

Original Research Article

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Development of Health Mix from Banana

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ABSTRACT

Bananas are among the world's leading food crops, after rice, wheat and maize. Banana is a dessert fruit for millions and it contains nearly all the essential nutrients. Banana accounts for 31.7 per cent of the total fruit production in India. It has short shelf life of 6-10 days under tropical condition. Converting this perishable fresh fruit into shelf stable high value products like powder flour will be of immense value. The present study was undertaken to develop health mix from 'Chakkai banana variety. Freshly harvested fully matured green fresh banana fruits were utilized for the study. The selected banana fruits were washed, surface dried, steamed (15 min), peeled and cut into circular slices of 3 mm thickness, dried at $60 \pm 5^\circ\text{C}$ in a cabinet drier for 6 to 8 h, milled/ ground, sieved, packed and stored at room temperature for the preparation of health mixes. Standardized methods for preparation of sprouted bajra flour and sprouted bengal gram flour were utilized for the present study. Different combinations of banana flour, sprouted bajra flour, sprouted green gram flour, nuts and oil seeds (cashew nut and white sesame seeds) in varied percentage were tried for the development of health mixes. The developed mixes were served with milk to the 10 semi-trained judges using 9 -point hedonic scale rating. Development of banana health mix using banana flour (40%), sprouted bajra flour (20%), sprouted green gram flour (25 %) and cashew nut (15%) was found to be highly acceptable in colour and appearance, texture, taste, flavour and over all acceptability. There was slight variation in the nutrient content of the developed mixes than the control.

Keywords

Banana, Chakkia variety, Health mix, Nutrient content, Sensory characters

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Introduction

A dessert fruit for the millions, banana is also called 'Apple of paradise' 'Adam's fig', 'Kela' and botanically *Musa spp.* which belongs to a Family *Musaceae* (Arya, 2002). The edible banana is believed to have originated in the hot, tropical regions of South East Asia. India is believed to be one of the

centre's of origin of banana. It is often considered as a poor man's food owing to its affordability and rich food value (Sachin and Hosamani, 2001). Banana (*Musa spp*) is believed to be found in Greek, Roman and Arabian writings where it is referred as a remarkable fruit of India. Alexander the Great, tasted banana for the first time while on an expedition to India as early as 327 BC.

Popenoe, a historian stated that the name “Musa” comes from Sanskrit ‘moca’ the Arabic Mauzor, Muz and Latin “Musa”. Plinius the historian, in 67 A.D, made reference to the fruit as the food of sages of India. Rao (1999) reported that ripe banana contains 75.7 per cent water with almost 83 per cent of solids consisting of mixture of sucrose, glucose and fructose.

Banana is the cheapest, plentiful and most nourishing of all fruits. It contains nearly all the essential nutrients including minerals and vitamins and has several medicinal properties. Many regions, banana fruits are used as medicine for many ailments. A ripe banana fruit contains moisture (70%) and carbohydrates (27%) mainly as sugars and starch, crude fibre (0.5%), protein (1.2%), fat (0.3%), ash (0.9%) ascorbic acid (12 mg), vitamin B₆ (0.26 mg) and minerals like phosphorus, calcium and iron was reported by Sivashankar (1997). Gopalan *et al.*, (1999) reported that ripe banana has energy (116 K cal), carbohydrates (27. 20g), protein (1.2 g), fat (0.3g), calcium (17 mg), phosphorus (36 mg), iron (0.3 mg), carotene (78 µg), thiamine (0.05 mg), vitamin B₂ (0.08 mg), niacin (0.5g) and vitamin C (7 mg).

Chitra *et al.* (2002) developed banana flour for utilizing in the preparation of weaning food mixes, various sweets and savoury products. Selected banana varieties *viz.*, Rasthali, Poovan and Nendran (unripe, green and mature) were washed, steamed (10 min), sliced (3mm thickness), dipped in 0.2% KMS solution for 30 min, dried at 80°C in a cabinet drier for 6 to 8 h, milled, sieved through BS 80 mesh, packed and stored for 6 months.

Banana is the most widely cultivated and consumed fruit in the tropical and sub tropical regions of the world where they constitute a major staple food crop for millions of people. It is an alternative perennial fruit crop for

farmers due to its high economic gains throughout the year. Furthermore, with most of the cultivated bananas exported or consumed, the fruit is rarely processed, converted into food products, or processed for industrial use. Globally, large quantities of bananas are being lost with about one-fifth of all harvested bananas being wasted as a result of little or no processing and poor post harvest handling.

