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Physicochemical and Sensory of *Manihot Esculenta Crantz* Characteristics and *Manihot Glaziovii* Fermentee (Ntoba Mbodi) to the Congo, Brazzaville

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Abstract:- The objective of this study is to characterize and optimize the flavor of the Ntoba mbodi to contribute to the basic knowledge needed to master the sensory properties of the product. Methodology: a study in 2018 on the sheets of manihot esculenta crantz and manihot Glaziovii fermented (Ntoba mbodi). These sheets were age 2 to 3 months. We determined the ash and water content. The potential for the content of hydrogen and titratable acidity of 10 samples, using or combining chemical raw materials and various materials in the laboratory. A panel of 31 students was set month training on different answers on the day of the sensory evaluation on: the color, smell or aroma and taste. During the tasting, a panel was set up this to taste these different samples of (A, B and C). Results: physicochemical aspects, the potential of hydrogen ranged on average between 6.5 and 7.6. The water content was 70.6 - 80.6% and 8.1 - 9.7% in ash. Sensory: light green: 74.1%. Smell of fermented: 93.54%; sweet: 41.9%. Smooth and soft: 35.45%; rubber: 80.64% and Nice: 51.66%. The analysis of variance of the tests of the hedonic variables was not significant p≤0.05. All in all, the Ntoba mbodi is a food fermented potential of hydrogen alkaline food containing very beneficial lactic bacteria for the digestive system in humans. This production is not the level of instruction, but only the know-how. It would be necessary to drink more to avoid cancer.

Keywords:- *Physicochemical characteristics, sensory, fermentation, Ntoba mbodi, potential hydrogen.*

I. INTRODUCTION

The Ntoba mbodi is a food fermented cassava under various packaging leaves (leaves of pay, tablecloth plastic...). It is produced in the Congo and in the Northwest of Angola, in country Kongo and Teke. It is a customary product highly prized for its taste and unique aroma. The interest of cassava leaves lies in their high protein content and more in the quality of the amino acids that make up these proteins [1].

Unfortunately leaves of cassava being spontaneous fermentation, one can imagine the variety of final products due to their organoleptic characteristics and health risks that this represents. Indeed, during fermentation, total microflora is increasing; on the other hand, the population of lactic bacteria growing after 24 hours of fermentation and decreases thereafter. The proportion of lactic flora compared to the total flora decreases of 65% à 4%, during the fermentation than no lactic flora increases 34.97% à 95.92% [2]. The flavor of the Ntoba mbodi variations are important (highly significant) and express (seasonal) trend, according to the species of raw material, fermentation conditions and involved microorganisms [3]. The sensory response is not only a mechanical translation of the evens that occur at the level of the receivers; it is a construction in large part of reflection and the sensory response is diverse, unstable over time as a result of 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 discriminative [4].

The cassava leaves fermentation is a process that contributes to the elimination of cyanogenic glucosides in more than 70% [5,6,7]. It remains to produce scientific knowledge to support these objectives [8]. The objective of this study is to characterize and optimize the flavor of the Ntoba mbodi to contribute to the basic knowledge needed to master the sensory properties of the product.

II. MATERIALS AND METHODS

➢ *Materials*

The biological material used, were fermented cassava leaves. The sheets of manihot esculenta crantz and manihot Glaziovii (commonly called rubber) ages from 2 weeks to 3 months which were used for the production of the Ntoba mbodi (fermented cassava leaves). We used material at the laboratory: PH meter, beaker, Erlenmeyer and spatula for the determination of the pH meter. Vial, Erlen Meyer, magnetic stirrer, Wash bottle, Burette, spatula, beaker, bar magnet to determine determination of titratable acidity; Distilled water, buffer, phenolphthalein, and soda (NaOH) Solution chemicals and in the end, freezing, the scale accuracy, cremation oven and Proofer for various use.

