Field Scientific Report

Consumer Testing of Boiled Plantain in Rural and Urban Areas in Cameroon

Understanding the Drivers of Trait Preferences and the Development of Multi-user RTB Product Profiles, WP 1, Step 4

Njombé, Cameroon, November 2021

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Ethics: The activities, which led to the production of this manual, were assessed and approved by the National Ethics Committee for Human Health Research in Cameroon (Letter n° 2019/07/1347/L/CNERSH/SP of 18 July 2019). When relevant, samples were prepared according to good hygiene and manufacturing practices. When external participants were involved in an activity, they were priorly informed about the objective of the activity and explained that their participation was entirely voluntary, that they could stop the interview at any point and that their responses would be anonymous and securely stored by the research team for research purposes. Written consent (signature) was systematically sought from sensory panellists and from consumers participating in activities.

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ABSTRACT

Consumer testing of Boiled plantain in rural and urban areas of Cameroon

Njombé, Cameroon

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In order to understand consumers' demand for boiled plantain quality characteristics, and provide WP2 with relevant information pertaining to the sensory characteristics associated to boiled plantain samples, consumer testing was carried out in some localities of the West and Littoral regions of Cameroon. Plantain cultivars used during this activity were all harvested from CARBAP's experimental plot in Njombé and included: *Batard*, *Big ebanga* and *CARBAP K74* (a plantain-like hybrid). These varieties were processed on-field as recommended in activity 4. Prior to consumption, they were respectively coded as 194, 928 and 215. A total of 300 consumers tested the samples during this activity. In each locality, the three boiled plantain samples were presented before each consumer in a random order and their assessment of the overall liking, JAR ("Just About Right") and CATA ("Check-All-That-Apply") tests of these samples were recorded. Results showed that consumers liked samples 194 and 928 with mean overall likings of 7.0 and 6.9 respectively, corresponding to "Like moderately". Conversely, sample 215 was liked least with a mean overall liking of 5.8 ("Like Slightly"). More than 60% of consumers scored attributes such as "colour", "humidity", "texture in the mouth" and "sweet taste" as JAR for the most liked boiled plantain samples (194 and 928). On the other hand, about 40% of consumers perceived the colour of sample 215 as "too light", while more than 60% found its taste "not sweet enough". Principal Component Analysis of CATA data explained 100% of the variance of the sensory characteristics. High quality characteristics of boiled plantain mainly include: 'good plantain odour', 'plantain taste', 'smooth plantain', 'firm plantain', 'mealy' and 'well-cooked plantain'. Low quality characteristics of boiled plantain on the other hand are mostly: 'soft plantain', 'immature plantain' and 'taste of sap'. This study suggests that characteristics such as 'plantain taste', 'plantain odour', 'plantain colour' and 'plantain firmness' have to be taken into consideration for varietal improvement.

Key Words: boiled plantain, Cameroon, check-all-that-applies, just-about-right, consumer acceptability, sensory characteristics, gender

1 STUDY CONTEXT AND GENERAL OBJECTIVES

The main aim of this Activity 5 "*Consumer testing*" is to understand consumers' demand for the quality characteristics of boiled plantain.

Another aim is to provide WP2 with a clear and visual mapping of the most liked products associated with high quality characteristics and high overall liking scores, and of the least liked products associated with low quality characteristics and low overall liking scores.

The activity consists in inviting a large number of consumers to test three boiled samples of plantain varieties prepared on-site, from plantain varieties that were initially used during processing demonstrations, with different quality characteristics.

2 METHODOLOGY

2.1 Location

Consumer testing was held in villages where *gendered food mapping* (activity 3) took place, in addition to small and big towns. This activity took place from November 9th to November 18th 2020 in the West and Littoral regions of Cameroon. Each of these regions had 150 participants distributed as follows:

- One big town (60 consumers);
- One small town (30 consumers);
- Four villages (15 consumers per village, for a total of 60 consumers)

The study sites are shown in Figure 1. In each region, the study was carried out in three Divisions. In the West region, the Bamboutos (Bamendjing and Bafounda), Menoua (Dschang, Penka Michel and Balessing) and Mifi (Bafoussam) Departments were targeted, while in the Littoral region, the Moungo (Kombe and Njombe), Sanaga Maritime (Pouma, Sokelle and Song-mayo) and Wouri (Douala) Departments were of interest.

The number of consumers per locality is displayed in Table 1.

Table 1: Number of consumers interviewed in rural and urban areas of the West and Littoral regions

	Total	West region						Littoral region					
		BAF	DSC	PM	BAL	BAM	BDA	DLA	POU	SOK	SOM	KOM	NJO
Number of Consumers	300	60	30	15	15	15	15	60	30	15	15	15	15
Women	149	30	15	8	7	7	7	30	15	7	8	7	8
Men	151	30	15	7	8	8	8	30	15	8	7	8	7

BAF = Bafoussam; DSC = Dschang; PM = Penka-Michel; BAL = Balessing; BDA = Bafounda; BAM = Bamendjing

DLA = Douala; POU = Pouma; SOK = Sokelle; SOM = Song-mayo; KOM = Kombe; NJO = Njombé