India is the largest producer of banana in the world with a production of 30477.22 Thousand MT from an area of 859.97 Thousand Ha during 2016-17 (Horticultural Statistics at a Glance 2018). Out of this amount only 3-4% of banana is processed. The most popular processed product is Nendran chips, which is still in cottage scale while some bigger manufacturers are processed banana puree for export. However, there is scope for converting banana into several other processed products like figs, jam, jelly, powder, flour, baby food, health drink, RTS beverages, wine, alcohol, sauce, pickles, chutneys, animal feed, fiber etc.

Banana is a tropical fruit that easily rot; fruit colour has changed rapidly by physical influences such as sunlight and cuts, and influence of biological (fungus). Therefore, post-harvest handling of banana is essential to prolong the shelf life, so it can be converted in to high value food products. Banana is a fruit with abundant minerals and functional nutrients with characteristic properties, yet it has been highly underutilized. The banana Chakkai variety is mainly cultivated for culinary purpose. Chakkia/ Chakkai variety has been not exploited for both fresh and processed form. However, the incorporation of banana flour with addition of malts of millet, pulses and nuts for the development of health mixes has not been tried so far. Hence, the present study was undertaken to develop health mix from Chakkai banana variety.

Materials and Methods

Selection of fruit

Fresh banana fruits var. `Chakkai` (A clone of Monthan) were procured from local farmers field in and around Killikulam, Thoothukudi District and utilized for the processing of banana flour.

Processing of banana flour

Freshly harvested fully matured green fresh banana fruits var Chakkai (A clone of Monthan) were washed in tap water, surface dried, steamed (15 min), peeled out manually and cut into circular slices of 3 mm thickness, dried at $60 \pm 5^{\circ}\text{C}$ in a cabinet drier for 6 to 8 h, milled/ ground, sieved, packed and stored at room temperature for the preparation of health mixes (Figure 1).

Preparation of health mix

Standardized methods for preparation of sprouted bajra flour, sprouted green gram flour and sprouted bengal gram flour were utilized for the present study. Different combinations of banana flour (40-50%), sprouted bajra flour (20-30%) and pulses (sprouted green gram flour-20-30%) and nuts /oil seeds (cashew nut /white sesame seeds - 10-15%) were tried for the development of health mixes. Development of banana health mixes using banana flour (40%), sprouted bajra flour (20%), sprouted green gram flour (25%) nuts and oil seeds (cashew nut 15%) have been found to be highly acceptable in colour, appearance, texture, taste, flavour and over all acceptability based on the sensory evaluation

Chemical analysis

The developed health mix samples were analyzed for moisture, acidity, protein, and

ascorbic acid as per the method described by Ranganna (1995). The total ash, fat and calcium were analyzed as per the procedure of Ranganna (1995). The total carbohydrate content of the sample was estimated by phenol sulphuric method. Crude fibre was estimated using acid- alkali extraction method given by Sadasivam and Manickam (1996). The phosphorus content of sample was analyzed colorimetrically (Fiske and Subbarow, 1925). Iron content of the samples was analyzed by the method given by Wong (1928). Potassium content of samples was analyzed using flame photometry (Ward and Johnston, 1962). The energy values of the health mix were estimated using Atwater factors in which the percentage carbohydrate, crude fat and crude protein contents were multiplied by 4, 9 and 4, respectively. The energy values of the health mix were expressed in Kcal/g. Microbial load (bacteria, yeast and fungi) was determined by the method described by Istavankiss (1985).

Sensory evaluation

The sensory quality of the banana health mix was examined visually and organoleptically. Sensory evaluation of the developed mix was done by 10 untrained judges using a 9-point hedonic scale where 9-like extremely; 8-like very much; 7-like moderately; 6-like slightly; 5-neither like nor dislike; 4-dislike slightly; 3-dislike moderately; 2-dislike very much; 1-dislike extremely as per the procedure given by (Watts *et al.*, 1989). The developed mix was evaluated for their colour and appearance, flavour, texture, taste and overall acceptability. The mean scores obtained by hedonic scale rating are tabulated.

Statistical analysis

The results obtained from the study with four replications were subjected to Analysis of Variance by Completely Randomized Design.

The significant difference among the samples was tested in Least Significant Different (LSD) at 5 % level of significance using SAS system for SPSS 16.1 version.

Results and Discussion

The nutrients content of the developed health mix is furnished in Table 1.