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➢ *Methods*

The principle was as follows: in a beaker, it mixed 5g of leaves of cassava fermented or Ntoba mbodi with 20 milliliters (ml) of distilled water, then they waved to homogenize; We made a buffer solution to potential hydrogen (pH) 4 at a temperature of 25 ° c with 40ml of distilled water, that we then plunge a pH meter digital and got the values of PH ranging from 3.7 to 4. The pH meter so immersed in him filters which, after a few seconds did appear the pH value of the product. The same procedure was repeated with the rest of the samples. The rate of ash allows judging the purity and the rate of minerals of a product. To make, it weighs 5g of raw materials in electric heating furnace for 8 hours at a temperature of 550 ° c and you get a residue after incineration. This content is determined according to standards NF. T76.110 of September 1981. Ash (%) =M_1-M_2 /M_1-M0 *100 With: M0=Mass of the cup is empty; M1: mass of raw material; M2: mass of the sample after incineration. The water content of the product is loss of water it when it is subjected to the experimental conditions (by drying of the product the oven) until a constant weight of the dry product. The water content is calculated as following: H2O (%) =M_1-M_2 /M_1-M0 *100.

➢ *Analysis sensory*

Preparation of 31 panelists over six months to the recognition of the aromas (smells) and flavour of the products was carried out by the panelists had varying between 17 and 25 years old. They recognized what was contained in the samples; this initiated age group has not experienced difficulties with the tasting.

➢ *Calculated statistical analysis*

The data were entered and analyzed by the Statistical Social Science (Spss) Version 17.5 Package software (Word 2010 and Window - 8) [9]. The results are given in table form. The average was calculated variables on the titratable acidity and percentage of several. Also, we conducted the analysis of variance of the hedonic test which was carried out according to the method of Duncan with 10 tasters on a scale of 1 to 5 (or 5 levels) by indicating their level of appreciation, respectively: I don't like, I like a little I love, I love, I love with the characteristics: color, texture to the touch, smell or aroma, flavor, flavor and texture in the mouth. The three samples, are the leaves of cassava fermented with salt to 4% (E2), 6% (E3) and sample (E1) (leaves of cassava fermented without salt) cooked or Ntoba mbodi. The difference was not significant with $p \leq 0.05$.

III. THE INTERPRETATION OF THE DATA & RESULTS

The physicochemical characterization of the leaves of cassava fermented or Ntoba mbodi features physicochemical of fermented cassava leaves Potentiel d'Hydrogène (Ph), ash and water content are represented in the tables) following:

Sample/ pH	1st test	2nd test	3rd test	Average
1	6.5	6.6	6.5	6.5
2	7.2	7.0	6.9	7.0
3	6.0	6.9	7.1	7.0
4	7.2	7.3	7.2	7.2
5	7.4	7.6	7.5	7.5
6	7.3	7.3	7.9	7.1
7	7.2	7.1	7.2	7.1
8	7.2	7.1	7.2	7.1
9	7.2	7.1	7.2	7.1
10	7.8	7.4	7.6	7.6

Table 1:- pH of fermented cassava leaves or Ntoba mbodi

Samples	Water content (%)	Ash content (%)
1	76.2	8.1
2	80.0	9.7
3	78.13	8.7
4	70.6	8.6
5	78.9	9.6
6	77.6	9.1
7	80.6	7.6
8	77.3	8.1
9	77.8	8.1
10	78.8	9.1

Table 2:- Water and ash of fermented cassava leaves or Ntoba mbodi

The table 1, the highest average of pH was found at the level of the 10 sample amounting to 7.6.

As shown in Table 2, the highest water content was 80.4 percentage (%) of the sample 7. However in ash was 9.6% of the sample 5.