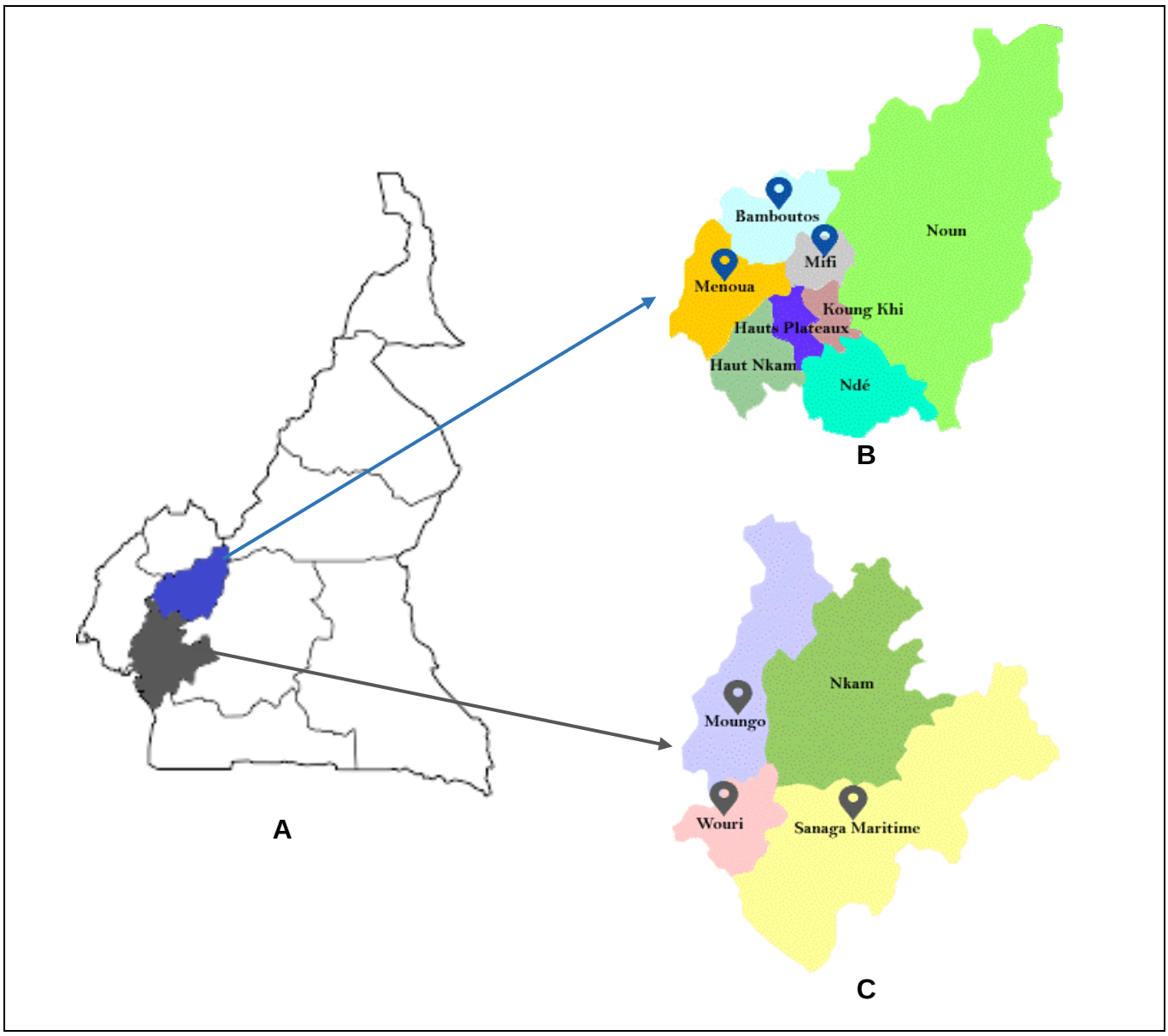


Figure 1:Study sites. (A) Overview of Cameroon with the West and Littoral regions highlighted. (B) Overview of the West region with the Departments of Bamboutos, Menoua and Mifi highlighted. (C) Overview of the Littoral region with the Departments of Moungo, Wouri and Sanaga Maritime highlighted.

2.2 Sample preparation

Plantain varieties used in the course of this activity were obtained from CARBAP's experimental plot in Njombé. These varieties were two plantain landraces: *Batard* and *Big ebanga*, and a plantain-like hybrid: *CARBAP K74*. They were chosen because of their contrasting characteristics as reported in activity 4 (*Processing demonstrations*) within the framework of WP1 by processors and because of their availability at their optimum physiological maturity stage (figure 2). It should be recalled that activity 5 was delayed because of the unavailability of matured plantain bunches from CARBAP experimental plots.

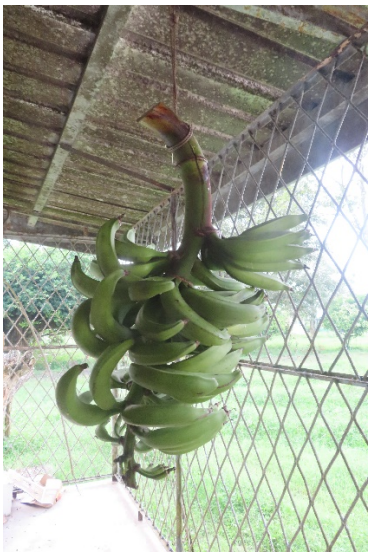


Photo 1: A bunch of *Batard cv.*

Photo 2: A bunch of *CARBAP K74* hybrid

Photo 3: A bunch of *Big ebanga cv.*

Figure 2: Photos of plantain bunches used within the framework of activity 5

When arriving in each locality, plantains were processed on-site once the processing setup was displayed. It was made of 4 cooking pots, 4 gas stoves, 3 strainers, 2 cooking knives, 3 plastic basins, 4 transparent buckets and 2 thermos flasks. The same processor was responsible for boiling plantains in all the localities surveyed.

