PRODUCTION OF PASTRIES FROM SELECTED BANANA CULTIVARS

ABSTRACT

Banana plants (Musa sp.) are monocotyledonous perennial and important crops in the tropical and subtropical world regions where it is consumed as a major source of carbohydrate for millions of people. Banana is the nations most wasted food, report showed that banana tops the list of most wasted items in weekly shopping basket, which has a better shelf life in flour form. As a result, there is need for an alternative means of flour production in the making of pastries as there exists an over-dependence of pastries made from cassava and cereals; hence, this study. Banana cultivars were processed into flour and made into pastries (puff-puff, doughnut, cup-cake, African egg-roll and pan cake) with sensory evaluation carried out afterwards. The sensory evaluation suggests that the pastries made; had good flavours, moderately good taste, moderately good texture, good colour to complement, moderately good hardness as well as a moderately good crispiness. Other sensory tests suggest that the pastries had good surface with a very good smell. From the study, banana flour shows potentials competing with known common flours in baking, thus can be an alternative form of flour for the production of pastries and related products.

Keywords*: banana, flour, pastries, sensory evaluation.*

INTRODUCTION

Banana plants are monocotyledonous perennial and important crops in the tropical and subtropical world regions (Strosse*et al*., 2006). They include dessert banana, plantain and cooking bananas. Traded plantain (*Musa paradisiaca* AAB) and other cooking bananas (*Musa* ABB) are almost entirely derived from the AA·BB hybridization of *M. acuminata*(AA) and *M.balbisiana (*BB) (Stover and Simmonds 1987; Robinson 1996). Plantain and cooking bananas are very similar to unripe dessert bananas (*M.Cavendish* AAA) in exterior appearance, although often larger; the main differences in the former being that their flesh is starchy rather than sweet, they are used unripe and require cooking (Happi-Emaga *et al*., 2007). Dessert bananas are consumed usually as ripe fruits; whereas ripe and unripe plantain fruits are usually consumed boiled, roasted or fried (Surga *et al*., 1998). Plantain (*Musa paradiciaca*) is a staple food grown

Comment [jo1]: I think this should be revised, focus should be on the flour content and not the plant. E.g Banana plant has a huge potential to provide an alternative source of flour to the more common sources like cassava and cereals.

Comment [jo2]: Be specific, which Nation? And use REPORTS not report

Comment [jo3]: I feel the reason for the study should be processing banana into flour to minimize waste and complement existing sources like cassava and cereals.

Comment [jo4]: As a result of what? This line is unnecessary.

Comment [jo5]: I don't think it is supposed to appear here. Take out

Comment [jo6]: Shows not suggests expect if the test is subjective and not objective.

Comment [jo7]: Also the test "suggests or shows".

Comment [jo8]: This study shows that banana flour has the potentials to competing with flours made from common sources for the production pastries and related products

Comment [jo9]: Different varieties of banana include…

throughout the tropical and subtropical regions of the world. It is one of the major sources of carbohydrate for millions of people in Africa (Frison & Sharrock, 1998). It ranks third, after yam and cassava, for sustainability in Nigeria (Jayaraman & Das Gupta, 2006) and Nigeria is known to be the largest producer of plantain in West Africa (Ibrahim, 2013).

Comment [jo10]: Make these one sentence and the references should come at the end

Banana is a highly perishable fruit because it has a very short shelf life. Thus, it is usually processed into durable products like chips and flour (Akalumhe, 1999; Jayaraman & Das Gupta, 2006; Ibrahim, 2013). Banana can either be used for domestic consumption or used as input by other producers. banana flour, apart from being used as a substitute for cassava flour especially for diabetic patients, also serve as a raw material used in the production of cakes, chips, puff-puff, biscuit, bread and pancakes. The products of banana flour have nutritional and medicinal values which makes banana a highly sought-after product (Marriott *et al*., 1981; Marriot & Lancaster, 1983). Banana flour is a cheap source of iron, protein and vitamin A (Foramfera, 2012). Banana is an important staple food in the humid tropical zones of Africa. It is undoubtedly one of the oldest cultivated fruits in West and Central Africa. Due to the over-dependence of pastries made from cassava and cereals there is need for an alternative means of flour production in the making of pastries. The increase in demand for an alternative source of flour to checkmate the overdependence of flour made from cereals justifies the need for this research. Thus bakers and other pastry producers may adopt the use of flour produced from banana and create a favourable awareness of the flour in the society for it to thrive and compete with the known forms of flours. For the researcher, the study will help uncover critical areas in the production process of the flour that many researchers may not have explored, thus a new theory on the flour production may be arrived at. The aim of the study is the production of pastries from selected banana cultivars.

Comment [jo11]: I think the study is centered around the suitability of the flour in the making of pastries and related product rather the production process of the flour.