There was slight variation in the nutrient content of the developed mixes than the control (banana flour). The banana flour was

found to be high in potassium (679.71 mg) and, crude fiber (4.0 g). The banana health mix with sprouted green gram flour had slightly higher moisture content, protein and mineral content. Incorporation of the banana flour with sprouted bajra flour and sprouted pulse flour improved the nutritive quality of the developed mixes. The health mix incorporated with sprouted green gram flour was judged best in nutrient content. Initially, there was no microbial count in the developed mix.

Table.1 Nutrient content of the developed mixes (100 g)

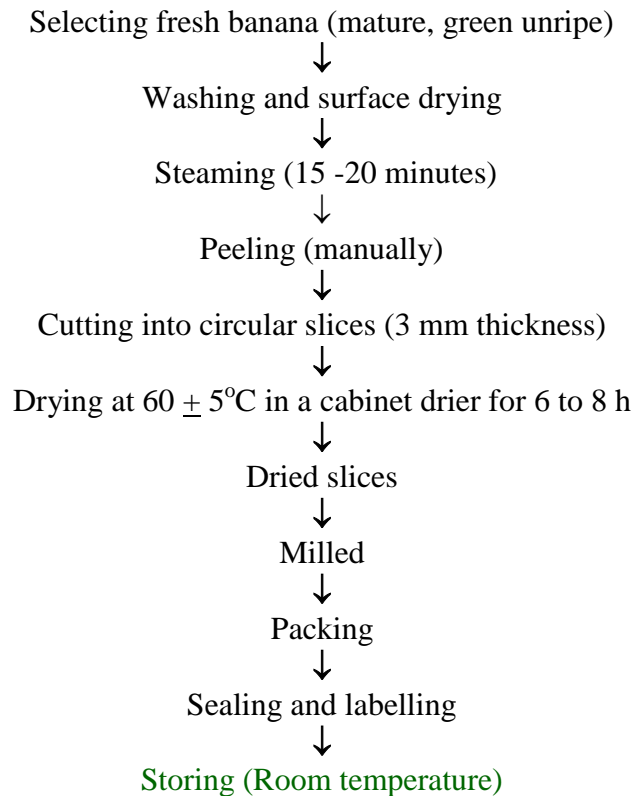
S. No.	Nutrient content	Control (T ₁)	Banana health mix (T ₂)
1	Moisture (%)	5.40 ^b	8.00 ^a
2	Protein (g)	1.28 ^b	15.51 ^a
3	Fat (g)	0.52 ^c	8.70 ^b
4	Carbohydrates (g)	33.60 ^b	67.78 ^a
5	Energy (K. cal)	144.40 ^b	411.46 ^a
6	pH	6.00 ^a	6.00 ^a
7	Acidity (g)	0.32 ^c	0.41 ^b
8	Vitamin C(mg)	36.00 ^b	40.00 ^a
9	Crude fiber (g)	4.00 ^a	1.60 ^b
10	Total ash content (g)	2.25 ^b	2.75 ^a
11	Calcium (mg)	11.66 ^c	39.31 ^a
12	Phosphorus(mg)	22.00 ^c	188.57 ^a
13	Potassium (mg)	679.71 ^a	544.03 ^b

Values with the same superscript in the same line are not significantly different (p>0.05)

Table.2 Sensory score value of the banana health mixes

S. No	Sensory Characteristics	Control (Banana flour)	Banana health mix
1	Colour	6.8 ^a	7.5 ^a
2	Appearance	7.0 ^a	8.0 ^a
3	Texture	7.0 ^a	8.0 ^a
4	Flavour	6.0 ^b	7.6 ^a
5	Taste	7.0 ^b	8.0 ^a
6	Over all acceptability	6.7 ^b	8.5 ^a

Fig.1 Flow chart for the processing of banana flour



Sensory score value of the banana health mix

The developed mixes were served with hot milk to the 10 semi trained judges using 9 point hedonic scale rating. The mean scores obtained by hedonic scale rating (9-1) for the developed health mixes are tabulated (Table 2).

The developed health mix was found to be superior in all the sensory attributes than the control (banana flour as such). Banana health mix with sprouted green flour had slightly higher organoleptic score than the control. This decreased colour, flavor and appearance score of banana flour might be due to banana variety.

The study concluded that banana fruits *var. 'Chakkai'* was highly suitable for development of banana flour and health mixes

with locally available millet, pulses and nuts. The developed mix contains high protein, vitamin C and potassium without any food additives such as artificial colour and preservative. The developed mix can be useful for all age groups and also pre event drink or post event drink for sports person.

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