Processing steps as highlighted by processors during activity 4 within the framework of WP1 served as benchmark. The following operations were carried out:

- Four fruits were detached from each plantain bunch and soaked in water. Each variety being soaked in a separate basin (photo 4);

- These fruits were then peeled, and their pulps were scraped and soaked in water to prevent enzymatic browning. They were later cut into two halves (photos 5 & 6);

- Three pots containing approximately two litres of water were brought to boil. These pots were used for plantain processing, while a fourth one was used to heat additional water to be added in the other pots during cooking in order to ensure the complete immersion of plantain pulps;

- When water started boiling, the scraped pulps of each of the plantain varieties were introduced in their respective pots and allowed to boil for 1 hour;

- After 30 minutes of boiling, one litre of boiled water (from the fourth pot) was introduced in each of the pots;

- Once cooking was complete, the content of each of the pots was drained in a strainer, put in rectangular boxes and kept in a thermos flask containing hot water in order to have samples tested when they are warm (photos 7, 8 & 9);

- Two slices of plantain pulps (55 – 57 °C) about 1-2 cm thick, of each variety were put in small cylindrical boxes and served to the participants. These boxes were initially coded before conditioning (photo 10).

Photo 4: Detached fruits soaked in water

Photo 5: Fruit's peeling

(a)

(b)

Photo 6: Pulp scraping (a) and cutting (b) into halves

Photo 7: Cooked pulps drained in strainers

Photo 8: Cooked pulps put in rectangular boxes prior to storage in a thermos flask

Photo 9: Cooked pulps stored in a thermos flask containing hot water

Photo 10: Boiled plantain samples in a tray prior to testing

Figure 3: Photos of sample preparation prior to consumer testing

2.3 Consumer testing

A method including a hedonic test, a just-about-right (JAR) test, and a check-all-that-apply (CATA) test was used. Consumers (n=300), of both genders were randomly selected in each locality. People of those locations who are regular consumers of boiled plantain were invited to participate to the testing session. These consumers were asked individually to look/touch/smell/taste each boiled plantain sample, one after the other, in a random order, and score the overall liking using a nine-point hedonic scale (from 1. “Extremely dislike, to 9. “Extremely like”) (figure 4).

Photo 11: Consumer testing session in Pouma

Photo 12: Consumer testing session in Bamendjing

Figure 4: Photos of consumer testing sessions in Pouma and Bamendjing

Consumers were also asked to assess how they perceive the intensity of four (4) characteristics identified as important in the previous Activities 3 & 4, using the 3-point JAR “Just About Right” scale (1 = “too low, too weak, not enough”, 2= “Just About Right” and 3 = “too high, too strong, too much”) for each of the boiled plantain samples. The JAR quality characteristics chosen were: colour, texture in the mouth, humidity, and sweet taste. These characteristics were chosen because, beside the fact that they were cited the most in the previous activities 3 & 4, they also vary significantly between the varieties chosen for the study.

Consumers were then asked to select the quality characteristics that better describe each boiled plantain sample, among a list of 24 sensory characteristics (table 2) -that were the most liked and the least liked collected during the previous Activities 3 & 4- using a “Check-All-That-Apply” (CATA) approach. Finally, consumers were invited to give their opinion and preferences on the boiled plantain samples.

Table 2: Quality characteristics identified during the previous activities (3 and 4 of WP1) and selected for building the CATA table

	List of the most liked characteristics	List of the least liked characteristics
Quality characteristics of the ready to eat product	**Appearance** - Deep yellow colour - Yellow colour - Like ripe plantain - Smooth - Absence of spaces between grains **Odour** - Good plantain odour	**Appearance** - Pale colour **Texture when Touching** - Hard - Too soft **Taste** - Taste of sap - Bitter taste

	List of the most liked characteristics	List of the least liked characteristics
	Texture when touching - Soft - Firm - Tender - Mealy **Taste** - Sweet taste - Plantain taste **Texture in mouth** - Well cooked - Juicy	**Texture in mouth** - Crunchy - Too humid - Immature plantain - Not well cooked - Sticky

In red colour: characteristics identified during Activity 3; In blue colour: characteristics identified during Activity 4; In green colour: characteristics identified during Activity 3 and 4.

2.4 Data analysis

A one-way analysis of variance (ANOVA) was carried out to identify significant differences in Overall liking scores between the three (03) boiled plantain samples as tested by 300 consumers. Multiple pairwise comparisons were applied using Tukey's test with a confidence interval of 95% at $p < 0.05$ (n=300 consumers). For each boiled plantain sample, the number of consumers who judged each specific characteristic either Just All Right (JAR), 'too weak' or 'too strong; was counted, and the percentage of consumers (out of 300) was determined. A Principal Component Analysis (PCA), (Covariance) was used to describe the relationships between frequencies of citation of CATA sensory characteristics and the mean Overall liking scores for each boiled plantain sample. When ranking some variables, the overall frequency of citations obtained by summing the frequency of citations multiplied by their corresponding coefficients was used as a means of differentiation. As such, the first choice had a coefficient of 3, the second choice had a coefficient of 2 and the third choice a coefficient of 1. Statistical analyses were performed using XLSTAT 2014 software (Addinsoft) and IBM SPSS Statistics Version 20.

