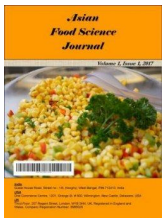

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Production of Pastries from Selected Banana Cultivars

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Banana fruit (Musa sp.) is consumed as a major source of carbohydrate for millions of people mostly in the tropics and subtropics. Worldwide, banana is the most wasted fruit; postharvest of the banana fruit records up to 40-60% loss, and this loss may be prevented by converting the green bananas to flour. This study was geared towards the 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 flour. Banana cultivars were processed into flour and made into pastries with sensory evaluation carried out afterwards. The sensory evaluation suggests that the pastries made; had moderately good hardness, good crispiness, good flavors, good taste, good texture, good hardness, good crispiness and good color to complement, Other sensory tests show that the pastries had good surface with a very good smell. This study shows that banana flour has the potentials to competing with flours made from common sources for the production pastries and related products.

Keywords: Banana; flour; pastries; sensory evaluation.

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1. INTRODUCTION

Banana plants are monocotyledonous perennial and important crops in the tropical and subtropical world regions [1]. Different varieties 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. acuminate* (AA) and *M. balbisiana (*BB) [2,3]. 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 [4]. Dessert bananas are consumed usually as ripe fruits; whereas ripe and unripe plantain fruits are usually consumed boiled, roasted or fried [5]. Plantain (*Musa paradiciaca*) is a staple food grown throughout the tropical and subtropical regions of the world, it's one of the major sources of carbohydrate for millions of people in Africa and ranks third, after yam and cassava, for sustainability in Nigeria known as the largest producer in West Africa [6,7,8,9].

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 [8,9,10]. 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 [11,12]. The products of banana flour have nutritional and medicinal values which makes banana a highly sought-after product [13,14]. Banana flour is a cheap source of iron, protein and vitamin A [15]. 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 favorable awareness of the flour in the society for it to thrive and compete with the known forms of flours. The aim of this study is the pastries making possibilities of banana flour as a replacement for dependence of flour produced from cassava and cereals.

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Sample collection

Bunches of matured unripe selected banana cultivars 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).

2.1.2 Preparation of flour from selected banana cultivars

The banana cultivars 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 [16].

2.1.3 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.

2.1.4 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. [18].

2.1.5 Sensory evaluation

Sensory acceptability (taste, color, odor, texture and overall acceptability) attributes were evaluated on a nine-point hedonic scale of Bartoshuk [19].

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.

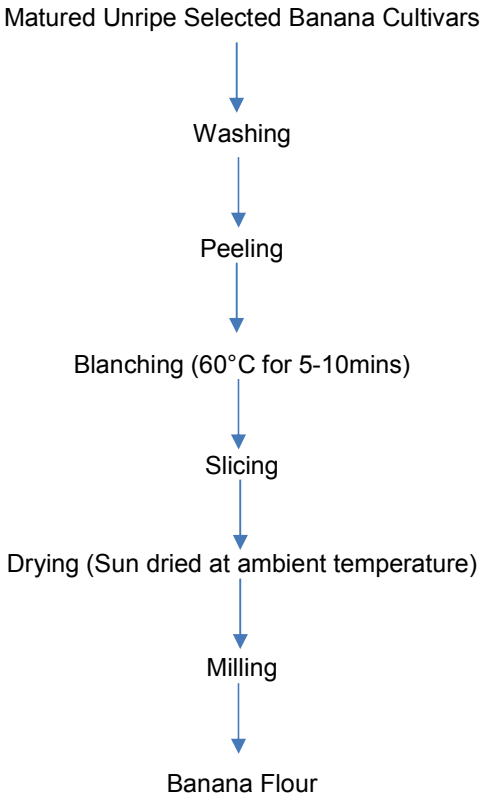

Fig. 1. Flowchart for the production of banana flour [17].

2.2 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 [20].

3. RESULTS AND DISCUSSION

Table 1 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 results show that the mean values of the banana species are not the same and it was discovered that Saro had better flavour, followed by Enubabaseje, Pambo and Paranta. On the side of taste, it was observed that Paranta had the highest mean which showed that it was the one that had the better taste out of the four banana cultivars.

The results shows that Pambolabola had the better texture since it had the highest mean. This implied that the texture of this particular was better than the remaining three. The color and hardness of Saro was the best because it had the better mean and Pambo had 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 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 showing the sensory mean and standard deviation scores of the samples.

Table 1. Sensory evaluation of different Banana species

Sensory evaluation on different banana cultivars				
Banana cultivars	**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}

