

Original Research Article

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Development of Soy Flour Incorporated Mango Bars

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ABSTRACT

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Mango (*Mangifera indica* L.) is important commercial fruits of India. It is liked by people due to its high palatability, excellent taste and exemplary nutritive value. Mango pulp is rich in carbohydrates, minerals, vitamin C, starch, pectin, carotenoids, but lacks in protein, fat and some essential amino acids. But pulses are good sources of important dietary nutrients, proteins, minerals and vitamins. The present study was carried out to develop soy flour incorporated mango bars from two mango varieties namely Neelum and Totapuri (Bangalore) with pretreated soy flour. The developed mango bar of each variety had increased protein, fat, ash and crude fibre contents and decreased total acid, vitamin C and Beta-carotene content. A drastic difference in protein, fat, crude fibre and ash contents were noted among the soy flour incorporated mango bars. The bars prepared from Neelum variety had high vitamin C, Beta-carotene and total sugar content than Totapuri variety. There was no flatulence compound in control mango bars. The soy flour incorporated bars was found to contain minimum level of flatulence produced by *Clostridium perfringens*. The developed bars were found to be acceptable in sensory attributes like colour, flavour, texture, taste and overall acceptability.

Introduction

Mango is one of the most important tropical fruits. It belongs to the family Anacardiaceae and is reported to contain 41 species and 793 cultivars and known to have originated in South East Asia (Kalra *et al.*, 1995). Mango fruit bar is a dried pulp with proper amount of sugar and acid mixture, which is an important product of commerce in mango growing areas of India. Though processes are available for making bars from mango, guava, banana pineapple and ber, only mango bar is

marketed commercially. Ready to eat mango bar has a rich potential to be used as part of ration pack to Armed Forces to provide variety and also a good fruit based products.

Mango pulp is good source of carbohydrates, vitamin C and inorganic potassium, but lacks in protein and fat and therefore it is not considered to be nutritionally complete food. On the other hand, soy flour contains 40 per cent protein, 23 per cent carbohydrates, 5 per cent minerals and 3.0 per cent crude fibre. The direct use of soy flour in food products

results in the incorporation of protein and calories. It has great potential to provide good quality protein and calorie at low price and helps in combating protein-calorie malnutrition in the country. Keeping in view, an investigation was undertaken to develop soy flour incorporated mango bars from two varieties (var. Totapuri and Neelum) with pretreated soy flour.

Materials and Methods

Two varieties of mango fruits "Neelum and Totapuri (Bangalora) were procured from the local market in Madurai and were used to study. Mango pulp was prepared after peeling and destoning the fruits and the pulp was heated for 10 minutes for enzyme inactivation.

Soy flour was steamed for 10 minutes to reduce the raw beany flavour and to inactivate trypsin inhibitor activity. The steamed flour was dried and passed through fine mesh to avoid clumps and further used for fruit bar preparation.

Preparation of mango bar

The mango pulp (800 g) was mixed with 200 g of pre treated soy flour, 250 g of sugar, 2.5 g of citric acid and 20 g of corn flour. The mixture was concentrated to 45° B, cooled and 400 ppm of KMS was mixed. Then the bar mix was poured in a greased tray to 0.5 cm thickness and dried in mechanical drier at 60°C for 7 hour.

The second layer was poured above the first dried layer. The process was repeated until it reached 1.5 cm thickness. The dried leather was cut into rectangular bars (9 x 3 packed in different packaging materials, heat sealed and stored in air tight stainless steel containers at room temperature for further storage studies.

Chemical analysis

The fruit bar samples were analysed for moisture, acidity, total soluble solids (TSS), reducing and total sugars, protein, ascorbic acids as per the method described by Ranganna (1995) and Beta-carotene by Raghuramulu *et al.*, (1983). The initial total ash and fat were analysed as per the procedure of Ranganna (1995). Trypsin inhibitor activity of the samples was determined as per the method given by Kakade *et al.*, (1974). The method detailed by EL Faki (1984) was followed for the invitro gas production experiment. In this experiment, the various oligo saccharides were fermented by *Clostridium perfringens* anaerobically and the quantities of gas produced were measured directly in airtight syringes. Crude fibre was estimated as per the procedure given by Sadasivam and Manickam (1995) and microbial local (bacteria, yeast and fungi) was determined by the method described by Istavankiss (1985) at monthly intervals. Sensory evaluation was done by 10 untrained judges using 4-1 hedonic scale.

