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Studies on Preparation of Fortified Sapota-Papaya Fruit Bar

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Abstract

Food Enrichment and Fortification are the most cost effective and sustainable strategy to address the problem of micronutrient malnutrition. The study was conducted to standardize the protocol for preparation of sapota-papaya fruit bar and to enhance the nutritional value by fortifying with skim milk powder. For preparation of fruit bars, Sapota and Papaya pulp were blended in different proportions to standardize parameters like pectin, pulp combination and SMP concentration and the mixture was dried in mechanical dehydrator at 55 ± 2ºC for 8-10 h. Best recipe was selected on the basis of sensory evaluation. The protein content of sapota-papaya bar was increased gradually from 1.17% to 1.85% with the increasing amount of skim milk powder whereas the protein content of fruit bar without addition of skim milk powder was found to be 0.87%. Also the amount of energy obtained by consuming 100 g of sapota-papaya bar fortified with 6% SMP was higher (346.06 Kcal) than that of control sample (342.96 Kcal). Thus the study revealed that the developed fruit bar was found to be rich in protein and it can be given as a supplement to malnutrition.

Keywords: Sapota; Papaya; SMP; Pectin; Fruit bar; Fortification

Introduction

Sapota or sapodilla is a native of tropical America, having originated in Mexico of Central America. It is a delicious fruit also known as chiku, dilly, sapota plum, sapodilla or prickly pear. India has about 162 thousand hectares of land under cultivation of sapota and produces about 1358 thousand tonnes of sapota per year (Ministry of Commerce and Industries Data Sheet, Government of India 2009-10).

Sapota and papaya are the most important tropical fruits in India. Sapota fruit is a good source of sugar which ranges between 12 and 14%. A 100 g of edible portion of fruit contains moisture (73.7 g), carbohydrates (21.49 g), protein (0.7 g), fat (1.1 g), calcium (28 mg), phosphorus (27 mg), Iron (2 mg) and ascorbic acid (6 mg) as reported by Bose and Mitra [1], whereas papaya contains higher percentage of β-carotene as compared to other fruits. The principal constituents of mature fruit are tannins and carbohydrates. Out of the carbohydrates, free sugars such as glucose, fructose and galactose form a major portion, whereas starch is found in small quantities or absent. The fruit also contains 1.13% sapotin, the principle bitter component. Ascorbic acid content decreases with the ripening of fruit [2]. The fruit also has appreciable amounts of protein, fat, fiber and minerals.

In recent years, consumers have become more health conscious in their food choices but have less time to prepare healthful meals. As a result the market demand for "minimally processed" or "lightly processed" foods has rapidly increased. This investigation was carried out with an objective to process the sapota and papaya fruits, to enhance the nutritional value by fortifying with skim milk powder, to study the organoleptic evaluation and nutrient analysis of the developed sapota-papaya fruit bar.

Materials and Methods

Fruit bars are high calorie foods and are a rich source of the vitamins and minerals. Fruit bars being principally made out of fruit pulps, retain most of these ingredients and form a good nutritional supplement Fruit bars are so far made from pulpy fruits or by mixing the pulps of fruits that are commercially in demand.

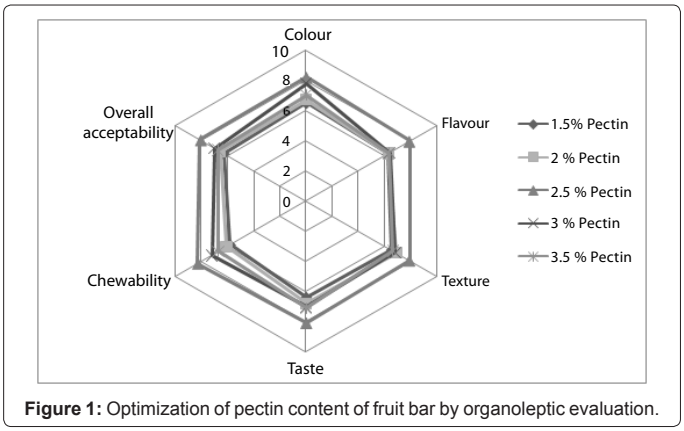

Figure 1: Optimization of pectin content of fruit bar by organoleptic evaluation.

Development of fruit bar

Uniform sized, fully ripened fruits of sapota and papaya free from any injury, disease were procured from the local market for the development of fruit bar. These fruits are then washed thoroughly with clean water and peeled to remove the outer skin. Pulp was extracted from the peeled fruits with the help of pulper. To the boiled pulp Sugar (50%), Pectin (2.5%), Citric acid (1%), Maltodextrin (1%) and SMP (0-6%) were added and it was heated enough to form a homogenous mixture. The mixture was poured into Aluminium trays (smeared with butter) in thin layer (0.5-1 cm) and dried at 60 ± 2°C for 10-12 h in

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Ingredients/ Trials	A	B	C	D	E
Sapota pulp (g)	100	80	70	60	50
Papaya pulp (g)	00	20	30	40	50
Pectin (g)	0.90	1.20	1.50	1.80	2.10
Skim Milk Powder (g)	2	4	6	8	10

Table 1: Optimization of ingredients in fruit bar.