3 RESULTS AND DISCUSSION

3.1 Overall liking of the product samples

The overall liking of the boiled plantain samples differed significantly at $p<0.05$ (one-way ANOVA) (Table 3).

Table 3: Mean overall liking scores for the three boiled plantain samples tested

Product Samples	Mean Overall liking scores* (300 consumers)	Groups**	
Batard	7.0		B
CARBAP K74	5.8	A	
Big ebanga	6.9		B

*Overall liking was rated on a nine-point scale from 1 = dislike extremely, to 9 = like extremely.

**Different letters correspond to the products, which are significantly different. Tukey test ($p<0.05$).

The most liked boiled plantain samples were the *Batard* and *Big ebanga* samples with a mean overall liking score of 7 (like moderately) and 6.9 (close to 7, like moderately) respectively. The least liked was the *CARBAP K74* sample with a mean overall liking score of 5.8 (close to 6, like

slightly). Despite having undergone the same process, these varieties presented significant differences with samples *Batard* and *Big ebanga* being significantly different from sample *CARBAP K74*.

3.2 Segmentation of consumers into groups of similar overall liking

The aim of an Agglomerative Hierarchical Clustering (AHC) analysis is to create homogeneous clusters of consumers who have similar overall liking scores. It is useful to classify consumers who have been interviewed randomly, into similar groups.

An Agglomerative Hierarchical Clustering analysis of the mean overall liking scores enabled the identification of three groups of consumers that we have named "*Batard* & *Big ebanga* likers", "All likers" or "All likers" and "Neither likers or dislikers". These three clusters contain 54.3%, 24.0% and 21.7% of all the consumers interviewed respectively. There were significant differences ($P < 0.001$) in the overall liking of the three clusters (Figure 5 and Figure 6).

From this clustering, it is clear that *CARBAP K74*, the variety that was deemed bad (for boiling) following activity 4 comments by processors, is not that bad for consumers. The 3rd cluster contains *Batard* with an overall liking of 5.32, *CARBAP K74* with an overall liking of 4.95 and *Big ebanga* with an overall liking of 4.55, hence corresponding to "Neither like nor dislike". The reason behind this could be attributed to the varied preferences of the consumers interviewed. In fact, depending on their consumption habits, the acceptance of a variety will depend on how familiar they are with boiled plantain at an unripe stage.

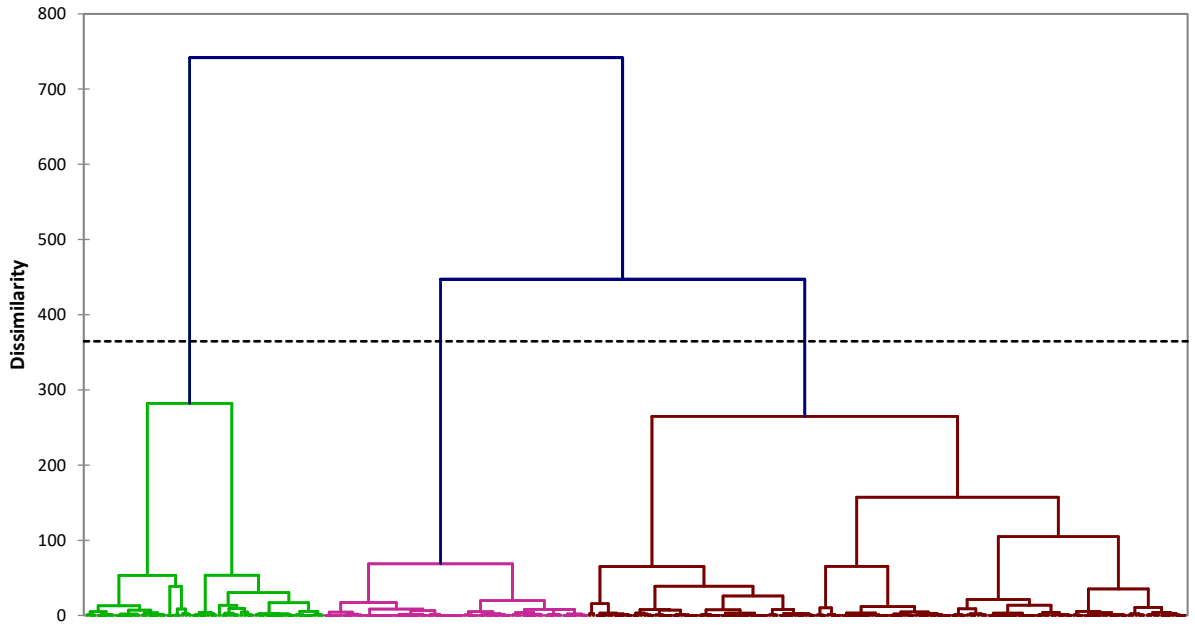
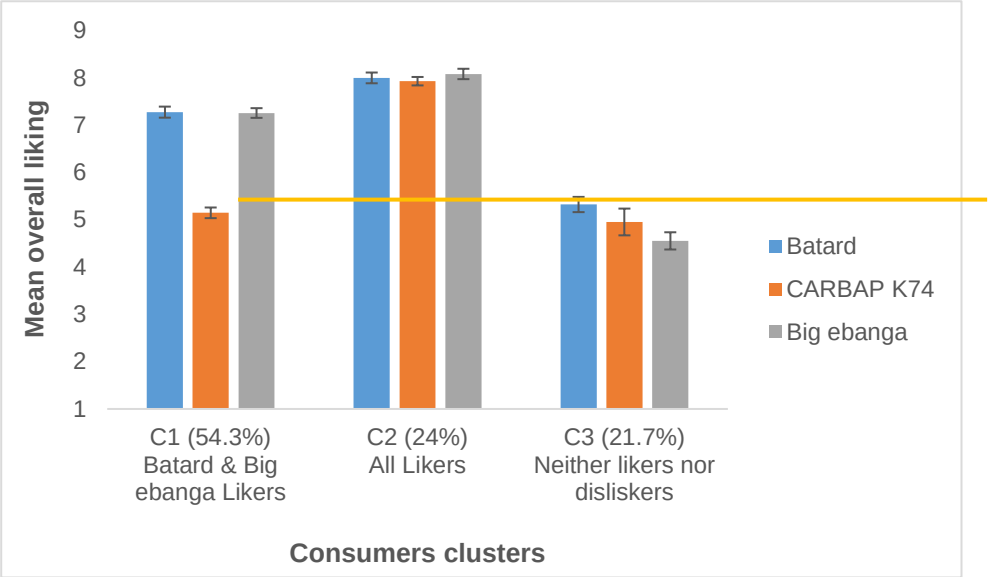