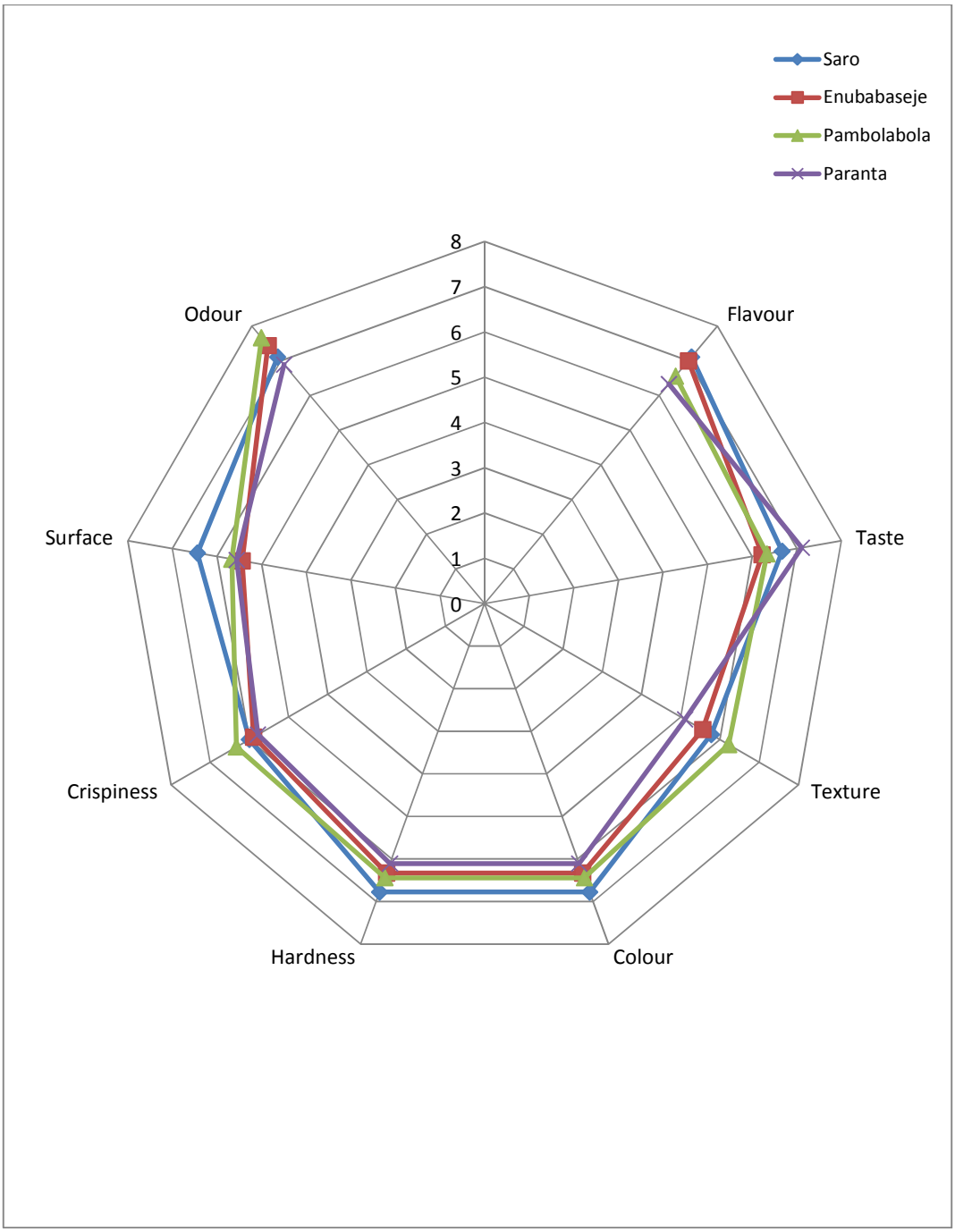

Fig. 2. Spider chart analysis of the consumer's preference

Fig. 2 which represents the spider chart for the analysis of consumer preferences shows the cultivars as they perform with different sensory evaluation attributes. For example in terms of odour, texture and cripsiness Pambolabola was the best, while for hardness, colour and flavor Saro was the best.

The statistical analysis (ANOVA) revealed the significant differences in the banana varieties 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 cultivar 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 varieties subjected to texture evaluation, Pambolabola gave the highest mean value, hence the best in terms of texture.

For colour evaluation, the colour differences observed in the sample could be due to the different sugar contents in the different banana varieties or cultivars [21]. This agreed with the findings of Falade and Oyeyinka, [22] 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, [23] and Zuwariah and Noor, [24] 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, [22] 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 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."

4. 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.

4.1 Recommendations

More studies should be carried out on the banana flour to determine their health benefits on humans. Further research should be carried out to ascertain the shelf life and the best packaging recommended for banana flour. These, along with other factors will influence the commercialization of the product for national sustenance.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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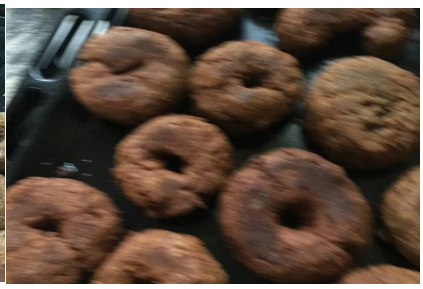
APPENDIX

DOUGHNUTS MADE FROM DIFFERENT BANANA CULTIVARS

PARANTA



PAMBOLABOLA

ENUBABASESEJE

SARO

EGGBUNS MADE FROM DIFFERENT BANANA CULTIVARS

PARANTA

PAMBOLABOLA

ENUBABASESEJE

SARO

CUPCAKES MADE FROM DIFFERENT BANANA CULTIVARS

PARANTA

PAMBOLABOLA

ENUBABASEJE

SARO

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