SENSORY ATTRIBUTES OF FRESH MAIZE ACCESSIONS IN SOUTH-EASTERN NIGERIA.

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ABSTRACT
Consumption of boiled or roasted fresh maize is very common in Nigeria. Variations in palatability attributes were studied among fifteen accessions of local accessions of maize collected from Abia and Imo states in south-eastern Nigeria. The seeds used were sourced from rural dwellers. Data collected were analyzed using Gen Stat statistical software. Highly significant differences were obtained among accessions for sensory (palatability) attributes of colour, taste, grain-size, appeal, hardness and preference. Preference which assessed level of acceptability and rejection showed that the most highly preferred accession was AB-Ibeku while the most rejected accession was AB-Ndoro. The best accession in terms of consumption and acceptability was IM-Mbaise with rank summation index value of 30 while the least (not acceptable) accession was AB-Ndoro with rank summation index value of 69. Preference correlated significantly and positively with appeal (r=0.838**), colour (r=0.77**), grain-size (r=0.61*) and taste (r=0.84**) but significantly and negatively correlated with hardness (r = -0.71**). * = Significant (P=0.05); ** = Significant (P=0.01).
Keywords: **Maize accessions, palatability, rank summation index.**

1.0 Introduction

Maize *(Zea mays* L.*)* is the next most important cereal in the world after wheat and rice with regard to cultivation area and total production (Purseglove, 1992; Osagie and Oka, 1998).

In Nigeria, maize production is quite common in all parts of the country, with an annual production of about 5.6 million tons (Central Bank of Nigeria, 1992). The consumption pattern of maize varies among states in Nigeria, but generally maize is consumed as green maize, baby food, breakfast cereals and different types of preparations for local dishes (Ezekwe, 1991). Maize is highly nutritive even though it is deficient in the essential amino-acids (lysine and tryptophan) in most cultivars (Leslie, 1979). It is biologically one of the most productive crops known to man and one of the most responsive to fertilizer inputs (Lukas, 1991). 'Green maize' which is maize harvested and consumed at the milk or dough stage, is rather indispensable during the hunger period prevalent in most part of the state before other crops are ready for harvesting (Ezekwe, 1991). Some reasons for the booming trade in fresh maize are the huge demand for it for human consumption and difficulty in maintaining adequate moisture content for storage of the early season maize (Balogun, 1991). Maize also answers satisfactorily to its expectations of food acceptance (Nordtest, 2002). The physical aspect of food has an effect on food acceptability through the sensory attributes of the product and psychological factors. Subconsciously, consumers often evaluate foods using a checklist that begins with appearance and ends with mouth feel (Berry 2005). Human perception of food quality relies on the visual image of the food product (Hetherington and MacDougall, 1992). Imran (1999) contends that visual sensory properties are of critical importance especially in situations where products are sold through appearance rather than through packaging. Although there have been many improvements in maize cultivars, landraces or local accessions are still relevant in most localities such that they influence the consumption pattern of the people and also encourages the sales of its accompaniments; local pea *(Dacroydes edulis)*, coconut *(Cocos nucifera)* and palm kernel. It is on this premise that this research was carried out to determine the accession(s) preferred most by consumers for fresh maize consumption within this stipulated location.

2.0 Methodology

2.1 Location

The planting was carried out at the Teaching and Research Farm, Federal University of Technology Owerri, Imo State located at $5^{\bullet}\ 2^{1}$ N and $7^{\bullet}\ 2^{1}$ E during 2010 cropping season.

The area is characterized by minimum and maximum temperatures of between $20^{\bullet}$C and $32^{\bullet}$C respectively. The soil of this area is characterized by deep porous oxisol derived from sandy deposits in the coastal plains which are highly weathered, low in mineral reserve and natural fertility (Ononiwu, 1990).

2.2 Treatments

The treatments were the fifteen local accessions of maize collected from different locations in Abia and Imo states of South-eastern Nigeria. The comprehensive list of the fifteen local accessions and their collection sites are shown in Table 1.

Table 1: Names and collection sites of maize accessions from Abia and Imo States in South-eastern Nigeria.

S/N	Name of accession	Collection site
1	AB-Aghoro	Aghoro
2	AB-Bende	Bende
3	AB-Ibeku	Ibeku
4	AB-Ndoro	Ndoro
5	AB-Ngwa	Ngwa
6	AB-Obuohia	Obuohia
7	AB-Umuahia	Umuahia
8	AB-Umudike	Umudike
9	IM-Awaka	Awaka
10	IM-Emekuku	Emekuku
11	IM-Eziobodo	Eziobodo
12	IM-Ikwuano	Ikwuano
13	IM-Mbaise	Mbaise
14	IM-Ohaji	Ohaji-Egbema
15	IM-Okwuato	Ibeku Okwuato

Key: AB= Abia State ; IM= Imo State

2.3 Palatability Experiment

Palatability test was carried out at harvest in the Laboratory of Department of Crop Science and Technology, Federal University of Technology Owerri. The fresh maize harvests of all the 15 accessions were boiled for about one hour and water-drained. Each accession was placed on a separate tray with appropriate identification tag number. A panel comprising of 20 participants of the university community were trained for the experiment. A total of three hundred (300) structured questionnaires were distributed in all. Each participant received fifteen (15) questionnaires one for each accession for data collation. The ages of the participants ranged from 20 years and above. Adequate volume of clean water and carrots were provided for participants to rinse mouths and also to neutralize the taste buds as the testing proceeds from one accession to another. The data from this survey were analyzed statistically using Gen Stat software and was further subjected to rank summation index test in other to ascertain the significance of acceptance or rejection with regard to the different maize accessions. Parameters tested for were colour, grain size, hardness, appeal, taste and preference.