Figure 5: Clustering of the consumers based on their overall liking scores of the product



Where: error bars represent the standard error.

Figure 6: Mean overall liking of the boiled plantain samples by consumer cluster type

3.2.1 Demographic data of the consumers interviewed

Among the 300 consumers interviewed, 49.7% were women and 50.3% were men. Majority of these consumers were aged between 26 and 35 years, representing 30% of the total consumers. Artisanship (37%) was the main occupation of these consumers, followed by the category "employed" (21%). With respect to ethnicity, Bamileke (59%) was mostly represented, followed by Bassa (21%) and Bamenda (3%). These consumers had attended secondary schools for the majority (55%). No significant differences between these clusters were observed with respect to any sociodemographic characteristics at 5% threshold (Table 4). Since no significant differences were found between the locations and other demographic factors, the obtained data were analysed as whole.

Table 4: Demographic differences of the consumers with respect to cluster division

		Total	C1 (Batard & Big ebanga Likers)	C2 (All Likers)	C3 (Neither likers nor Dislikers)	Chi-square (p)*
	Number of consumers	**300**	**54.30%**	**24.00%**	**21.70%**	
Region	West	50.0	55.3	23.3	21.3	0.939
	Littoral	50.0	53.3	24.67	22.00	
Gender	Women	49.7	57.7	24.2	18.1	0.310
	Men	50.3	51.0	23.9	25.2	
Age	18-25 years old	16.7	48.0	24.0	28.0	0.055
	26-35 years old	30.0	54.4	21.1	24.4	
	36-45 years old	19.7	55.9	27.1	17.0	
	46-55 years old	18.7	69.6	12.5	17.9	
	≥56 years old	15.0	40.0	40.0	20.0	

		Total	C1 (Batard & Big ebanga Likers)	C2 (All Likers)	C3 (Neither likers nor Dislikers)	Chi-square (p)*
Number of consumers		**300**	**54.30%**	**24.00%**	**21.70%**	
Ethnicity	Bamileke	59.3	53.4	24.2	22.5	0.218
	Bassa	20.7	62.9	19.4	17.7	
	Bamenda	3.3	50.0	30.0	20.0	
	Beti	2.0	33.3	16.7	50.0	
	Essimbi	2.3	14.3	71.4	14.3	
	Mbo	2.7	50.0	25.0	25.0	
	Sawa	1.7	40.0	20.0	40.0	
	Northerner	1.0	100.0	0.0	0.0	
	Bafia	1.7	100.0	0.0	0.0	
	Others	5.3	43.8	31.3	25.00	
Education	No education	1.7	40.0	20.0	40.0	0.308
	Primary education	20.7	50.0	30.7	19.4	
	Secondary education	54.7	57.9	23.8	18.3	
	Higher education	23.0	50.7	18.8	30.4	
Marital status	Single	35.7	56.1	19.6	24.3	0.409
	Married	60.7	54.4	26.4	19.2	
	Widower	3.7	36.4	27.3	36.4	
Occupation	Student	14.3	51.2	11.6	37.2	0.078
	Artisanship	36.7	53.6	21.8	24.6	
	Civil servant	1.3	75.0	25.0	0.0	
	Trading business	12.7	44.7	39.5	15.8	
	Employed	21.0	57.1	25.4	17.5	
	Unemployed	12.0	63.9	27.8	8.3	
	Retired	2.0	50.0	16.7	33.3	
Frequent consumption form	Boiled plantain	63.0	52.9	21.2	25.9	0.091
	Roasted plantain	6.0	38.9	38.9	22.2	
	Pounded plantain	7.3	72.7	22.7	4.6	
	Fried plantain	23.7	56.3	28.2	15.5	
Consumption frequency	Daily	0.7	50.0	0.0	50.0	0.524
	Several times a week	38.3	60.0	20.9	19.1	
	One time a week	21.7	53.9	26.2	20.0	
	Several times a month	26.0	47.4	30.8	21.8	
	One time a month	13.3	52.5	17.5	30.0	

**Chi-square test performed using IBM SPSS Statistics Version 20*

3.2.2 Consumption attitudes

Plantain is found to be mostly eaten in the boiled form (as boiled plantain), accounting for over 60% of consumers. Fried plantain was the second form of plantain consumption of 24% of consumers. 38% of consumers interviewed were used to consume boiled plantain several times a week, while 26% consume it several times a month. Boiled plantain is seldom eaten daily as only 0.7% of consumers made mention it (Table 4).