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Samples	Color	N	%	Aroma or smell ,	N	%	Taste or flavor	N	%
	Light green	13	41.9	Smell of smoke	15	38.7	Smoke	4	19.20
S.A	Tends green	-	-	Smell of fermented	17	54.8	Fermented	1	3.22
	Dark green	2	6.45	Smell of rot	1	3.22	Smoke	6	19.35
	Brown green	16	51.6				Rear taste	-	-
							Bitter	3	9.67
							Sugar	5	16.12
							Fermented	10	32.25
							Leaves cente	1	3.22
							Sale	1	3.22
S. B	Light green	23	74.1	Fermented smoke	1	3.22	Leaf	3	9.67
	Dark green	8	25.8	Smell smoke	2	6.45	Fermented	-	-
				Smell of fermented	24	77.41	Smoke	3	9.67
				Smell of burnt	1	3.22	Acid	3	9.67
				Smell of leaves	2	6.45	Astringent	2	6.45
				Smell of rot	1	3.22	Rear-taste	-	-
							Sugar	6	19.35
							Bitter	6	19.35
							Fermented	11	35.48
							Cooked leaves	1	3.22
							Earthy	1	3.22
S.C	Light green	17	54.83	Smell of fermented	29	93.54	Fermented	3	16.12
	Dark green	14	45.16	Smell of rot	2	6.45	Smoke	2	6.45
							Acid	4	19.20
							Earthy	1	3.22
							Sweet	13	41.9
							Bland	1	3.22
							Astringent	1	3.22

Table 3:- Vocabulary generated by a panel of 31 students during the tasting of the leaves fermented cassava or Ntoba mbodi (color, smell or aroma and taste or flavor)

The percentages (%) highest on the 3 samples (S) were represented as suite: In Color: light green the Number of subjects (N) was 23 = 74.1%. Aroma or smell: smell of fermented: 93.54%. Taste or flavor: sweet = 41.9%.

Samples	Texture to the touch	N	%	Texture in the mouth	N	%	Flavor	N	%
S.A	Soft smooth	6	19.35	Rubber	25	80.64	Medium nice	14	45.16
	Fermented	2	6.45	Hard	2	6.45	Nice	3	41.93
	Hard	3	9.67	No sticky	1	3.22	Unpleasant	3	16.12
	Sticky	3	9.67	Fluffy	2	6.45	Very nice	1	3.22
	Smooth	8	25.80	Bland	1	3.22			
	Soft	1	3.22						
	Tender	7	22.58						
	Fluffy	1	3.22						
S. B	Soft tender	5	16.1	Rubber	25	50.64	Nice	16	51.66
	Little tender	3	9.67	Hard	2	6.45	Medium nice	13	41.93
	Smooth	11	35.45	No sticky	1	3.22	Unpleasant	2	6.45
	Soft	7	22.58	Fluffy	2	6.45			
	Rough	1	3.22	Bland	1	3.22			
	Tights	4	19.20						
S.C	Soft	11	35.45	Rubber	22	70.96	Nice	15	48.33
	Fermented	4	19.20	Bland sticky	2	6.45	Unpleasant	13	41.93
	Smooth	7	22.58	Soft	3	9.67	Nice Medium	3	9.67
	Soft	3	9.67	Soft sticky	3	9.67			
	Soft smooth	1	3.22	Hard	1	3.22			
	Hard	5	16.12						

Table 4: Vocabulary generated during the tasting of fermented cassava leaves by a panel of 31 tasters (Texture and flavor) (Sample (S), Percentage (%) and Number of subjects (N)

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The samples were the following: -A sample: Manihot Glaziovii (fermented without salt or sample sheets); -sample B: Manihot esculenta crantz (leaves of cassava fermented with salt to 4%); and the C sample: Manihot esculenta crantz (leaves of cassava fermented with salt to 8%). The texture to the touch; the smooth and soft were 35.45%; the texture in the mouth of the sample A, presented a percentage the more 80.64% and the flavor was nice: 51.66%.

