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Assessment of Different Dehydration Techniques for the Preparation of Unripe Banana Flour

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Abstracts

The study was conducted to assess the different dehydration technique for the preparation of banana flour preparation. The drying technique used were Sun drying, solar drier and cabinet drier. The selected unripe bananas were sliced to 3mm thickness and steamed followed by curing in 2% salt solution for 20 mins. Then the slices were dried and ground to flour. The unripe banana flour were assessed for its functional, sensory, storage and economics and comparative study was performed for different drying techniques. The result of the study reveals that the moisture content ranges from 9.89 to 12.34 % ,while the functional properties of bulk density values between 0.68 -0.70 g/ml , WAC between 116.2 to 149.8% and OAB between 115.70 to 117.85 % respectively. The shelf life of the solar and cabinet dried unripe banana flour were 120 days whereas sundried for 90 days. The sensory attributes of the solar and cabinet dried unripe banana flour secured a highest score than the sundried unripe banana flour.The economics of the results indicates that the B.C ratio of solar drier technique for banana flour preparation is viable when compared with cabinet drier and sundried banana flour. The study concluded that solar drying technique is cost effective, inexpensive, technically uncomplicated and viable business venture for the production of quality-dried product for agriculture holdings.

Key words: Drying techniques, solar, cabinet, banana flour, functional properties

Introduction

The large quantity of unmarketable bananas available in all banana growing regions of India are wasted due to improper postharvest handling and lack of processing technology for value addition. The waste due to surplus banana production can be minimized by preparing banana chips and banana flour from the excess banana. Banana flour is most widely used as raw material for other value added products from banana. It contributes to the flavour of widely food products and its functional properties are good value (Sunitha *et al*., 2017).

Green Banana flour is an alternative to reducing banana wastes and it is a low cost material for food industry. Most unripe banana flour, produced from the green unripe fruit is often sun dried, it reduces quantitative and qualitative value of the dried product due to difficulties encountered in drying conditions (temperature and time), also under these conditions the quality of the product is very variable (Kaddumukasa *et al.*, 2005). Sun dried products are subject to contamination by extraneous materials such as sand, stones, soils, tree leaves and incursion by rodents, insects, animal excreta and various forms of microorganisms. In view of this, efforts were made to improve traditional drying methods have been going on. Adding to that discoloration during preparation and drying commonly called "browning" is caused by chemical or biochemical reactions or over heating due to difficulties in controlling, the drying conditions notably temperature and time (Anon, 1993). Flour from unripe banana also possess a good export potential. Currently the market prefers high quality dried products with good reconstitution properties and excellent sensory attributes at an affordable price. Adopting advance-processing methods adds additional processing cost to the product.

Falade (2010) explained that drying is one of the best methods in terms of cost efficiency to preserve plantain flour in other to have plantain product with considerable shelf stability. Drying serves as a suitable and cheap means for removing water from plantain, which adds value to plantain and this result in production of convenience product having suitable shelf life (Demirel and Turhan, 2003).

To combat all the factors associated with declining quality of banana, the present study was carried out to assess the effect of different drying methods on the quality of banana flour.

Materials and methods:

Procurement of raw material:

Unripe green banana (Ranipoovan) were procured from farmers field of Tiruchirappalli district, Tamil Nadu, India

Preparation of banana flour by different drying techniques

Peeling of skin of unripe banana followed by dipping in hot water for 3 – 5 minutes. Then the blanched fruits are cut into small pieces followed by immersing in 2% salt solution for 20 minutes for curing. The pretreated samples were then dried using sun, solar and cabinet drying methods. They were then milled and stored in zip lock bags for further analysis.

Dehydration ratio

After recording the weight of banana before drying, they were cabinet dried, solar dried and sundried until they attained constant weight. Later the dehydrated unripe banana were weighed and dehydration ratio was calculated according to Singh *et al*., (2007)

Dehydration ratio = Weight of dried sample / Weight of the fresh sample

Moisture content (%):

Moisture content of unripe banana flour was determined by according to the hot air oven method described by AOAC (2006).

Functional properties:

The banana banana flour was evaluated for functional properties. Bulk density of unripe banana flour were determined according to the method of Mpotokwane *et al.* (2008), water and oil absorption capacity as described by Sathe and Salunkhe (1981).