Boiled plantain is consumed with a variety of accompaniments or sauces. The most consumed sauces are listed in table 5. Of these sauces, “Ndole” is the most consumed, followed by groundnut sauce and fried beans. “Ndole” also happens to be the first choice for more than 100 consumers.

With respect to the ripening stage, boiled plantain was found to be mostly eaten when it is either half-ripe or ripe. When overripe, it is rarely eaten (table 6).

Table 5: Frequency of citations of accompaniments/sauces for boiled plantain

Accompaniments / sauces	Frequency of citations			Overall score*
	First choice (Coef. 3)	Second choice (Coef. 2)	Third choice (Coef. 1)	
With fried beans	31	50	54	247
With fried eggs	5	17	26	75
With pepper soup	34	33	45	213
With "*Ndole*"	108	64	43	495
With groundnut sauce	42	45	41	257

Coef. =Coefficient

**Obtained by summing the number of citations multiplied by their corresponding coefficients for each row.*

Table 6: Preferred ripening stages for boiled plantain

Preferred ripening stage	Frequency of citations			Overall score*
	First form (Coef. 3)	Second form (Coef. 2)	Third form (Coef. 1)	
Unripe plantain	80	69	86	464
Half-ripe plantain	115	128	20	621
Ripe plantain	103	62	76	509
Overripe plantain	2	5	9	25

Coef. =Coefficient

**Obtained by summing the number of citations multiplied by their corresponding coefficients for each row.*

3.3 A Just About Right test (JAR)

Just about right (JAR) scale was used to determine the optimum level of intensity as perceived by the consumers for colour, texture in the mouth, sweet taste, and humidity of boiled plantain samples. Such “descriptor diagnostic” may help understand why consumers like or dislike a particular boiled plantain sample.

Consumers were asked to give their perception of Colour, Texture in the mouth, Sweet taste, and Humidity of each boiled plantain, by using a 3-point JAR scale (1 = “too low, too weak, not enough”, 2= “Just About Right” and 3 = “too high, too strong, too much”). Most of consumers considered samples from *Big ebanga* and *Batard* plantain varieties as JAR for the four selected descriptors. On the other hand, the *CARBAP K74* plantain variety was considered “too dark” and no sweet taste. These results can explain the lower score of this sample compared to others.