MATERIALS AND METHODS

Materials

Sample Collection

Bunches of matured unripe selected banana cultivars fruits and other ingredients for production of pastries were purchased from Oje market in Ede town.

The following cultivars were used for the study:- Pambolabola (Nino), Saro (Kunnan), Enu baba seje (Dwarf and Red Tall), Paranta (Giant Cavendish).

Preparation of flour from selected Banana Cultivars

The banana cultivars fruits were washed to clean the latex, which may cause black staining during peeling. This was followed by peeling to remove the hard covering and then sliced longitudinally by stainless-steel knife into a 3cm-thick sample. The sliced pulp was dried by sun drying. The dried samples were milled by the use of a hammer mill and then sieved into fine flour (Ukhun and Ukpebor, 1991).

Apparatus

Apparatus used in the production of pastries includes the following: Mixer, Gas cooker, Oven, Frying pan, Frying spoon, Baking Pan, Measuring cup, Measuring Scale.

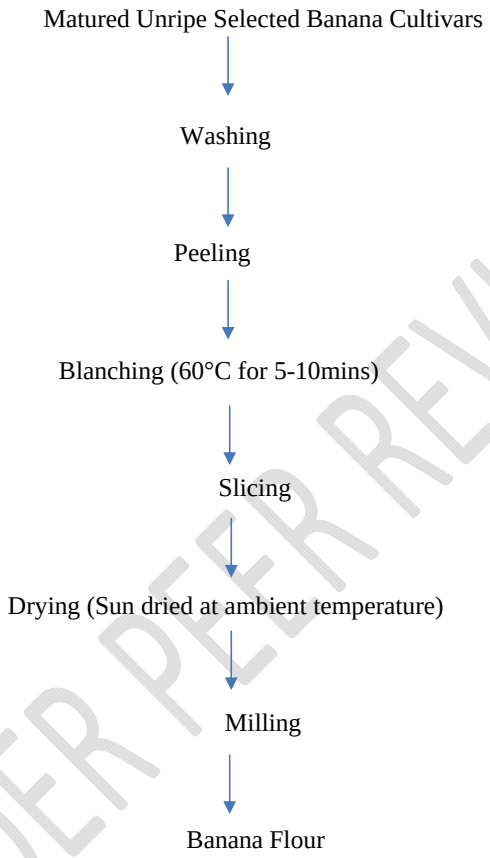

Figure 1: Flowchart for the production of banana flour (Saljilata *et. al.*, 2006).

Production of pastries using banana flour

Mixture contents and measurements of selected pastries production was carried out according to the work of Martínez-Monzó *et. al*., (2013).

Sensory evaluation

(b)

Sensory acceptability (taste, color, odor, texture and overall acceptability) attributes were evaluated on a nine-point hedonic scale of Linda *et al*., (1991).

Sensory evaluation was conducted by 25 untrained consumers (15 males and 10 females), randomly recruited among the graduating class students of the Department of Science Laboratory Technology in Federal Polytechnic Ede. After orientation, three digit-coded samples were given in random order to panelists along with a cup of water to cleanse their mouth between sample tasting, to avoid carryover bias. The mean scores were subjected to analysis.

Statistical Analysis

Data was subjected to Statistical Analysis of Variance (ANOVA) at 5% level, and the means were separated using the Duncan Multiple Range Test (Daniel, 1991).

RESULTS AND DISCUSSION

Table 1: Sensory evaluation of different Banana species

SENSORY EVALUATION ON DIFFERENT BANANA SPECIES				
Banana Species	**Saro**	**Enubabaseje**	**Pambolabola**	**Paranta**
Samples	**9**	**9**	**9**	**9**
Flavour	7.11 ± 0.60^{a}	7.00 ± 0.86^{b}	6.56 ± 0.88^{c}	6.33 ± 1.00^{d}
Taste	6.67 ± 1.00^{b}	6.22 ± 0.97^{a}	6.33 ± 1.00^{b}	7.11 ± 1.54^{c}
Texture	5.78 ± 0.97^{a}	5.56 ± 1.01^{b}	6.22 ± 1.48^{c}	5.11 ± 1.97^{d}
Colour	6.78 ± 0.83^{a}	6.33 ± 1.32^{b}	6.44 ± 1.88^{c}	6.11 ± 2.21^{d}
Hardness	6.78 ± 0.87^{a}	6.33 ± 1.66^{b}	6.44 ± 1.88^{d}	6.11 ± 1.69^{c}
Crispiness	6.00 ± 1.12^{a}	5.89 ± 1.77^{b}	6.33 ± 1.87^{d}	5.78 ± 1.79^{c}
Surface	6.44 ± 1.33^{a}	5.44 ± 1.88^{c}	5.67 ± 1.58^{b}	5.56 ± 2.19^{d}
Odour	7.11 ± 1.97^{d}	7.44 ± 0.88^{a}	7.67 ± 1.12^{b}	6.89 ± 1.90^{c}

The table above reveals the sensory evaluation of the differences in banana species factors (Flavour, Taste, Texture, Colour, Hardness, Crispiness, Surface and Odour) present in the pastries.