3.0 Results

Table 2 showed that the mean squares of six sensory parameters of maize accessions evaluated were highly significant (P=0.01). The performances of the fifteen accessions of local maize on palatability qualities as evaluated by the panelists are presented in Table 3. It showed six sensory qualities namely colour, grain-size, hardness, appeal, taste and preference.

Table 2: Mean squares for palatability parameters evaluated on 15 samples of fresh maize accessions from Abia and Imo States in South-eastern Nigeria

Sources of variation	Degree of freedom	Colour	Taste	Gran -size	Appeal	Hardness	Preference
Variety	14	7.03**	1.52**	8.36**	1.12**	5.45**	1.39**
Residual	285	0.38	0.39	0.24	0.33	0.42	0.27
Total	299						

* =Significant (P=0.05)
**= Highly significant (P=0.01)

Table 3: Panel evaluation of 15 samples of fresh maize accessions for palatability- qualities
A= Numerical rating of 1-3; 1=white, 2=yellow, 3=mixed colour

Accession	Colour [A]	Grain Size [B]	Hardness [C]	Appeal [D]	Taste [E]	Preference [F]
AB-BendeV_1)	1.95	1.15	2.35	1.95	1.85	1.85
AB-Umuahia	1.30	1.45	2.55	2.00	1.80	2.15
AB- Ngwa	2.20	1.80	1.90	2.05	2.00	2.10
IM- Ohaji	1.05	1.75	2.40	2.15	2.05	2.25
IM-Mbaise	2.00	2.60	1.75	1.70	1.42	1.65
IM-Okwuato	2.05	2.75	2.05	1.80	1.40	1.85
AB-Aghoro	2.60	2.85	1.20	1.90	1.35	1.75
IM-Ikwuano	2.25	1.20	2.50	2.11	1.90	2.10
IM-Eziobodo	2.60	2.80	1.40	1.79	1.40	1.85
AB-Ndoro	1.00	1.95	3.10	2.37	2.11	2.50
IM-Emekuku	2.10	2.75	2.16	1.40	1.53	1.80
AB-Umudike	1.11	1.35	3.00	2.05	1.84	2.30
AB-Obuohia	1.15	1.30	2.30	1.95	2.00	2.05
AB-Ibeku	2.20	2.50	1.95	1.60	1.47	1.60
IM-Awaka	2.60	2.30	2.45	1.85	1.50	1.70
Mean	1.88	2.03	2.20	1.91	1.71	1.97
L.S.D $_{(0.05)}$	0.38	0.31	0.41	0.36	0.39	0.32
CV%	32.9	24.1	29.5	30.1	36.8	26.3

B=Numerical rating of 1-3; 1=large, 2=medium, 3=small grain size
C=Numerical rating of 1-4; 1=very soft, 2=soft, 3=hard, 4=very hard
D=Numerical rating of 1-3; 1=strongly appealing, 2=mildly appealing, 3=not appealing
E=Numerical rating of 1-3; 1=sugary, 2=tasteless, 3=sour
F=Numerical rating of 1-3; 1=highly preferred, 2=mildly preferred, 3=not preferred (rejected

For colour attribute, result showed that with the assigned scaling AB-Ndoro, was pure white colour accessions with mean value of 1.0.Conversely, result showed that IM-Mbaise was a pure yellow accession with mean value of 2.00. For grain-size attribute, AB-Bende had the largest grain-size with a mean value of 1.15 while AB-Aghoro had the smallest grain-size with a mean value of 2.85. For hardness attribute, result showed that AB-Aghoro was also the softest accession with a mean value of 1.20. On the other hand the hardest accession was AB-Ndoro with a mean value of 3.10. For appeal attribute, the accession that had the strongest appeal was IM-Emekuku with a mean value of 1.40. On the contrary the accession that had the least appeal was AB-Ndoro with mean value of 2.37. For taste attribute, the sweetest rated accession was AB-Aghoro with mean value of 1.35. On the contrary, the poorest rated accession in terms of sweetness was AB-Ndoro with mean value of 2.11. Preference which is also one of the yardsticks for evaluating the palatability test showed that the most preferred accession was AB-Ibeku with a mean value of 1.60. Conversely the least preferred accession was AB-Ndoro with mean value of 2.50.