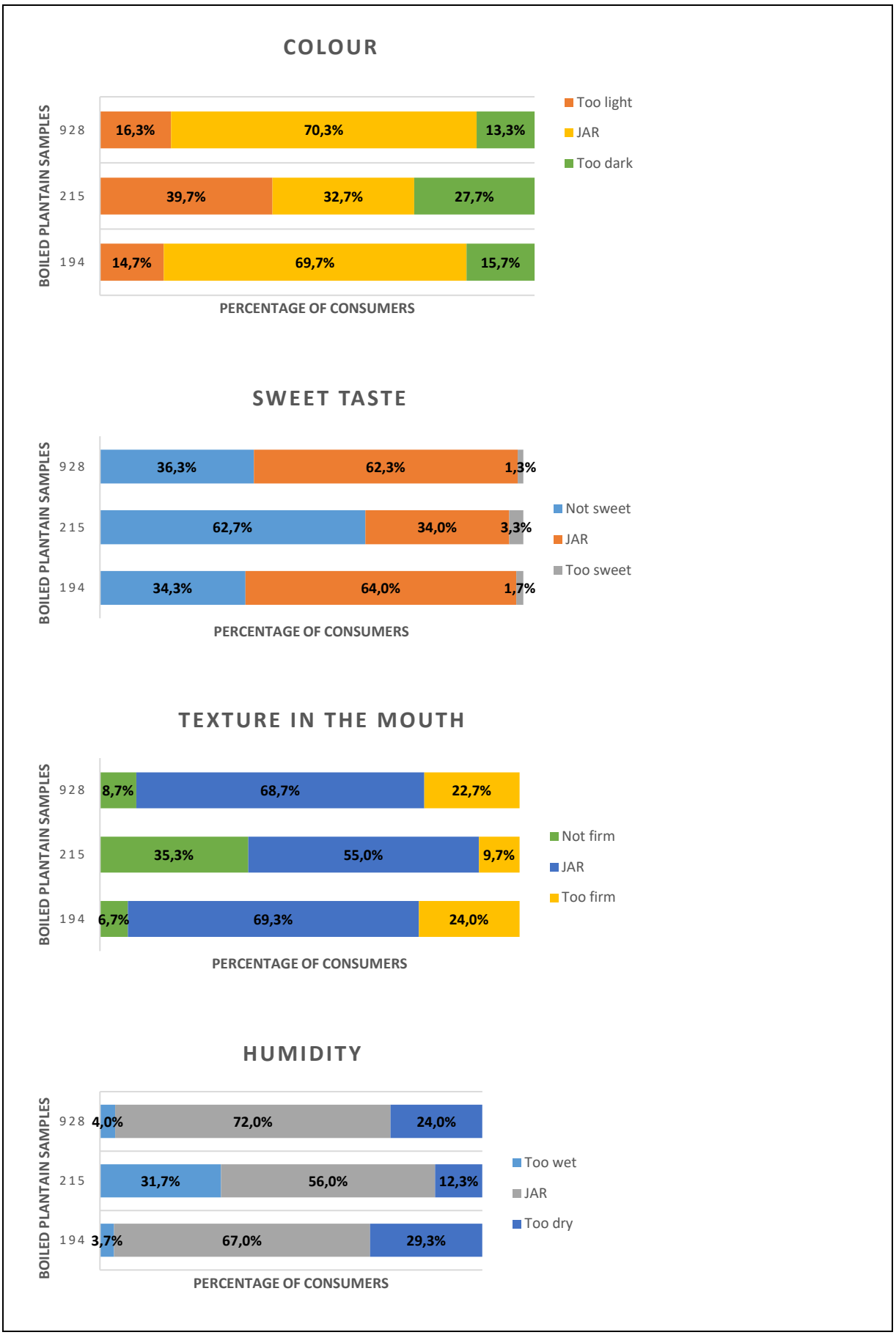


Figure 7: Percentage of consumers who scored the four selected quality characteristics

3.4 Check All That Apply (CATA) test

The objective of the CATA test is to show the relationships between hedonic overall liking scores for each boiled plantain sample and the frequencies of citation of each CATA sensory characteristic by all the consumers.

After scoring the overall liking and the perception of some specific sensory characteristics, consumers were invited to choose the most appropriate terms among 24 sensory characteristics that better describe each boiled plantain sample.

The frequency of citations given by consumers to describe each boiled plantain sample were calculated (Table 7).

The sensory characteristics most frequently cited by the consumers were considered the best for describing boiled plantains. They were the following: “well cooked”, “plantain taste”, “good plantain odour”, and “smooth” with a number of citations between 800 and 650, followed by “mealy”, “firm plantain”, “yellow”, and “tender” with a number of citations between 600 and 400. The least used terms were “bitter”, “too soft” and “too humid”.

The Batard boiled plantain sample was described as “well cooked” by consumers (258 citations), “smooth” (241 citations), “firm” (227 citations), with a “good plantain odour” (271 citations) and “plantain taste” (283 citations). Consumers used the same characteristics to describe the 928 boiled plantain sample with almost the same number of citations.

The CARBAP K74 boiled plantain sample was qualified as “soft” (149 citations), “immature” (137 citations), and with “taste of sap” (120 citations). It was however perceived “well cooked” (248 citations) and “smooth” as the two other boiled plantain samples.

Table 7: Frequency of citations of each quality characteristic by all the consumers

Quality characteristics	194	215	928	Total number of citations
Hard	86	31	68	185
Sweet	114	47	100	261
Sticky	130	104	110	344
Pale colour	54	107	49	210
Plantain taste	283	171	281	735
Deep yellow	113	105	102	320
Tender	151	115	145	411
Juicy	79	93	91	263
Firm plantain	227	119	224	570
Good plantain odour	271	156	274	701
Too humid	5	73	4	82
Not well cooked	40	46	44	130
Immature plantain	33	137	41	211
Too soft	5	67	5	77
Like ripe plantain	113	51	117	281
Yellow	162	98	169	429
Soft	96	149	110	355
Mealy	203	109	205	517
Well cooked	258	248	248	754
Smooth	241	217	236	694
Absence of spaces between grains	112	140	80	332
Crunchy	32	58	38	128
Taste of sap	55	120	59	234

Quality characteristics	194	215	928	Total number of citations
Bitter	2	6	1	9
Mean overall liking	**7.0**	**5.8**	**6.9**	

3.5 Sensory mapping of the sensory characteristics

Principal component analysis (PCA) was used to summarize the relationships between CATA sensory characteristics, Product samples, and mean Overall liking of each product scored by all the consumers.

The PCA plot explained 100% of the variance of the sensory characteristics, the first and second axes accounting for 97.8% and 2.2% respectively. Most of the variance was explained by the first axis.

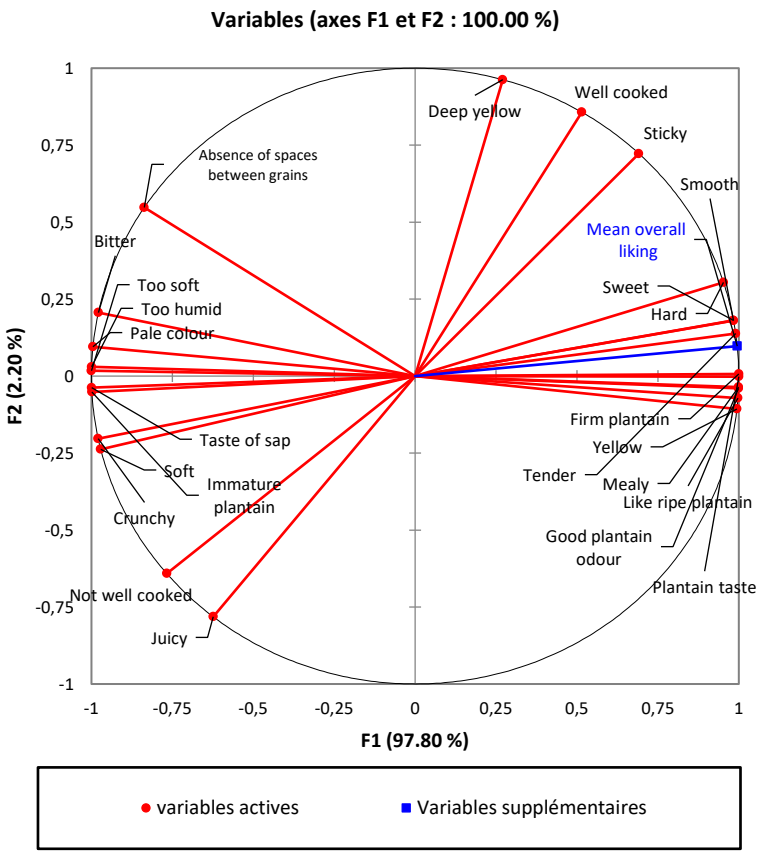
The loading of sensory characteristics on PCA plan (Figure 8) shows that axis F1 was mainly explained positively by the terms such as “sweet”, “like ripe plantain”, “plantain taste”, “firm plantain”, “good plantain odour” related to the most liked boiled plantain samples (*Batard* & *Big ebanga*) and negatively by the terms such as “immature”, “too soft”, “taste of sap” and “crunchy” related to the least liked boiled plantain sample (*CARBAP K74*). As far as the three samples were associated to the axis F1, these descriptors can be considered as discriminating the samples.