Sensory Evaluation

The unripe banana flour prepared from different drying techniques were evaluated for appearance, flavor, taste, texture and overall acceptability of the product by untrained panelists using nine-point hedonic scales (Demirkesen, 2016).

Results and discussion

The results of the unripe banana flour prepared by different dehydration techniques were presented and discussed under following heads

Material balance data for unripe banana flour preparation by different drying techniques

Material balance data obtained during preparation unripe banana flour by by different drying techniques were presented in the table 1.

Table 1: Material balance data for unripe banana flour preparation by different drying techniques

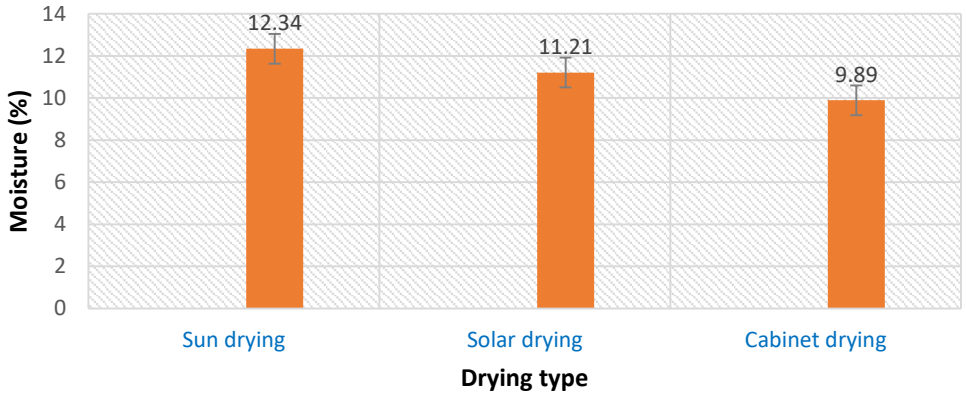
SI.No	Drying Type	Slice thickness	Temperature maintained	Time interval (Hrs.)	Dehydration ratio
1	Sun drying	3mm	37°C	72	0.2177
2	Solar drying	3mm	42 °C	48	0.2570
3	Cabinet drying	3mm	60 °C	12	0.3307

The data shows that the dehydration ratio of unripe banana flour prepared from different drying techniques ranges from 0.2177 to 0.3307 respectively. Results reveals that dehydration ratio is better in cabinet drying followed by solar drying and sun drying. Time taken for drying in solar and sun drying were high (48 hrs.) compared to cabinet drying (12 hrs.). Cabinet drying takes less time than the other two drying methods.

Effect of Different dehydration methods on moisture content of unripe banana flour

The moisture content of unripe banana flour prepared from different drying techniques were presented in the fig 1.

Fig : 1 Moisture content of Unripe banana flour by different dehydration techniques



The moisture content of the samples ranged from 9.89 to 12.34 % with cabinet drier showed a lowest moisture content whereas sundried had the highest. The lower moisture content could be due to effect of heat on the samples during drying. Generally, the moisture content of all the plantain flours obtained by different dehydration method were lower than the permissible level for moisture content of food flour according to FAO (2004) which makes the flour safe.

Effect of Different Drying techniques on Functional properties of Banana flour

Effects of drying methods on the functional properties of banana flours were presented in the table 2.

Table: 2 Effect of Different Drying techniques on Functional properties of Banana flour

SI.No	Drying type	Bulk density (g/ml)	WAC (%)	OAC (%)
1	Sun drying	0.68	116 .2	115..70
2	Solar drying	0.69	121.5	117.69
3	Cabinet drying	0.70	149.8	117.85

*WAC – Water absorption capacity, OAC – Oil absorption capacity

The results revealed that bulk density and water absorption capacity (WAC) of the banana flours were affected by drying methods. The bulk density of the samples varied from 0.68 -0.70 g/ml. Bulk densities of cabinet dried banana flour was highest followed by solar and sundried banana flour. This implies that the particle size of cabinet dried banana flour was higher compare to that of solar dried banana flour and sun dried banana flour. Bulk density has effect on the packaging and transportation of food materials and higher bulk products present better packaging properties than those with low bulk density (Fagbemi, 1999). The results of the study shows that the values obtained for bulk density is higher than the values (0.55 – 0l.60 g/ ml) reported for banana flour by Falade (2010) and lower than values reported by Arinola *et al.* (2016) for banana flour.