The best preferred accession in terms of consumption and acceptability was IM-Mbaise with rank summation index value (RSI) of 30 while the worst preferred accession was AB-Ndoro with rank

summation index (RSI) value of 69 as shown in Table 4.

Preference was significantly and positively correlated with appeal (r = 0.83**), colour (r = 0.77**), grain-size (r = 0.61*) and taste(r = 0.84**). However preference was significantly but negatively correlated with hardness (r = - 0.71**) as shown in Table 5.

4.0 Discussion

The IM-Mbaise which emerged as the most preferred accession after being subjected to rank summation index analysis is a yellow accession and this supported the findings of (Alika, 1993) which stated that out of the best four preferred varieties used in his experiment three were yellow. However this result is in contrast with the earlier findings of (Alika *et.al.,* 1986) that reported preferential consumption of white coloured maize at the green stage in the then Bendel state of Nigeria. Furthermore yellow maize contains more vitamin A which has high carotene content than white maize as it is one of the contributing factors to the yellowing colour of the maize; this is also in agreement with the findings of (Onyishi and Obi, 1990) which states that there is quantitative relationship between vitamin A content in fresh yellow maize and its acceptability. The contrasting result could be attributed to taste differences of people in different geographical location. This means that people in one location may prefer yellow maize to white, while other people in another location may prefer white maize to yellow one. Preference was significantly and positively related with appeal, colour, grain-size and taste but significantly and negatively related with hardness. This simply means that preference and acceptability increase as appeal and grain size increased. For colour, preference was higher with yellow accession, for taste, preference and consumption was higher with sweeter accession. However preference decreased as hardness of the fresh maize increased.

Table 4: Rank and rank summation index (RSI) of palatability parameters evaluated on 15 fresh maize accessions from Abia and Imo in South-eastern Nigeria.

Accessions	**Colour**	**Rank 1**	**Grain size**	**Rank 2**	**hardness**	**Rank 3**	**Appeal**	**Rank 4**	**Taste**	**Rank 5**	**Preference**	**Rank 6**	**Rank summation index (RSI)**
IM-Mbaise	2.00	7	2.60	11	1.75	3	1.70	3	1.42	4	1.65	2	30
AB-Ibeku	2.20	10	2.50	10	1.95	5	1.60	2	1.47	5	1.60	1	33
IM-Okwuato	2.05	8	2.75	12	2.05	6	1.80	5	1.40	2	1.85	6	39
AB-Bende	1.95	6	1.1 5	1	2.35	9	1.95	8	1.85	10	1.85	6	40
AB-Aghoro	2.60	13	2.85	15	1.20	1	1.90	7	1.35	1	1.75	4	41
IM-Eziobodo	2.60	13	2.80	14	1.40	2	1.79	4	1.40	2	12.85	6	41
IM-Emekuku	2.10	9	2.75	12	2.16	7	1.40	1	1.53	7	1.85	5	41
AB-Obuohia	1.15	4	1.30	3	2.30	8	1.95	8	2.00	12	2.05	9	44
IM-Awaka	2.60	13	2.30	9	2.45	11	1.85	6	1.50	6	1.70	3	48
AB-Umuahia	1.30	5	1.45	5	2.55	13	2.00	10	1.80	8	2.15	12	53
AB-Ngwa	2.20	10	1.80	7	1.90	4	2.05	11	2.00	12	2.10	10	54
AB-Umudike	1.11	3	1.35	4	3.00	14	2.05	11	1.84	9	2.30	14	55

IM-Ohaji	1.05	2	1.75	6	2.40	10	2.15	14	2.05	14	2.25	13	59
IM-Ikwuano	2.25	12	1.20	2	2.50	12	2.11	13	1.90	11	2.10	10	60
AB-Ndoro	1.00	1	1.95	8	3.10	15	2.37	15	2.11	15	2.50	15	69

Table 5: Pearson correlation matrix of palatability test for samples of fresh 15 maize accessions from Abia and Imo in South-eastern Nigeria.

	Appeal	Colour	Grain size	Taste	Hardness	Preferences
Appeal	-					
Colour	0.54*	-				
Grain size	0.62*	0.58*	-			
Taste	0.77**	-0.73**	-0.82**	-		
Hardness	0.54*	-0.72**	-0.67**	0.69**	-	
Preference	0.83**	0.77**	0.61*	0.84**	-0.72**	-

*=correlation is significant at the 0.05 level (2 tailed)
**= correlation is highly significant at the 0.01 level (2 tailed)

5.0 Conclusion and Recommendation

The accession AB-Ibeku had the best rating when preference was accessed as a single palatability attribute; however when the six palatability attributes were subjected to rank summation index analysis, IM-Mbaise from Mbaise in Imo-State emerged as the best local accession in terms of acceptability and consumption. Furthermore, correlation result showed significant and positive relationship between preference and all other parameters except in hardness where there was significant but negative correlation

I therefore recommend the IM-Mbaise accession that showed superior trait in terms of palatability attributes and should be subjected to further research to scientifically verify the purity of these observed traits for further breeders' research work towards improving the accession for the benefit of the maize farmers in South-eastern Nigeria.

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