SENSORY AND INSTRUMENTAL TEXTURE PROFILING OF YELLOW-FLESHED PLANTAIN FLOUR COOKED PASTE PRODUCED FROM DIFFERENT VARIETIES

Introduction

Textural quality of starchy dough can be determined by using both sensory texture profiling and instrumental texture profiling. In sensory texture profiling, trained panelists are used to describe and give quantitative measures of the texture attributes of a given food. This is applied using standard rating scales, which provide a quantitative evaluation of the mechanical and other texture parameters (Otegbayo et al., 2005). Sensory texture profiling is a descriptive product-oriented test. It furnishes a qualitative and quantitative measure of textural differences among similar samples. Qualitatively, it pinpoints differences in specific characteristics such as cohesiveness, adhesiveness, and springiness, while quantitatively, it tells whether the sample has more or less of a given attribute than another sample and to what degree (Otegbayo et al., 2005).

Instrumental texture profile analysis on the other hand involves compressing a bite-size piece of food two or more times in a reciprocating motion that simulates the action of the jaw as described by Bourne and Szczesniak (2003). The resulting force-time curve generated is then used to quantify many textural parameters that correlate well with results from the sensory evaluation. Textural attributes considered in pounded yams are stretchability, cohesiveness (moldability), hardness (soft but firm, not very soft or tough), smoothness, and adhesiveness (stickiness) (Otegbayo et al., 2005).

In the household storage of plantain flour, little concern is made towards the type of packaging material used for storage and the storage conditions. This can however affect the sensory and the instrumental attributes of the product (*amala*) made from them. Consequently, it will be important to study the effect of different packaging materials and storage periods on the sensory and instrumental texture attributes of the amala prepared from the plantain flour. Therefore, the aim of this study is to assess the effect of different packaging materials and storage periods on the sensory and instrumental texture attributes of *amala* prepared from different plantain flour.

Materials and Methods

Mature unripe plantain (Musa paradisiaca) bunches of PITA-17 and *agbagba* (Plate 1) varieties were obtained from the banana breeding unit of IITA, Ibadan, Oyo State, Nigeria. The packaging

materials: polypropylene woven sacks (PPS), polyethylene nylon bag (PEN) and polyvinyl chloride container (PVC) were purchased from a local market (Aleshinloye) in Ibadan, Oyo State, Nigeria.

Fresh bunches of green, physiologically mature plantain were cleaned and washed properly with clean water to remove adhering sand particles and dirt, after which they were peeled, and sliced (1mm) (Plate 2) (Kure et al., 1999). The slices were spread in a single layer on drying trays and dried at 65 °C for 48 h in a cabinet dryer (Akin-Idowu et al., 2011). Dried plantain slices were milled into flour using a hammer mill of 250 μm sieve size (Plate 1).

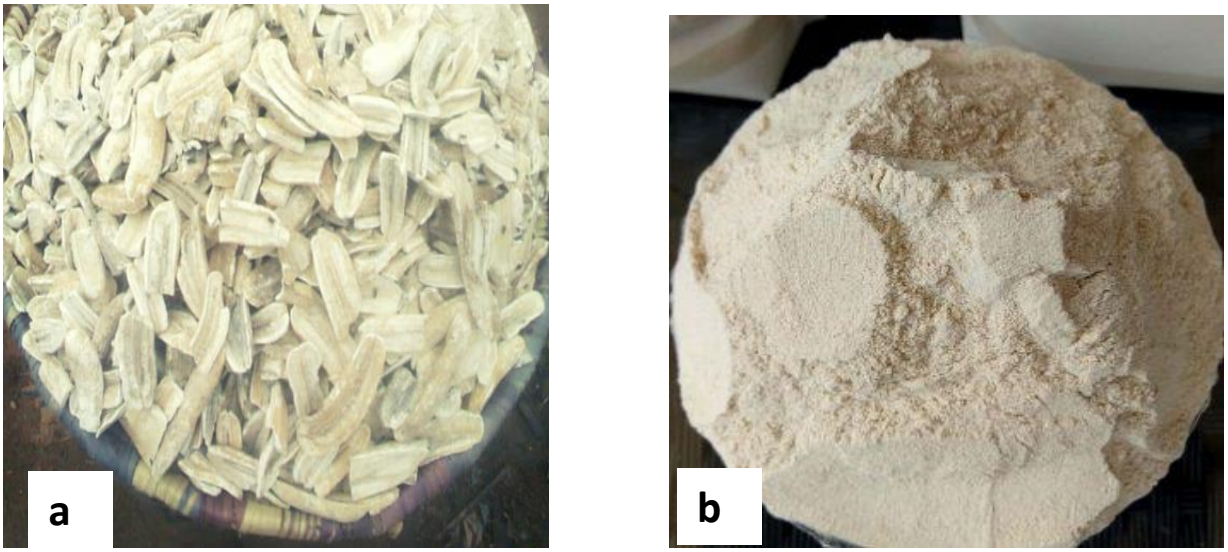

Plate 1. Dried plantain chips (a) and flour (b) produced from plantain fingers

The processed plantain flours were aseptically weighed (200g/pack) into PEN sealed with an electric sealer, PPS, sealed with a stitching machine and PVC covered with a lid. The packaged samples were kept in a cupboard at room temperature (28-30 °C) for 24 weeks (6 months) and was monitored for the sensory texture attributes of the cooked dough (*amala*).