Axis F2 was mainly explained positively by the terms such as “deep yellow” and “well cooked” related to the *Batard* boiled plantain sample.

A high Mean overall liking scored by consumers was related to the high-quality characteristics such as “smooth”, “mealy”, “tender”, “sweet”, “plantain taste” which were associated to the most liked boiled plantain samples (*Batard* & *Big ebanga*).

At the opposite, a low mean overall liking by the consumers were related to the low-quality characteristics such as “immature”, “too soft” and “too humid”, “which were associated to the least liked boiled plantain sample (*CARBAP K74*).

The characteristic “Hard”, deemed as a poor quality characteristic, was rather related to the most liked boiled plantain samples (*Batard* and *Big ebanga*) instead of the least liked boiled plantain sample (*CARBAP K74*). In fact, this could be attributed to the fact despite the difficulty observed when chewing these plantain samples, the other characteristics outpass it, hence making it acceptable by consumers. Besides, these consumers were found to consume half-ripe or ripe plantain the most, which compared to unripe plantain is less hard.



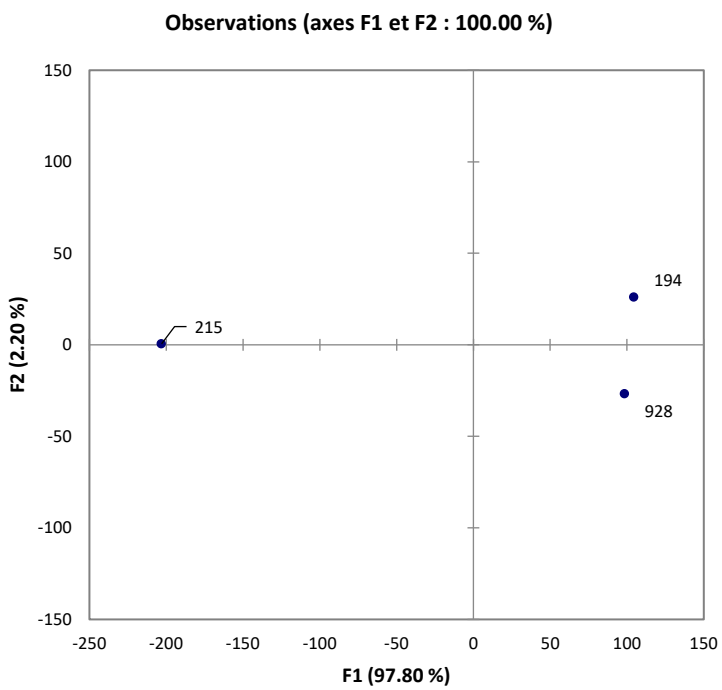


Figure 8: Mapping of the sensory characteristics and the overall liking of the product samples

4 CONCLUSION

This activity focused on understanding consumers' acceptability for boiled plantain and perception of quality characteristics in view of providing WP2 with a clear and visual mapping of these quality characteristics in relation to plantain varieties. Despite the unavailability of plantain bunches which could have allowed this activity to be done earlier, this activity was finally carried out when plantain bunches from CARBAP experimental plots reached their optimal physiological maturity.

The following conclusion can be drawn:

- Of the three boiled plantain samples, *Batard* and *Big ebanga* coded as 194 and 928 were liked most (mean overall likings of 7 and 6.9 respectively), while the plantain like hybrid, namely *CARBAP K74* and coded as 215 was liked least (mean overall liking of 5.8);

- Three clusters emerged from the 300 consumers interviewed in two locations: Cluster 1 (194 & 928 likers), Cluster 2 (194, 215 & 928 likers) and Cluster 3 (Neither likers nor dislikers), with no significant differences between these clusters and sociodemographic characteristics (location, education, marital status, gender, etc.)

- JAR test revealed that Colour was the characteristic that was scored highest by the consumers for the most liked boiled plantains. 62.7% of consumers perceived Sample 215 as "not sweet";

- The main high-quality characteristics of boiled plantain include: "good plantain odour", "plantain taste", "well-cooked", "smooth", "firm plantain" and "mealy texture".

- The low-quality characteristics of boiled plantain include: "soft plantain", "immature plantain", "taste of sap", "too humid".

Plantain taste, colour, odour and firmness are key characteristics that need to be included into consideration in breeding improvement programs.

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