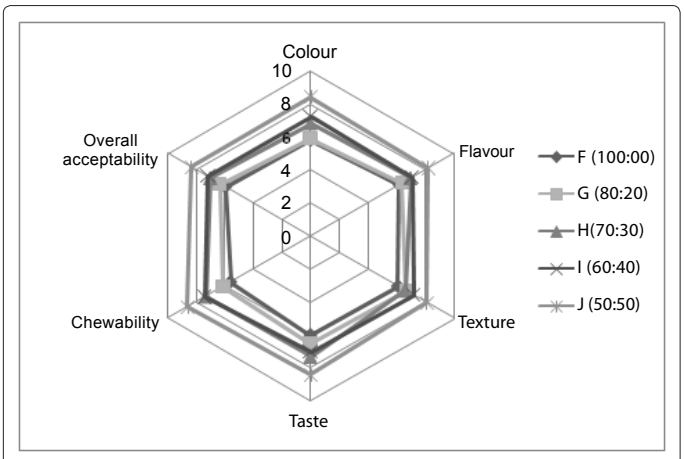

Figure 2: Optimization of sapota: papaya pulp combination of fruit bar by organoleptic evaluation.

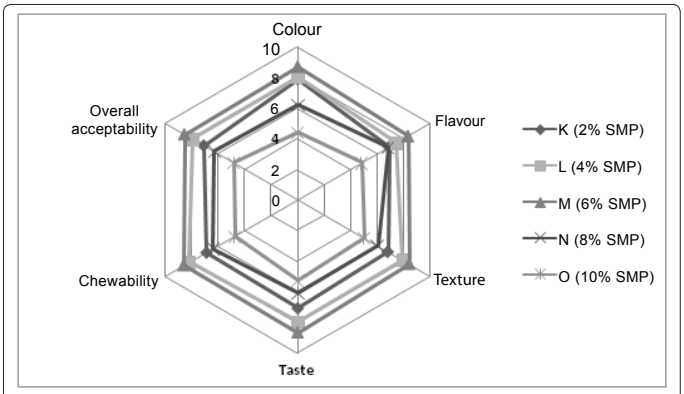

Figure 3: Optimization of SMP content of fruit bar by organoleptic evaluation.

tray drier. The cooled fruit bar were cut in to rectangular pieces and wrapped in food grade polythene (fresh wrap).

Optimization of parameters for preparation of sapota fruit Bar

Optimization of pectin content: The amount pectin required for proper setting of fruit bar and to obtain uniform texture was optimized by adding pectin at different concentrations ranging from 1.5 to 3.5%. From organoleptic evaluation the amount of pectin required was standardized and that amount was kept constant in next trials. The formulations for optimization of pectin content are shown in Figure 1 and Table 1.

Optimization of sapota: papaya pulp combination: Five different combinations of sapota and papaya pulp were used in formulations for optimization which are as shown in Table 1. During this trial the amount of sugar added was also varied with the amount of pulp to obtain uniform final sugar content of 40°Brix. The optimum combination of pulp was standardized on the basis of organoleptic properties which were used in next trial (Figure 2).

Optimization of Skim Milk Powder: Attempt was made to fortify the fruit bar for which skim milk powder was added in different proportions and optimization was carried out and figured in Figure 3 and Table 1.

These bars were analyzed for energy, carbohydrate, protein, fat, moisture, ash [3], TSS (°Brix), pH (pH meter), ascorbic acid, crude fiber, total sugar, reducing sugar, non reducing sugars [4] and organoleptic ratings [5],were determined using standard analytical procedures.

Results and Discussion

Physicochemical characteristics Sapota *(Achras zapota)*

Data in Table 2 and 3 represent the physical and chemical characteristics of sapota (cv. Cricket ball) fruit respectively. The average weight of sapota fruit recorded was 55.6 g. Yield of sapota pulp was 87.80% and the waste index which contains peel and seed was 10.0 and 2.19% respectively. Pulp contains about 69.22% moisture while nutrients like protein, fat and minerals were found to be 0.6%, 1.25% and 0.62% respectively. Total sugar content of sapota pulp was found to be 17.57% and the TSS of pulp was 24°Brix. These observations are in conformity with the results reported by Gopalan et al. [6].

