Study of Process Parameters Standardisation for Whole Unripe Banana Flour & Its Utilisation in Crackers - A Review

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Abstract— To prevent the losses of unripe banana drying method was used to convert Unripe banana into banana flour by drying the unripe banana slices in tray dryer at 60oc for 6hrs. To make proper use and avoid wastage of banana it can be use in preparation of crackers with unripe banana flour with its peel which is rich in nutrients. Unripe bananas are a power house of fibers, vitamins and minerals. In addition to potassium, rich source of vitamin C and B complex vitamins. It also facilitate absorption of essential minerals and nutrients, especially calcium due to this it can be use in preparation of variety of nutritious products.

Crackers — Cracker is a flat, dry baked food typically made with different type of flour. They are plain, unsweetened, hard, brittle biscuits. They can be leavened or unleavened. Flavorings or seasonings, such as salt, herbs, seeds or cheese, may be added to the dough or sprinkled on top before baking and use as a as a nutritious and convenient way to consume a staple food or cereal grain. They can be eaten on their own, but can also accompany other food items, such as cheese or meat slices, jam, butter, or peanut butter, use in varieties of soups.

Key words: Tray Drying, Unripe Banana Powder, Crackers

I. INTRODUCTION

Banana (Musa spp.) belongs to family Musaceae. It is known since the dawn of ancient history as one of the delicious fruits "in the world. The fruit is soft, sweet and pleasantly flavoured. The fruit is eaten in the fresh form and also as cooked vegetable in the tropics. It is also used for the preparation of popular products like banana, fig, banana powder, banana beer, starch and yeast. Banana is the largest produced and maximum consumed amongst the fruits cultivated in India. It is highly nutritive and very delicious. India leads the world in banana production with an annual output of 14.2 million tons (FAO 2016). To increase the utilization of banana, production of immature banana powder and its incorporation to various innovative products is usually practiced in banana producing countries (sarah sheikh et al., 2017). Banana powder prepared from unripe banana possess the thickening and cooking properties almost similar to that of starch. In most of the South East Asian countries, however, banana is mainly consumed ripe.

It is starchy, rich in carbohydrate, calcium, phosphorous, iron and other food nutrients. (Joshi et al., 2015) it a sweet and salt free diet. Banana ranks first in production and second in area, among the fruits grown in india. Production of 291 lakh metric tonnes annually from an area of 846 lakh hectares. In India Maharashtra 3rd ranks of production in banana. In Maharashtra state banana is grown with 65,000 hectares with approximate production of 30 lakh MT of fruits and the productivity of Jalgaon district is 50 MT (2015-16). Other major banana growing districts are Buldhana, Dhule, Nandurbar, Nanded and Parbhani (Patil et al., 2012).

Ardhapuri (Musa main Group Cavandish Subgroup) is a local cultivar having high yield potential and is well acclimatized in the region which is largely grown by the farmers of Marathwada region. However, its yield potential is not fully exploited due to various production and other constraints like lack of proper management practices and poor ferti lization schedule which result in poor yield. This cultivar can be brought up to the standard of exportable banana by proper horticultural management practices and suppling judicious plant nutrients.

There are so many variety grow in india. In Maharashtra Musa Cavendish and Robusta mostly grow. New economic strategy to increase utilization of banana includes the production of banana powder when the fruit is immature, and to incorporate the flour into various innovative products such as slowly digestible cookies, high-fiber bread and edible films (Saifullah et al., 2009).

Bananas aid in the body's retention of calcium, nitrogen, and phosphorus, all of which work to build healthy and regenerated tissues. In the following paragraphs, we will discuss some of these benefits. Bananas can be used to fight intestinal disorders like ulcers. Bananas are one of the few fruits that ulcer patients can safely consume. Bananas neutralize the acidity of gastric juices, thereby reducing ulcer irritation by coating the lining of the stomach. Not only can bananas relieve painful ulcer systems, and other intestinal disorders, they can also promote healing. The fruit is also used as treatment for burns and wounds.

II. REVIEW & LITERATURE

Daramola et al., (2006) conducted the study for the production and characterization of pasting properties of mature green banana flour as well as application and organoleptic assessment of banana flour in whole maize meal.

Gomes A.A.B et al., (2016) prepared bread with flour obtained from green banana with its peel as partial substitute for wheat flour.

Li choo (2007) conducted study to develop a high fiber noodle with potential health benefits and functional properties by incorporation of green banana flour and oat β-gluten as the fiber source.

Abbas et al., (2009) studied the physicochemical properties and in-vitro starch digestibility of cooked yellow noodles prepared by partial substitution of wheat flour with Cavendish Banana pulp flour.

