of Sierra Leone until Angola along the Atlantic and, further inland to Uganda and in the North of the Zimbabwe. The exact native range is unclear because Dacryodes edulis is very cultivated and naturalized [3].

The safou is largely consumed in various forms is what made human survival. In addition, there is a multitude of assigned name to this leaking according to continents.

In french: Plum by comparison to color purplish fruit of the plum tree which is a fruit tree in temperate zones. In reality, the two species have nothing in common.

In Africa, in Cameroon, vernacular names are as varied as the dialects and tribes and here are a few: the Tse, ekiep, Bangante: Choo; Bafang: Che; Bamoun: youon; Bassa, Ewondo, Elton: Assa; Bafia: kiyom; Douala: Sao; Pygmy: Senna, in Gabon: atanga, in Congo Kinshasa: Nsafou.

In Congo Brazzaville, the vernacular name is Nsafou.

The economic interest of the safoutier is like to think [4] have estimated that Boko in Congo Brazzaville region produces 1,063 to 4.220 tons of fresh safou according to the seasons. [5] Assessed the Cameroonian safou to 13,000 tons (unspecified surface) production and reports that in 1997, 89 tons of safou were exported by Cameroon to Gabon. There are some important informal marketing channels of safou between Cameroon, the Congo, Gabon,

Equatorial Guinea and Nigeria [5,6]. For its part, [5] statement that about 105 tons of safou are exported annually from Central Africa to Europe (France, Belgium).

The flavor of the bleached Safou variations are important and the tendency of the express (in season), depending on the species of raw, fermentation conditions and involved microorganisms. The sensory response is not only a mechanical translation occurring at the level of the receivers; It is a construction in much of the thinking and the sensory response is diverse, unstable to the wire of the time due to the functioning of the nervous system itself and the conditions of the sample was taken.

Also, when it presents him three products A, B and C, the operator can then ask him to test discriminatory [7]. It remains to produce scientific knowledge in support of these objectives [8]. The objective of this study is to characterize the pulp of fruit Dacryodes edulis (Safou Blanchi) to contribute to the underpinning knowledge required to master the organoleptic properties of the product.

II. MATERIALS & METHODS

A. Materials

Here it's the safou plant product harvested in Makoua, urban community located in the central basin in the Republic of the Congo. The product used was drinking water, salt, vegetable oil, distilled water, hexane. The material used Balance to pressure from 0 to 210 grams (g), trade balance of 0 to 1000g, Proofer, glasses to watch, crucibles, erlen meyer, oven mitten, hood, test-tube graduated, graduated pipette, soxhlet, balloon, balloon heater, refrigerant, capsules, bags, plastic, thermo-welder, burette, refrigerator, film paper, hen, knives purposes, trays, range and bath married.

B. Methods

The process flow diagram of the product of snack made from the pulp of safou was made in the following way: Triage → washing → Pesage whitening → depelliculage → pulping → weighing ingredients additions → mixing → shaping → cooking oil (170°C) → cooling → packaging labelling → storage.

C. Reception of the Raw Material

The safou and (salt, garlic, red onion) ingredients used in the manufacture of the product were purchased at the market Total in Congo-Brazzaville. Modelling enabled us to give the shape of sticks the dough made into the mixing bowl. It was made using a model (small cylinder head open and shrunken foot).

Fig. 1: Modeling of Potato Chips

Packaging has been achieved using the plastic bags, closed by a thermo-welder (electrical appliance form of clap and burning teeth), labelling has been done by hand and the chips already in bags were stored in a pot in the laboratory and in a closet. Safou (dough) pulp manufacturing test was weighed according to the quantity while reaching a mass of 536.04 g; then the weighing of ingredients to improve its taste.

The weighed ingredients contributed in mixing bowl. The completed mixture helped make dough similar to doughnuts. The mixture was made with lukewarm water. After kneading, was shaping and frying in a chip in a bath of oil heated to more than 170°C. The cooking lasted for 3 to 5 minutes. At the end of cooking, the product obtained was a finished product ready to eat.