The result shows that the mean value of the banana species are not the same and it was discovered that Saro has a better flavour, followed by Enubabaseje, Pambo and Paranta. On the side of taste, it was observed Paranta has the highest mean which shows that it is the one that has a better taste out of the four banana species.

The results also make us understand that Pambolabola has the better texture since it is the highest mean. The colour and hardness of Saro is the best because it has the better mean and the Pambo has the best crispiness over others because of its better mean. The surface and odour of Saro is the best due to its better mean.

The general observation of the above table shows that Saro is the best banana cultivar for making pastries according to the response of the respondents.

The result of sensory analysis of banana cultivar pastries using different species of banana was carried out and is as summarized in table 1 above showing the sensory mean and standard deviation scores of the samples.

The statistical analysis (ANOVA) revealed the significant differences in the banana species by comparing /F/ with the significant level. If /F/ > significant level, then there is significant difference and if otherwise, there is no significant difference. From the table, Saro specie has the highest mean value of 7.11 of all the species compared, hence Saro sp. has the best flavour. When the taste evaluation was carried out, there was a significant difference between the tastes

of the banana species, making Paranta specie the best in taste. Of all the species subjected to texture evaluation, Pambolabola gave the highest mean value, hence the best in terms of texture.

Colour is a very important attribute that influences the initial acceptability of a product by a consumer (Zuwariah and Noor, 2009). For colour evaluation, the colour differences observed in the sample could be due to the different sugar content in the different banana varieties or cultivars. This agreed with the findings of Falade and Oyeyinka, (2014) who worked on the colour, chemical and functional properties of plantain cultivars and cooking banana flour as affected by drying method and maturity. They reported that different cultivars of plantain and cooking banana had different total sugar contents. The sugar content of the saro cultivar could probably be higher compared to that of paranta cultivar thereby causing the browning observed in the saro to be more pronounced than that of the paranta. Kent and Evers, (1994), reported that dark brown-coloured bread was observed when wheat flour was substituted with ripe banana flour which had high sugar content. They explained that it was due to caramelization reaction which involves thermal degradation of sugars at high temperatures causing browning or discolouration in products. Hardness, crispiness and surface attributes had no significant difference, hence all banana species can be said to be potentially acceptable in this aspect. In the case of aroma, the mean scores for Enubabaseje and Pambolabola were 7.44 and 7.67 respectively indicating that the aroma of both varieties was liked. However there was no significant difference ($p>0.05$) between the samples in terms of their aroma. This was consistent with the research findings of Falade and Oyeyinka, (2014) in which a similar observation occurred when they substituted banana flour into wheat bread and studied its physicochemical properties. This shows that banana flour in pastries imparts a pleasant aroma making it appealing to consumers. The overall acceptance of the commercial and developed pastries showed no

Comment [jo12]: Previous line not necessary

Comment [jo13]: Recast this line please "Who worked on the colour, chemical and functional properties of cultivars. He reported that ....

difference which indicated that the developed pastries might fare well in competition with other existing pastries that were produced by large industries. In addition, it shows that the developed banana pastries has a future in the market and according to the panelists, the developed banana pastries will be successful in the future markets.

CONCLUSION AND RECOMMENDATION

The study showed that flour could be produced from matured green banana. This flour shows potentials competing with known common flours in the baking, thus can be an alternative form of flour in the production of pastries and related products thereby reducing the over reliance on wheat and other forms of flour in the commercial market. It can as well serve as a component in the formulation of composite flour.

The unripe banana flour produced was used in the production of selected pastries which includes puff-puff, egg roll, cupcake doughnut and pancake in which sensory evaluation was carried out on the pastries in order to test for public acceptability of the flour. Most of the pastry samples were scored above average by sensory judges implying its potential acceptability when commercialized.

REFERENCES

Ahenkora, K.M., Kye, A., Marfo, K., and Banful, B. (1997). Nutritional composition of false horn Apantupa plantain during ripening and processing. *Afr. Crop Sci. J.* 5(2):243-248.

Akalumhe, O. (1999). Economics of marketing and post-harvest losses green banana in Southern Nigeria (Unpublished M.Sc., Thesis). University of Ibadan, Ibadan.

Falade, K.O. and Oyeyinka, S.A. (2014). Colour, chemical and functional properties of plantain cultivars and cooking banana flour as affected by drying method and maturity. *Journal of Food Processing and Preservation* pp: 1-13.