Results and Discussion

The chemical composition of mango bar and soy flour incorporated mango bars are summarized in Table 1.

It is clear that protein enrichment of each variety of mango pulp with soy flour, for fruit bar preparation changed the chemical characteristics of the product. The protein and fat content of the fruit bars were enhanced considerably by blending mango with soy flour. Ascorbic acid and acidity were found to be low in soy flour incorporated mango bars when compared to control bars. The mango bars and soy flour incorporated mango bars prepared from Neelum variety had high percentage of ascorbic acid, β -carotene and total sugar than Totapuri variety. The crude

fibre and ash content were higher in soy flour incorporated mango bars when compared to the control bars. A drastic difference in protein, fat, crude fibre and ash content was observed among the soy flour incorporated mango bars. Similar study was reported by

Chauhan *et al.*, 1993) in protein enriched apricot soy bar. The apricot soy bar had 70 per cent pulp and 30 per cent soy slurry with 15.3 per cent moisture, 7.8 per cent protein and ascorbic acid. .

Table.1 Chemical composition of protein-enriched mango bars

Particulars	Neelum control bar (T ₁)	Totapuri control bar (T ₂)	Neelum Soy bar (T ₃)	Totapuri soy bar (T ₄)
Moisture (g%)	20.00	15.59	19.19	19.61
Acidity (g/100g)	0.419	0.640	0.307	0.358
pH	4.25	4.20	4.50	4.50
TSS (°Brix)	75.00	65.00	65	60
Reducing Sugar (g/100g)	13.05	13.87	7.00	7.46
Total sugar (g/100g)	59.52	58.00	54.00	51.00
Vitamin C (mg/100g)	27.78	23.75	21.50	14.75
β - Carotene (μ g/100 g)	380.25	358.80	330.85	304.85
Protein (g/100g)	1.40	1.75	9.10	10.50
Fat (g/100g)	1.00	0.98	2.04	1.90
Total ash (g/100g)	1.40	1.46	2.00	2.24
Crude fibre (g/100g)	2.40	2.0	6.00	5.2
Trypsin inhibitor activity (T1 units (U) per mg protein)	-	-	6.58	6.58
Flatus compounds (ml of gas produced/4ml of broth)	-	-	Slightly gas production	Slightly gas production

Trypsin inhibitor activity was not observed in control (T₁ and T₂) and but soy bar (T₃ and T₄) prepared from both varieties had slight Trypsin inhibitor activity. Similar results have also been reported earlier for green gram. Anti tryptic activity decreased by 99 per cent in green gram on cooking at 100°C for 30 minutes as investigated by Yasminmarichar and Pattabiraman (1988). Cooking for 60 minutes was sufficient to inactivate over 90 per cent trypsin inhibitors with 15 per cent of α -galactoside loss (Trugo *et al.*, 1990). Gas production (flatus compounds) was not observed in control bars prepared from Neelum and Totapuri varieties. The soy in corporate bars from both varieties produced slight gas production. These results are in conformity with findings of Akinyele and

Akinlose (1991). The chemical changes with two cultivars of cowpea dehulled showed that verbascose, stachyose decreased significantly and also observed 56 percent decrease in raffinose content.

Sensory characters

The developed bars were found to be highly acceptable in sensory attributes such as appearance, colour, flavor, texture, taste and over all acceptability.

In conclusion the developed soy flour incorporated mango bar have excellent sensory characteristics and nutritious. It is highly suitable for children as fruit based snack. The results of the present study proved

that mango pulp could be fortified with protein from soy for the development of new protein enriched products. Such a low cost protein enriched food products, if introduced in the diets could become an efficient tool for nutritional improvement among the nutritionally deficient people.

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