D. Physico-Chemical Analysis of the Product of Snacking

These tests determine the overall composition of the product of snacking. The water content was determined by drying safou chips in the oven. It was to weigh foremost a Cup to hold the sample to weigh (crushed chips), then to weigh a mass of 5 g for each sample (three or all). Drying is made by heating the oven to temperature of 105°C for 24 hours until a constant mass which formed the last weighing. The water content was determined as follows: % (H_2O) = m0: mass of the empty Cup, m1: mass of the Cup containing the sample before drying, m2: mass of the Cup containing the sample after drying.

The ash content was one of the characteristics to determine the purity of the product. It also allows evaluating the rate of minerals in the sample. It was to weigh 5 grams (g) of the sample to be analyzed in a Cup. Place the sample in a cremation oven set at temperature of 550^0C for 8 hours. After cremation, the oven is stopped and cooled; the residue is removed from the oven and weighed.

Ash content was determined as follows: % (ash) = m0: mass of the empty Cup, m1: mass of the Cup containing the sample prior to incineration, m2: mass of the Cup containing the ashes.

The dosage of total proteins in our samples, we proceeded by the method of Kjeldhal (total nitrogen dosage). Lipids were compounds soluble in organic solvents such as: hexane, ether oil, benzene, chloroform and acetone; they are insoluble in water. We used this property of soluble in organic solvents for the isolate and measure them. The soxhlet device was used for extraction according to standard NF ISO 13877 in April 1999. In a cartridge, we introduce a sufficient amount of sample of the chips of safou crushed powders. Then you put the cartridge in the column of the soxhlet device. The ball is filled with 150 ml hexane caution, and then the device is set on for 3 to 4 hours at least. Evaporates, it liquefies in the refrigerant then falls into the cartridge and the extract contains lipids and the different chemical compounds soluble in hexane. Once the point of slurping reached, the solvent to oil and other compounds spilled the ball and the cycle starts again. The operation continues until complete extraction of oil from the cartridge. At the end of the extraction, the cartridge is removed and placed in the oven. The solvent is recovered before each slurping until there is only the oil extracted in the ball.

The oil is poured into a container, previously weighed, which is then placed in the oven to 70oC for 24 hours; this is so that traces of solvent are being evaporated by drying. The resulting oil is ready for later analyses. The total lipid content sought is given by the relationship: fat = × 100%. P1: sample weight prior to extraction (product); P2: mass of the fat obtained after drying in the oven (oil).

We determined the carbohydrate content by using the following formula: % carbs = 100 - (% protein + fat % + % ashes). We first determined the levels of protein, fat and ash, and then we proceeded to the calculation of the rate of carbohydrates [9].

E. Sensory Evaluation

Sensory analysis was a prerequisite for the design of new products and the quality control. Several tests can be put in place according to the objectives pursued [10]. Of these tests, we used the test of the sensory profile, which was to describe the product of snacking we made using a list of sensory descriptors. Organoleptic analysis is given to a panel of 14 people in the special room, prepared over six months, to the recognition of the color, flavor, Texture and smell for this event. During this test, we have selected for our product descriptors; then our tasters have intervened, they had each a glass of water mayo to clean and rinse their mouth, before and after a succession of tasting and a toilet paper of the type wipes everything to wipe the Hands and lips, Tasters described the product and then rated the intensity for each descriptor on a rating scale from 1 to "not good." 2 for "good bit"; 3 for "moderately good" and 4 for 'good' and 'very good 5 '. The test lasted 30 minutes; each taster was in his post the eyes on his record of tasting, in order to avoid communication between tasters.

F. Calculated Statistical Analysis

The data were entered and analyzed by the statistical software Social Sciences (Spss) Version 17.5 Package (Word 2010 and window - 8) [11]. The results are given in table form. The average, standard deviation, variance, and the coefficient of variation were calculated across taster. The comparison of the coefficients, the difference was not significant $p \leq 0.05$.

III. THE INTERPRETATION OF THE DATA & RESULTS

A. Of Snacking Product Description

The obtained snacking product is a kind of crispy chips. They are slightly salty with a pronounced smell of safou. Its color is golden yellow.