Drying methods affected the water absorption capacity (WAC) of the banana flours and the values obtained ranged between 116.2 to 149.8%. Water absorption capacity is the ability of flour to absorb water and swell for improved consistency during food preparation. According to Osundahunsi *et al.* (2003), higher water absorption capacity could improve yield and consistency and give body to food. Cabinet dried banana flour obtained higher water absorption capacity than the solar dried banana flour and sun dried banana flour. The values obtained were higher than those reported by Oluwalana and Oluwamukomi (2011). This is an

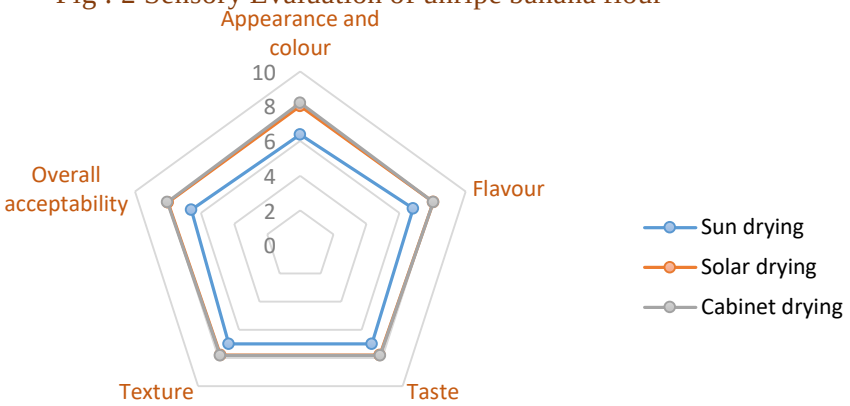
indication that the plantain flour could be useful for the development of products that require hydration to improve handling characteristics (Fadimu *etal.* 2018)

According to Aremu *et al*, (2009) oil absorption capacity (OAC) is an important quality parameter of flour since oil acts as flavor retainer and increases the mouth feel of food. The OAC of the banana flour ranged between 115.70 to 117.85 % were not showed any difference.

Evaluation of different drying techniques on sensory characteristics of Unripe Banana Flour

The score obtained for the sensory attributes such as appearance and colour, flavour, texture, taste and overall acceptability of the unripe banana flour was presented in the Fig 2

Fig : 2 Sensory Evaluation of unripe banana flour



The figure shows that the sensory attributes of cabinet dried and solar dried unripe banana flour obtained more or less similar score than the sundried unripe banana flour**.**

Effect of different dehydration methods on shelf life of unripe banana flour

Solar dried unripe banana flour and cabinet dried banana flour can be stored for a period of 120 days in ambient condition without compromising the quality as compared to sun dried unripe banana flour (90 days). Colour of solar dried banana flour and cabinet dried banana flour was more acceptable than sundried unripe banana flour.

Effect of different dehydration methods on economics of unripe banana flour

The economics of unripe banana flour of different dehydration technique were presented in the table 3.

Table: 3 Effect of different dehydration methods on economics of unripe banana flour

SI.No.	Drying type	Gross cost (Rs./kg)	Gross income (Rs. /Kg)	Net income (Rs./kg)	B.C ratio
1	Sun drying	189	289	100	1.52
2	Solar drying	200	374	174	1.87
3	Cabinet drying	375	475	200	1.72

The results showed that net income and B.C ratio of the unripe banana flour of different dehydration techniques ranges from Rs. 100 to 200 and 1.52 to 1.87 respectively. Based on the B.C ratio results indicates that solar drier technique for banana flour preparation is viable when compared with cabinet drier and sundried.

Conclusion

All techniques have an advantages and disadvantages, but the most important to consider for a best technique is cost reduction, environmentally friendly and to assure functional, physical and sensorial quality of the product. In this regard, the overall assessment of the study reveals that solar drying technique was cost effective, inexpensive, ecofriendly and technically uncomplicated when compared with cabinet drier. The quality of the product also more or less similar to cabinet dried unripe banana flour. So solar drying technique is a viable business venture for agricultural holding.

Reference

1. Addo, et al. 1993. In the study found that as DFS usually undergoes processing, the active lipoxygenase-2 might have added undesirable aroma compounds at higher replacement resulting in less acceptability of DFS supplemented products.