A part of the flour samples (approximately 1.5 parts v/v) was mixed with boiling water (100 °C) in a stainless-steel cooking pot with continuous stirring until a homogenous thick paste is formed. The paste was covered and left on the electric cooker set at medium temperature for about 3 min to cook before another stirring to get a good textured paste. The *amala* was scooped adequately with a spoon and wrapped in polyethylene nylon before evaluation. The sensory texture attributes of the plantain *amala* was carried out using trained panelists who consumes *amala* regularly based on attributes such as stretchability, moldability, softness/hardness, and stickiness (Plate 2). The

panelists were asked to rank the *amala* produced from the plantain flour before and during storage (every 4 weeks) for 24 weeks, using a 3-point scale. Where 1 is not moldable, not stretchable, not sticky, and soft, 2-moderately moldable, moderately stretchable, moderately sticky, and moderately hard, and 3-moldable, stretchable, sticky, and hard.

Plate 2. Panelists carrying out the sensory texture profiling of the plantain *amala*

The instrumental texture profiling was carried out by means of a TA.XTplusC texture analyzer (Stable Micro Systems, Godalming, U.K.; Texture Technologies Corp., Scarsdale, NY), attached with a 10-kg load cell. The texture analyzer was interfaced with an IBM computer. TPA parameters (cohesiveness, hardness, springiness, adhesiveness) were calculated using the computer software Texture Expert Exceed version (Stable Micro Systems), which allows capturing, storage and analysis of real-time data generated from the experimental runs with the texture analyzer. The size of the "amala" dough used for TPA was 3.5 cm × 2.0 cm (diameter × height) before evaluation of textural quality. Consistent thickness and diameter was necessary in order to get consistent results because compression tests are usually geometry and dimension sensitive (Bourne 2002).

Achievements

The result of this study showed that the *amala* prepared from the different plantain varieties, packaged in different packaging materials, and stored for 6 months were all moderately moldable, stretchable, sticky, and hard. Also, the storage periods and packaging materials (except stickiness and hardness) had significant effect on all the sensory texture attributes of the plantain *amala*. The plantain varieties affected only the stretchability of the *amala* of all the texture attributes. In addition, the storage period, packaging materials and varieties (except hardness) affected all the instrumental texture attributes of the plantain *amala*. The cohesiveness and springiness of the plantain *amala* increases, except the *amala* prepared from the *agbagba* variety packaged in PPS, which decrease in cohesiveness at the end of the 6 months of storage. The adhesiveness of the plantain *amala* increased except for the amala prepared from the plantain flour produced from PITA-17 and packaged in PPS and PVC, which decreased at the end of the 6 months of storage. The hardness of the plantain *amala* also increased for all the packaging materials except the *amala* prepared from the flour produced from the *Agbagba* variety and packaged in PEN, which decreased at the end of the 6 months of storage. By and large, the unripe plantain flour should be packaged in PPS to retain its sensory textural attributes throughout a storage period of 6 months.

This study is also part of an M.Sc. graduate research work titled 'Effect of different packaging materials and storage periods on the quality characteristics of plantain flour from two varieties of plantain, and the texture attributes of their dough (*amala*)' by Atobatele Oluwaseun Blessing from the Department of Food Technology, University of Ibadan, Oyo state, Nigeria, funded by the RTB project.

References

Akin-Idowu, P.E., Akinyemi, S.O.S., Ibitoye, D.O. and Ademoyegun, O. T. (2011). Sun-drying and nutritional composition of flour of novel Musa hybrids. Acta Horticulture, 918: 945-952.

Bourne, M. C. (2002). Food Texture and Viscosity; Concept and Measurement, 2nd Ed., pp. 257–290, Academic Press, London, U.K.

Bourne, M. C. and Szczesniak, A.S. (2003). Sensory evaluation-texture. In Encyclopedia of Food Sciences and Nutrition (B. Caballero, L. Trugo and P. Finglas, eds.) pp. 5167–5174, Academic Press, Amsterdam, the Netherlands.

Kure, O. A., Bahayo, E. J. and Daniel, E. A. (1998). Studies in the proximate Composition and effect of flour particle size on acceptability of biscuit produced from blends of soya beans and plantain flours. Namida Technology-scope Journal, 3:17-21.

Otegbayo, B.O., Aina, J.O., Sakyi-Dawson, E.O., Bokanga, M. and Asiedu, R. (2005). Sensory texture profiling and development of standard rating scales for pounded yam. Journal of Texture Studies, 36: 478–488.