Table – 1
Over all Composition of the Snacking Product (g/100 g MS)

Parameters	*Composition (%)*
Water content	*9.73*
Ash content	*1.22*
Protein content	*20.25*
Lipid content	*34.86*
Carbs	*43.67*

It was noted that this snacking product contains: 9.73% water, 1.22% ash, 20.25% protein, 34.86% lipids and 43.67% of carbohydrates.

Fig. 2: Of Snacking Product

Table – 2
The Taste Test Results

Variable & judges	*J1*	*J2*	*J3*	*J4*	*J5*	*J6*	*J7*	*J8*	*J9*	*J10*	*J11*	*X*	*б*	*V*	*CV*
Color	*3*	*4*	*4*	*3*	*5*	*4*	*5*	*3*	*4*	*3*	*3*	*3.4*	*0.79*	*0.63*	*18*
Smell	*3*	*2*	*3*	*2*	*5*	*3*	*5*	*2*	*3*	*4*	*2*	*3*	*1.08*	*1.17*	*38*
Flavor	*2*	*3*	*4*	*4*	*4*	*3*	*4*	*4*	*5*	*2*	*2.5*	*3.4*	*0.92*	*0.85*	*25*
Texture	*4*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*4.9*	*0.28*	*0.08*	*1.6*

As shown in table 2, it reveals that obtained snacking product is appreciated on average by tasters with as average (X) 3 for the color, the smell and flavor. The texture is the only descriptor best enjoyed with average 4.9 substantially equal to 5. The smell was presented the highest variable (the standard deviation (б): 1.08, the variance (v): 1.17 and the coefficient of variance (CV) were 38.

Table – 3
Test Sur Le Choix Du Produit De L'analyse Sensorielle

	Products					
Tasters/products	1	2	3	Great total	Total/ Taster	Average/Taster
1	4.9	4.8	6.5		16.2	5.4
2	5.7	3.5	6.8		16	5.3
3	7	4.9	3.5		15.4	5.1
4	6.8	6.3	7.6		20.7	6.9
5	6.7	4.6	6.3		16.8	5.6
6	7.5	4.3	5.3		18.1	6
7	6.7	4.7	6.8		18.2	6.1
8	4.2	5.1	4.2		13.5	4.5
9	5.9	4.7	5.7		16.3	5.4
10	4.2	3.3	4.8		12.3	4.1
11	3.3	1.3	4.9		9.5	3.2
12	6.3	7.7	6.4		20.4	6.8
13	5	8.3	5.5		18.8	6.3
14	4.6	6	3.2		13.8	4.6
Total/product	78.8	69.5	77.7	226	/	/
Average/product	5.62	4.96	5.55	/	/	/
Standard deviation	1.3	1.8	1.3	/	/	/

Table 3 on the test of choice of the product of the sensory analysis showed that the 11th taster has presented a total the lowest is a total of 9.5 and an average of 3.2.

Table – 4
Comparison of the Coefficients

Source of variation	*dL*	*SS*	*SM*	*P*
Total (T)	*41*	*87,4*	*/*	*/*
Product (P)	*2*	*3,7*	*2,5*	*≤0.05*
Taster (T)	*13*	*42,1*	*1,3*	*≤0.05*
Error (E)	*26*	*41,6*	*1,6*	

As shown in table 4, the Degree of liberty (DI), Sum of square (SS) and Square medium (SM), the difference was not significant on all of our variables. We calculated coefficients products, some tasters than the coefficients in the table of coefficients of distribution.

IV. DISCUSSION

Our study on the Physicochimiques characterizations and sensory of a snacking product made from the pulp of the Fruit of Safou tree (Dacryodes Edulis) in Brazzaville in the Congo is the first that has been undertaken on this theme in this country.

The product transformed in the final form was introduced as a golden yellow color (photo 2).

She showed that table 1 on the overall composition of the product of snacking (g /100g) a water content of 9.73%, it turns out that the study on products of transformation of banana fruits (flakes or flakes), several analyses in a different laboratories have been made such as: L. Randoin in the table of food composition, 1961 [12] got no percentages; analysis of P. Wranckx., in the laboratory of chemistry of Léopoldville introduced 1.3%. Our results are on the rise compared to their results.