Variables	Source of variance			
	Dl	SS	SM	P
a. The sweet flavor				
	29	147	-	≤0.05
	2	0.2	0.1	- // -
	9	4.09	0.44	- // -
	18	17.47	0.58	- // -
b. the bitter taste				
	29	58.97	-	- // -
	2	6.87	3.43	- // -
	9	12.97	1.44	- // -
	18	18.13	1.007	- // -
c. The texture in the mouth (soft)				
	29	63.7	-	- // -
	2	12.6	6.3	- // -
	9	16.7	1.85	- // -
	18	13.4	1.91	- // -
d. The flavor				
	29	20.17	-	- // -
	2	0.27	0.14	- // -
	9	3.5	0.50	- // -
	18	16.4	0.94	

Table 5: Analysis of variance for the hedonic test

As shown in Table 5, the Degree of liberty (DI), Sum of square (SS) and Square medium (SS) and the difference was not significant on all of our variables.

IV. DISCUSION

The population of 500 women, we conducted a raffle of a sample of 50 women producers of Ntoba mbodi ranging in age between 40 and 60 years. This method allowed us to have the reliability of the sample selected because all the producers of women at all levels are able to produce the Ntoba mbodi. The duration of fermentation varied between 3 and 5 days, but some women gave reasons related to the duration of fermentation of 5 days: during the dry season. Unlike the rainy season or hard fermentation often 4 days it is as well as the traditional manufacturing of ntoba mbodi is a multi-step process, the most important being the fermentation phase which lasts for 4 days. In addition, it produces a significant alteration of Ntoba mbodi [6]. That is why there is the presence of the heat which contributes to the softening of cassava leaves. More than 5 days of fermentation, we attended products of alteration as many authors have mentioned [10]. On the other hand, the Ntoba mbodi can be marketed and the types of packaging used were the leaves of taro leaves biloria (wild plant) and the leaves of the plant (often used in the packaging of the chikwangue) which are used to manufacture of the product (Ntoba mbodi). These leaves have also played a protective role; it prolongs the life of the product.

There are many methods of manufacture of ntoba mbodi among the different producers surveyed:- 30% observed fermentation in jars tightly closed to prevent the penetration of the flies that could contaminate the product and lead to the microbial alteration. Those who observed the fermentation in the bags (bags used for packaging of sweat and flour) were 40%. Indeed, the bag according to them was practiced for fermentation and required too much surveillance before the flies that were agents of handling food with food from their toxins. -30% of producers have used the leaves of papaya for fermentation. It turns out that content papaya papain sheet which is an enzyme used to cut the hydrogens of links. The risk of penetration of the drug in the product is very large, that should cover the product with a bag or a place in a pan, where to put them in a bag for a successful fermentation without penetration insects. The average of the Ph varied between 6.5-7.6 (table 1). 1 sample had average less than 7; he has been close to neutrality. 2 to 10 samples showed averages of pH ≥7.

The salt used during the fermentation of cassava leaves was not too influenced on the variation of the pH. These results are similar to those found by [11]; the pH reaches the maximum value of 7.95 to 72 hours of fermentation. It turns out that the production of the rich ntoba is accompanied by an

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important alkalization (pH 8.89), functionality found in other products such as of dawadawa (pH 8.6), fermented Chinese (pH 8.7) and the iru (pH 7.9), ogiri (pH 7.9), natto (pH 8.4) [5.12]. This means that the increase in pH is a determining factor in the microbial competition, explained that the kinetics of evolution of the Ntoba mbodi microflora, which differs from the fermentation of other compounds of plant origin. The water content of fermented cassava leaves or Ntoba mbodi was extended between 70.6 - 80.4% and ash was between 7 and 9.6% (table 2). However, the results found by [1] were 85 percent water and 8% in ashes. Compared to our results, we will tell that the water content was lower and upper ash from their results found. The ash content of potato soft leaves concluded [13] this was 2.0, which was below our results. In addition, we will also say fermented cassava leaves have a difference in water content and ash. Thanks to its high content, the Ntoba mbodi is a key molecule for the synthesis of compounds such as vitamins A and E, geraniol and derivatives. It also reduces sensitivity to pain by increasing morphinopeptides endogenous [14]. It turns out to be in good health, men need a range of macro and micronutrients in quantity sufficient but not excessive.