Foramfera A. (2012). Plantain flour production in Nigeria and processing in Nigeria. http://www.foramfera.com/index.php/market-research- reports/item/187-plantain-flour-production-and-processing-in-nigeria

Frison, E. A., and Sharrock, S. L. (1998). "The economic, nutritional and social importance of bananas in the world", Bananas and Food Security, (Proc. Symp. Douala), (PICQ C., et al., Eds), INIBAP, Montpellier, France, pp.21-35.

Happi Emaga T., Herinavalona A. R., Wathelet B., Tchango Tchango J., and Paquot M. (2007). Effects of the stage of maturation and varieties on the chemical composition of banana and plantain peels. *Food Chem.* 103: 590-600.

Ibrahim, A. H. (2013). How to start a plantain flour mill in Nigeria. Retrieved from http://constantive.com/business/plantain-flour-mill-in-nigeria.

INIBAP (2000). Bananas. International Network for the Improvement of Banana and Plantain, Internationalhttp://bananas.bioversityinternational.org/files/files/pdf/publications/brochure_bananas.pdf.

Jayaraman, K. S., and Das Gupta, D. K. (2006). Handbook of industrial drying. (pp. 606- 630). UK: Francis and Taylor Group LLC.

Kent, N.L. and Evers, A.D. (1994). Bread made with gluten substitutes. In: Technology of Cereals. Oxford, Pergamon Press. 1994. p. 215

Ketiku A. O. (1973). Chemical composition of unripe (green) and ripe plantain (Musa paradisiaca). *J. Sci. Food Agric.* 24: 703-707.

Bartoshuk L.M (1993). The biological Basis of food perception and acceptance. *Food quality and Preference* **4**(1-2):21-32

Marriott J. and P.A. Lancaster (1983). Bananas and Plantains. In: Chan, H.T. (ed.). Handbook of Tropical Foods. Marcel Dekker, New York, USA. pp. 85-143

Marriott J., Robinson M., and Karikari S. K. (1981). Starch and sugar transformations during ripening of bananas. *J. Sci. Food Agric.* **32**: 1021-1026.

Marriott, J., and Lancaster, P. A. (1983). Handbook of tropical foods: Bananas and plantains. In Jr. H.T. Chan (Ed.), (pp.85–142). New York, NY: Marcel Dekker.

Marriott, J., Robinson, M., and Karikari, S. K. (1981). Starch and sugar transformation during the ripening of plantains and bananas. *Journal of the Science of Food and Agriculture* **32**: 1021–1026.

Robinson J.C., and Eckstein K. (1996). Physiological responses of banana (Musa AAA; Cavendish sub-group) in the subtropics. VI. Seasonal responses of leaf gas exchange to short-term water stress. *J. of horticul. Sci*. **71**(5):679-692.

Saljilata M.G., Singhal R.S., and Kulkarni P.R. (2006). Resistant starch A review. *Rev Food Sci* **5**: l-16.

Stover R.H., Simmonds N.W. (1987). Bananas. 3rd ed. Wiley. New York, USA. pp. 97-103

Strosse H., Schoofs H., Panis B., André E., Reyniers K., and Swennen R. (2006). Development of embryogenic cell suspensions from shoot meristematic tissue in bananas and plantains (Musa spp.). *Plant Sci.* **170**: 104-112.

Suntharalingam, S., and Ganesharanee R. (1993). "Physical and biochemical properties of green banana flour." *Plant Foods for Human Nutrition* ***43***(1):19-27.

Surga J., Bolívar A., and Trujillo L.V. (1998). Caractérisation de la production et de la commercialisation des Musa au Venezuela In Picq C, Fouré E, Frison E (Eds.) Bananas and Food Security. Proc. Int. Symp. Bananas and Food Security. INIBAP. Douala, Cameroun. pp. 68-85.

Ukhun, M.E. and Ukpebor, U.I.E. (1991). Production of instant plantain flour: Sensory evaluation and physiochemical changes during storage. *Food Chem.* **42**:287-299.

Zhang A, and Pingyi. Y (2005). "Banana starch: production, physicochemical properties, and digestibility- a review." *Carbohydrate Polymers*. **59**:443-458.

Zuwariah I and Noor A (2009). Physicochemical properties of wheat breads substituted with banana flour and modified banana flour. *Journal of tropical agricultural and Foodscience* . 63-66.

DOUGHNUT PASTERIES MADE FROM DIFFERENT BANANA SPECIES

PARANTA

PAMBOLABOLA

ENUBABASEJE

SARO

EGGBUNS PASTERIES MADE FROM DIFFERENT BANANA SPECIES

PARANTA

PAMBOLABOLA

ENUBABASEJE

SARO

CUPCAKES PASTERIES MADE FROM DIFFERENT BANANA SPECIES

PARANTA

PAMBOLABOLA

ENUBABASEJE

SARO