2. AOAC .2006. Official methods of analysis and calculations moisture (M) Method 934.06 Fruits, Vegetables, and their Products, Association of Analytical Communities, Gaithersburg

3. Aremu, M. O., Basu, S. K., Gyar, S. D., Goyal, A., Bhowmik, P., Datta Banik, S. 2009. Proximate Composition and Functional Properties of Mushroom Flours from Ganoderma spp., Omphalotus olearius (DC.) Sing. and Hebeloma mesophaeum (Pers.) Quél. Used in Nasarawa State, Nigeria. Malaysian Journal of Nutrition, Vol 15 Issue 2. Pp 233 – 241.

4. Arinola, S. O., Ogunbusola, E. M., Adebayo, S. F. (2016) Effect of Drying Methods on the Chemical, Pasting and Functional Properties of Unripe Plantain (Musa paradisiaca) Flour. British Journal of Applied Science and Technology, Vol 14 Issue 3 Pp 1-7.

5. Demirel, D., Turhan, M. 2003. Air Drying Behaviour of Dwarf Cavendish and Gros Michel Banana Slices. Journal of Food Engineering, Vol.59 Pp 1–11.

6. Demirkesen, I. 2016. Formulation of Chestnut Cookies and their Rheological and Quality Characteristics. Journal of Food Quality Vol 39 Issue 4: Pp 264–273.

7. Falade, K.O., Olugbuyi, A. O. 2010. Effects of Maturity and Drying Method on the Physico-chemical and Reconstitution Properties of Plantain Flour. International Journal of Food Science and Technology, Vol 45 Pp 170–178.

8. FAO (2004) FAO. Available at: http://www.faostat.fao. org (02⁄2008).

9. Gbemisola Jamiu Fadimu, Lateef Oladimeji Sanni, AbdulRasaq Adebowale, Sarafadeen Kareem, Olajide Paul Sobukola, Olatundun Kajihausa, Abdulsam-Saghir, Bernard Siwoku, Aminat Akinsanya, Monilola Kudirat Adenekan, 2018. Effect of drying methods on the chemical composition, colour, functional and pasting properties of plantain (Musa parasidiaca) flour Croatian Journal of Food Technology, Biotechnology and Nutrition Vol 13 Issue 1-2, Pp 38-43

10. Kaddumukasa, P., Kyamuhangire, W., Muyonga, J. and Muranga, F.I. (2005). The effect of drying methods on the quality of green banana flour. African Crop Sci Conferen. Proc., 7: Pp 1267-1271

11. Mpotokwane, S. M., Gaditlhatlhelwe, E., Sebaka, A., Jideani, V. A. 2008. Physical properties of bambara groundnuts from Botswana. Journal of Food Engineering,Vol. 89 Pp 93–98

12. Oluwatooyin Osundahunsi, Tayo N. Fagbemi, Ellina Kesselman, Eyal Shimoni.2003. Comparison of the Physicochemical Properties and Pasting Characteristics of Flour and Starch from Red and White Sweet Potato Cultivars. Journal of Agricultural and Food ChemistryVol 51 Issue 8 Pp 2232-6

13. Oluwalana, I. B. Oluwamukomi, M. O. Fagbemi, T. N., Oluwafemi, G. I. 2011. Effects of Temperature and Period of Blanching on the Pasting and Functional Properties of Plantain (Musa parasidiaca) flour. Journal of Stored Products and Postharvest Research, Vol 2 Issue 8. Pp 164 – 169

14. Sathe, S.K., Salunkhe, D.E. 1981. Functional properties of lupid seed (Lupinus mutabilis) proteins and protein concentrates. Journal of Food Science, Vol.4.Pp 149-197.

15. Singh B, Kumar A, Gupta AK. (2007). Study of mass transfer kinetics and effective diffusivity during osmotic dehydration of carrot cubes. J Food Eng. Vol.79: Pp471-480.

16. Sunitha Venkataseshamamba B, R Krishnaveni, A Lavanya and T Vyshnavi.2017. Study on effect of quality of green banana flour using different drying techniques. The Pharma Innovation Journal. Vol 6 Issue 10 . Pp 01-07

17. T N Fagbemi.1999. Effect of blanching and ripening on functional properties of plantain (Musa aab) flour. Plant Foods Hum Nut. Vol 54 Issue 3: Pp 261-269.