The Ntoba mbodi fermented cassava leaves were considered to be a food rich in macro and micro nutrients [15] like the wild N. hallé isenguesis cuervea [16]. The investigation to identify the criteria generally used to enjoy focus them of various preparations. The criteria generally used were the following: color, aroma, smell, taste or flavor, touch and texture in the mouth, the texture in the mouth (soft), Texture to the touch and in the mouth, rubbers, hard and other variables cited, such as perceived by the consumer. In addition, vocabulary generated by a panel of 31 students during the tasting sheets of fermented cassava or Ntoba mbodi (color, smell or aroma and taste) (table 3). The perceived colors were the following: green light 41.9%, black green 51.6% for a sample of dark green 74.1% and green light 25.8% of the B sample; Black Green 54.83% panelists were able to perceive this color; 45.16% tasters have been able to perceive this color for sample C. It is ' was 38.7% were able to smell smoke, 54.8% were able to feel the smell of fermented and 3.22% is that a person could feel the smell of rot. The sample B, 77.41% of panelists were able to feel the smell of fermented sample C, 93.54% of the panelists were able to feel the smell of fermentation. 19.35% members of the panel have been able to perceive a bitter flavor, 16.12% panelists saw a sweet in the sample, a taste. For the B sample; 9.67%; 6.45%; 19.35% and 19.3% were able to perceive the bitter and astringent taste sweet and bitter respectively. On the sample C: the highest percentage was 41.9% of the members of the panel who perceived respectively acid, sweet and astringent flavors. The vocabulary generated during the tasting of fermented cassava guided by a panel of 31 tasters (Texture and flavor) (table 4). Some say that the leaves are soft, smooth, sticky and hard (texture to the touch) and the highest percentage found in smooth and tender 35.45% in samples B and C.

However, others say that fermented cassava leaves are rubbers, hard, soft, the highest percentage was found in the sample. It turns out that these comments are contradictory: panelists 41.93% saw a lovely flavor in the sample against 16.12% members of the panel observed that the fermented leaves a bad taste and 45.16% said it is fairly nice. While for sample B: 51.66% of panelists found pleasant fermented leaves, 41.93% found it's moderately pleasant and 6.43% of panelists found a bad taste. With regard to the sample C: 48.33% panelists perceived a good flavor and panelists 41.93% judge, however, that the taste is not good.The analysis of variance for the hedonic (table 5) test has been made with several variables: the sweet flavor, the bitter taste, flavor, texture in the mouth (soft). The DUNCAN test, allowed us to conclude that there is no significant difference ($p \leq 005$) between the averages of pleasant results for three samples of Ntoba mbodi all the variables.

V. CONCLUSION

The objective of this study is to characterize and optimize the flavor of the Ntoba mbodi to contribute to the basic knowledge needed to master the sensory properties of the product. Physical-chemical and sensory characteristics obtained were determined. The results of the various analyses testify to the ability of Ntoba mbodi; the technique tested for this purpose is suitable for small scale production. The overall perception of the consumer on the Ntoba mbodi confirms its good acceptability by the panel of tasters and the production of ntoba mbodi is not the intellectual level that can have an individual. The sensory evaluation we discovered that in all samples the difference was not significant. It is necessary that we adopt measures of processing of cassava leaves respecting the conservation of the rules of hygiene. We can measure the interest that may represent the leaves of cassava fermented by the safety provided by cooking and benefits provided by the Ntoba mbodi on health.

- In mechanizing agriculture and developing processing industries and manufacturing could not extend the shelf life of Ntoba mbodi?
- Are there any other methods physicochemical and sensory of cassava leaves?

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