Acevedo et al., (2009) carried out experiments and produced pasta (spaghetti) enriched with unripe banana flour and evaluated its physical, and texture properties as well as consumer preference.

Ravindran et al., (2009) evaluated the physical and biochemical characteristics of banana flour. The yields of

flour averaged 31.3 % for Alukehel and 25.5 % for Monthan. The pH of the flour ranged from 5.4 to 5.7. The bulk density and particle size distribution were also measured. Potassium is the predominant mineral in banana flour. Fresh green banana is a good source of vitamin C, but almost 65% is lost during the preparation of flour. Oxalate content (1.1 % – 1.6 %) of banana flour is probably nutritionally insignificant. The overall results are suggestive of the potential of green bananas as a source of flour.

Elizabete et al., (2011) evaluated chemical composition and nutritional value of banana flour obtained from unripe banana (Musa acuminata, Nanicao) under specific drying The unripe banana flour (UBF) presented ahigh amount of total dietary fiber (DF) (56.24 g/100 g), which consisted of resistant starch (RS) (48.99 g/100 g), fructans (0.05 g/100 g) and DF without RS or fructans (7.2 g/100 g). The contents of available starch (AS) (27.78g/100 g) and soluble sugars (1.81 g/100 g) were low. The main phytosterols found were campesterol (4.1 mg/100 g), stigmasterol (2.5 mg/100 g) and β-sitosterol (6.2 mg/ 100 g). The total polyphenol content was 50.65 mg GAE/100 g. The procedure used to obtain UBF resulted in the recovery of undamaged starch granule sand in a low-energy product (597 kJ/100 g).

Eleazu et al., (2011) evaluated the chemical composition, antioxidant activity, functional properties and inhibitory action of the extract of unripe plantain flour on 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical. Chemical analysis of the flour showed that it contained significant quantities of dry matter (48.00 ± 3.96%) and starch (31.10 ± 0.44%) but was low in phenol (1.42 ± 0.03%), protein (3.15 ± 0.042%), ash (5.50 ± 0.42%) and total soluble sugar (0.64 ± 0.001%) ($p < 0.05$).

III. Pre-treatments given for prevention from browning

Sulfur and sulfite compounds have been used for centuries as pretreatments to prevent darkening of preserved fruits. They also prevent microbial growth and reduce spoilage.

Prepare slices of bananas into 0.5-cm thick pieces, to reduce enzymic browning, slices were then dipped in 0.5% (w/v) citric acid solution for 10 min, drained and dried in oven (Abbas F.M. Alkarkhi et al., 2011).

Banana were washed and separated into pulp and peel. To reduce enzy mic browning, pulps were then dipped in 0.5 % (w/v) citric acid solution for 10 min, drained and dried in oven (AFOS Mini Kiln, at 60oC overnight).(Aurore et al., 2008).

Fruits were peeled and cut into 0.2 cm slices and immediately rinsed in citric acid solution (0.3% w/v). The slices were dried at 50°C in a hot air oven to obtain moisture content below 10%.

IV. Drying of unripe banana

Nguyen et al., (2007) investigated the effect of drying conditions on the drying kinetics over a wide range (30-700C) and looked the effect the slab thickness. The fick's law of diffusion is widely used to model the drying behavior. Increased temperature resulted in significant improvement of rate of mass loss, especially the initial rate. Total time was reduced significantly with increasing temperature. The difference in drying rates of the banana followed mainly the internal moisture transfer of falling rate period, in which water diffusivity depends on temperature and distance.

Somkiat et al., (2007) studied the drying characteristics of banana slices dried at high temperature (110-1400C) in a tray dryer. Banana slices were dried from the initial moisture content of 250-300 % dry basis to the required final moisture content of 4 % dry basis.

Koua et al., (2009) investigated the behavior of the thin layer drying of plantain banana, mango and cassava experimentally in a direct solar dryer and secondly to perform mathematical modeling by using thin layer drying models encountered in literature. The Henderson and Pabis drying model is found to be the most suitable for describing the solar drying curves of plantain banana, mango and cassava. The drying data of these products have been analyzed to obtain the values of the effective diffusivity during the falling drying rate phase.

Figiel (2010) studied the drying kinetics and quality of beetroots dehydrated by combination of convective and vacuum-microwave methods. treated samples as well as FD ones exhibited lower compressive strength, better rehydration potential and higher antioxidant activity than those dehydrated in convection. Increasing the microwave wattage and decreasing the time of CPD improved the quality of beetroot cubes dried by the combined method.

Babetto et al., (2011) studied the drying of garlic slices: kinetics and non-linearity measures for selecting the best equilibrium moisture content equation. The equilibrium data were obtained by the static method using saturated salt solutions. The main equilibrium equations for biological materials were discriminated using some measures. The Page equation adequately represented the drying kinetics data. The highest drying rates of sliced garlic were obtained with crosswise cut.