Analysis G. Brooks, Chemistry Secret Service. Of State for the Colonies, France has presented a percentage of 23.20% and analysis Kervegant about the average of the banana and its exploitation have been to 23.20%.

Our results have been lower compared to their results. But, we will notice that these first two analyses are on the rise compared to our results.

The analysis of the banana flour or unripe bananas chips, flour banana green 'Gros Michel' transformed by M.P. Wranckx to the chemistry laboratory, Léopoldville gave a percentage of 8.50% in water content.

Ash, in our study was of 1.22%. However, the study conducted in the laboratory on the making of the unripe banana chips brought 2.00% [13]. It is clear that their result found compared to ours was on the rise.

Protein in our study was of 20.25% percent. It is clear that the analyses conducted on the study of the transformation of the banana chips by researchers in different labs received: Wranckx P. Chemistry Laboratory of Léopoldville (3.00%), [12] 4.2% Brooks G. chemistry Secret Service. Of State for the Colonies, France (4.2%), Kervegant (3.33%) and (2.00%) [13].

The lipid content was 34.86%. But the study conducted on the chips manufactured by the green “Gros Michel” banana flour by M P. Wranckx in the chemistry laboratory, Léopoldville introduced 1.05%. Our results are on the rise compared to their results.

The result of the analysis obtained by [12] has been 1.2 food composition table % and P. Wranckx to the Chemistry Laboratory of Léopoldville found 1.25%, these two results were similar.

The Carb was of and 43.67% about analysis of banana flour or unripe bananas chips, flour of green banana “Gros Michel” transformed by M.P. Wranckx to the chemistry laboratory, Léopoldville gave a percentage of 82.20%. The analysis to the laboratory of chemistry of Léopoldville by L.P. Wranckx showed 73.40% of carbohydrate, the analysis that has been done by [12]. Table of food composition, 1961 showed 66%; G. Brooks has had 67.04% and Kervegant got 65.17%. The results found by M.P. Wranckx and other researchers were on the rise compared to our results. This difference was possibly due to a high concentration of calories of the banana.

As shown in table 2, reveals that obtained snacking product is appreciated on average by tasters with as average (X) 3 for the color, the smell and flavor. The texture is the only descriptor best enjoyed with average 4.9 substantially equal to 5. The smell was presented the highest variable (the standard deviation (σ): 1.08, the variance (v): 1.17 and the coefficient of variance (CV) was 38%.

Table 3 on the choice of the product of the sensory analysis test shows that the number (n°) 11 taster has presented a total the lowest is a total of 9.5 and an average of 3.2. On the other hand, the higher was seen at the taster n°4; He presented a total of 20.7 compared with an average of 6.9.

The total of the weakest product of samples has been sample 2 is 69.9 and the intermediary has been sample 3 (77.6%) while, the higher was that of sample 1 with 78.8. We got a total of 226 on ' together of these three samples. The average of the lowest product was 4.96% this sample 2, via was of the sample 3 (5.55%) and the highest was 5.62 represented by sample 1.

The lowest standard deviation was introduced by the sample 1 and 2. However, the higher was shown by sample 2.

We calculated products coefficients F or the tasters than the coefficients in the table of coefficients of distribution. The difference was not significant due to the products; No product was better than the other. But, the product 100% safou introduced an average higher than that of the other two, this product was the better appreciated than others; the difference was not significant due to some tasters (table 4).

V. CONCLUSION

The objective of this study is to characterize the pulp of fruit Dacryodes edulis (Safou Blanchi) to contribute to the underpinning knowledge required to master the organoleptic properties of the product. Although the ingredients have contributed to making the product obtained snacking, we say that it is good for consumption. It is a product that is rich in macronutrients. In addition, it would be necessary market, to promote local products and advice among the sprinters to consume, allowing it to perform well. The project for the mechanization of agriculture and creating plants for the manufacture of this product would be also desirable.

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