A. Effect of Drying on Colour

Saifullah et al., (2009) studied the Assessment of physical properties of ripe banana flour prepared from two varieties: Cavendish and Dream banana. Physical properties of ripe banana flour were studied in Cavendish and Robusta, in order to distinguish the two varieties. Flour was analyzed for pH, total soluble solids (TSS), water holding capacity (WHC) and oil holding capacity (OHC) at 40, 60 and 80 °C,) CA showed that the two types of flour were different in terms of selected physical properties. DA indicated that WHC at 60°C was the main contributor in discriminating the two types of flour.

B. Effect of Drying on Average Particle Size

Saifullah et al., (2009) Carried out utilization of green banana flour as a functional ingredient in yellow noodle. Banana pulp (BP) noodles prepared by partial substitution of wheat flour with green Cavendish banana pulp flour were assessed pH, color, tensile strength and elasticity, and in-vitro hydrolysis index (HI) and estimated glycemic index (GI). BP noodles had lower L* (darker) and b* values (less yellow) but higher tensile strength and elasticity modulus than control noodles. Following an in-vitro starch hydrolysis studies, it was found that GI of BP noodles was lower than control noodles. Partial

substitution of green banana pulp into noodles may be useful for controlling starch hydrolysis of yellow noodles.

Sonaye et al., (2012) measured the particle size of organic dust (different types of flour). Sieve analysis technique was used in the present study for estimation of weight percentage of micron sized (light weight and flyable) flour particles. The result shows the representative example of current Indian situation, where this recommended value found to get exceed upto 0.952 mg/m3.

Joshi et al., (2015) Evaluated the assessment of nutritional and Physiochemical properties of Banana Flour. In the present study, to preserve the fruit for an extended period, Peeled, sliced and treated bananas were oven dried for 18 hrs at 60°c. The dried bananas were ground to make banana powder is an excellent source of carbohydrate and is also a concentrated source of potassium, phosphorus, calcium and magnesium. In addition banana powder is rich in dietary fiber too. The physiochemical properties of banana flour make it suitable for incorporating and blending with almost all kinds of recipes.

Shaikh et al., (2017) studied the process optimization for making unripe banana flour and its utilization in vermicelli. Banana fruit has a very short post-harvest shelf life because of its highly perishable nature. Short shelf life and increased production necessitates development of non-conventional products from banana. To prevent the losses of riped banana drying method was applied to convert raw banana into banana flour by drying the raw banana flakes in tray dryer at 55°C for 6hrs. To make proper use and avoid wastage of banana we have introduced vermicelli with banana flour which is rich in nutrients. This study was carried out to determine the effect of substituting wheat flour with different levels of unripe banana flour in order to make vermicelli blends. The wheat flour was supplemented with UBF at different substitution levels. The study demonstrated that the nutritional quality and functional properties of vermicelli can be improved through supplementation with UBF.

C. Compostion of Banana Flour :(per 100gm)

Components	Unpeeled	Peeled
Protein	4.33	4.14
Lipids	0.701	0.453
Fibers	15.52	8.49
Carbohydrates	83.94	86.92
Ash	2.72	1.084

Table 1:

D. Medicinal uses of Unripe Banana Powder

Kumar et al., (2012) studied the Traditional and Medicinal Uses of Banana. Banana is the common name for herbaceous plants of the genus Musa and for the fruit they produce. It is one of the oldest cultivated plants. All parts of the banana plant have medicinal applications: the flowers in bronchitis and dysentery and on ulcers; cooked flowers are given to diabeties; the astringent plant sap in cases of hysteria, epilepsy, leprosy, fevers, haemorrhages, acute dysentery and diarrhea, and it is applied on haemorrhoids, insect and other stings and bites; young leaves are placed as poultices on burns and other skin afflictions; the astringent ashes of the unripe peel and of the leaves are taken in dysentery and diarrhea and used for treating malignant ulcers; the roots are administered in digestive disorders, dysentery and other ailments; banana seed mucilage is given in cases of diarrhea in India. Antifungal and antibiotic principles are found in the peel and pulp of fully ripe bananas. The antibiotic acts against Mycobacteria. A fungicide in the peel and pulp of green fruits is active against a fungus disease of tomato plants. Norepinephrine, dopamine, and serotonin are also present in the ripe peel and pulp. The first two elevate blood pressure; serotonin inhibits gastric secretion and stimulates the smooth muscle of the intestines.

V. CONCLUSION

Drying of immature banana and preparation of banana powder could increase the shelf life and it will increase the nutritive value of Crackers.Also it can be help in losses occurring during the storage and processing of unripe banana.It also contains very less amount of fat content due to which it can be use in daily diet of human beings.

REFERENCES

[1] Saifullah, R., Abbas, F. M. A., Yeoh, S.Y. and Azhar, M. E. (2009) "Utilization of green banana flour as a functional ingredient in yellow noodle". International Food Research Journal 16: 373379..
[2] Daramola, B. and Osanyinlusi, S.A. (2006). African journal of Biotechnology. Vol. 5(10), pp. 992-995.
[3] Li choo (2007). Utilization Of Matured green banana flour and oat beta glucan as fiber ingredients in noodles.
[4] Elizabete Wenzel Menezes, Carmen Cecília Tadini, Tatiana Beatris Tribess, Angela Zuleta, Julieta Binaghi,Nelly Pak, Gloria Vera, Milana Cara Tanasov Dan, Andréa C. Bertolini and Beatriz Rosana Cordenunsi, et al.(2011).
[5] Nguyen M.H., Price W.E., (2007) Air-Drying of Banana: Influence of Experimental Parameters, Slab Thickness, Banana Maturity and Harvesting Season, Journal of Food Engineering, 79(1), 200-207.
[6] Acevedo E.A., Hernandez J.J.I., Diaz P.O., Villalobos R.R. (2009). Pasta with UnripeBanana Flour: Physical, Texture, and Preference Study. Journal of Food Science. Vol 74, 1111-3841.
[7] Pallavi Joshi and Kanika Varma, (2015). "Assessment of Nutritional and Physiochemical p rop erties of banana Flour" Research Journal of Family, Community and Consumer Sciences Vol. 3(5).
[8] Shaikh Sarah, Prof. D.T.Bornare, Syed Ayesha. (2017) "Process Optimization for Making Unripe Banana Flour and Its Utilization In vermicelli". International Journal of Advance Scientific Research and Engineering Trends Volume 2 ||Issue 10 ||ISSN (Online) 2456-0774.
[9] Misha, . Mat, M.H. Ruslan, K. o ian and E. salleh, (2 3)."Review on the application of a Tray Dryer system for agricultural Products". World Applied Sciences Journal 22 (3): 424-433.
[10] K. P. Sampath Kumar, Debjit Bhowmik, S. Duraivel, M. Umadevi(2012), "Traditional and Medicinal Uses of Banana" Journal of Pharmacognosy and Phytochemistry IC Journal No: 8192 Volume 1 Issue 3.

[11] Aurore, G., Parfait, B. andhrasmane, L. 2008.Bananas, raw materials for making processed food products. rends in Food Science adechnology, 1-13.
[12] Riggs, K., & Brennand, C. (2010). Preserve the Harvest, Apples. Utah State University Extension.
[13] M. Ovando-Martinez, S. Sayago-Ayerdi, E. Agama-Acevedo, I. Goni,and L. A.Bello-Perez, 'Unripe banana flour as an ingredient to increase the undigestible carbohydrates of pasta," Food Chemistry., vol. 113, pp.121-126, 2009.
[14] Figiel, Adam. 2010. Drying kinetics and quality of beetroot dehydrated by combination of convective and vacuum-microwave methods. Journal of food engineering. Volume 98, Issues 4, Pages 461-470.
[15] Somkiat P., Tia W., Plyto N., & Soponronnarit S., (2008). Drying kinetics and Quality attributes of low-fat banana slices dried at high temperature. J. food engg.509-517.
[16] Tavakoli, H., S.S. Mohtasebi, V.M. Ghasemi and M. Tavakoli. 2010. Some physical, mechanical and thermal properties of barley (Hordeum vulgare L.) grains. Food Sci. Tech. Int. (in press).
[17] Ufot Evanson Inyang, Victoria Okon Ekop. (2015). Physico-Chemical Properties and Anti-nutrient Contents of Unripe Banana and African Yam Bean Flour Blends.International Journal of Nutrition and Food Sciences.Vol.4,No.5,pp. 549-594 .
[18] Sharma A, Baljeet S, Ritka (2008) Resistant starch: Physiological roles and food applications. Food Review International 24: 193-234.
[19] Gamlath S (2008) Impact of ripening stages of banana flour on the quality of extruded products. International Journal of Food Science and Technology 43:1541-1548.
[20] Alkarkhi, A. F. M., Ramli, S. bin, Yong, Y. S., & Easa, A. M. Comparing physicochemical properties of banana pulp and peel flours prepared from green and ripe fruits. Food Chemistry, 129(2), 312–318 (2011).
[21] Ovando-martinez, m. et al. Unripe banana flour as an ingredient to increase the undigestible carbohydrates of pasta. Food Chemistry, v.113, p.121–126, 2009.