Effect of SMP fortification on quality of sapota-papaya fruit bar

Table 4 revealed that the protein content of sapota-papaya bar was increased gradually from 1.17% to 1.85% with the increasing amount of skim milk powder whereas the protein content of fruit bar without

Parameter	Value
Weight (g)	55.6 ± 5.71
Length (cm)	4.01 ± 0.15
Diameter (cm)	2.05 ± 0.18
Shape Index	1.96 ± 0.14
Pulp yield (%)	87.8 ± 0.39
Peel (%)	10.00 ± 0.33
Seed (%)	2.19 ± 0.16

All values are mean ± SD of ten values.

Table 2: Physical properties of sapota fruit.

Parameter	Value
Moisture (%)	69.22
TSS (°Brix)	24
pH	4.8
Acidity (%)	0.8
Protein (%)	0.6
Fat (%)	1.25
Ash (%)	0.62
Carbohydrate (%)	28.31
Total sugar (%)	17.57
Reducing sugar (%)	8.91
Non-reducing sugar (%)	8.66
Ascorbic acid (mg)	1.38

Table 3: Chemical analysis of sapota fruit.

addition of skim milk powder was found to be 0.87%. It was also found that ascorbic acid content was increased significantly from 178 mg to 205 mg. The amount of energy obtained by consuming 100 g of sapota-papaya bar fortified with 6% SMP was higher (346.06 Kcal) than that of control sample (342.96 Kcal). Skim milk powder is rich source of protein and it gives high amount of energy. It also contains favorable amount of vitamin C and minerals like potassium, calcium, magnesium and iron. Total sugar content was increased gradually with the increase in concentration of skim milk powder while decreasing trend was observed in non reducing sugar.

Optimization of parameters by organoleptic evaluation of fruit bar

From Table 5-7 it was found that samples C, J and M received highest scores 8.08, 8.34 and 8.54 respectively by organoleptic evaluation. Addition of pectin and fortification of skim milk powder at higher levels in sample D, E, N and O affects the colour, taste, texture and chewability of fruit bar which resulted in lower overall acceptability scores. The average scores reported for the samples D, E, N and O were 7.04, 6.74, 6.3 and 4.86 respectively. The parameters that received highest score were kept constant and same proportions were used to formulate sapota-papaya fruit bar. Fruit bar prepared by these combinations was found superior in quality. The optimized recipe obtained from organoleptic evaluation of sapota-papaya fruit bar which received highest scores is as given in Table 8.

Parameter	J (0 % SMP)	K (2 % SMP)	L (4 % SMP)	M (6 % SMP)
Moisture (%)	15.91	15.55	15.87	14.64
Protein (%)	0.87	1.17	1.61	1.85
Fat (%)	3.08	3.01	3.04	2.9
Total Ash (%)	2.2	2.31	2.40	2.47
Crude Fiber (%)	10.22	11	12.02	12.08
Carbohydrate (%)	77.94	77.96	77.08	78.14
Total sugar (%)	15.51	16.21	16.49	16.97
Reducing sugar (%)	6.93	8.57	8.91	9.41
Non-reducing sugar (%)	8.58	7.64	7.58	7.56
Ascorbic Acid (mg)	171	178	184	205
Total Energy (Kcal)	342.96	343.61	342.12	346.06

Table 4: Effect of SMP fortification on quality of sapota-papaya fruit bar.

Parameter	A	B	C	D	E
Colour	6.5 ± 0.44	6.7 ± 0.40	8.2 ± 0.40	7.8 ± 0.74	7 ± 0.31
Flavour	6.2 ± 0.24	6.3 ± 0.24	7.9 ± 0.20	6.4 ± 0.49	6.3 ± 0.40
Texture	6.5 ± 0.31	6.9 ± 0.37	7.9 ± 0.49	6.8 ± 0.40	6.6 ± 0.37
Taste	6.4 ± 0.20	6.8 ± 0.24	8.1 ± 0.66	7 ± 0.63	7.1 ± 0.49
Chewability	5.8 ± 0.24	6.1 ± 0.20	8.3 ± 0.74	7.2 ± 0.74	6.7 ± 0.74
Overall acceptability	6.28 ± 0.09	6.56 ± 0.17	8.08 ± 0.27	7.04 ± 0.32	6.74 ± 0.78

All values are mean ± SD of five values.

Table 5: Optimization of pectin content of fruit bar by organoleptic evaluation.

Parameter	F	G	H	I	J
Colour	5.8 ± 1.16	5.9 ± 0.49	6.8 ± 0.74	7.2 ± 0.74	8.4 ± 0.49
Flavour	6.2 ± 0.74	6.4 ± 0.80	7 ± 0.63	7.1 ± 0.66	8.2 ± 0.67
Texture	6.1 ± 0.20	6.7 ± 0.40	6.6 ± 0.80	7.2 ± 0.67	8.1 ± 0.58
Taste	6 ± 0.00	6.5 ± 0.77	7.3 ± 0.40	7 ± 0.63	8.4 ± 0.37
Chewability	5.6 ± 0.49	6.1 ± 0.73	7.3 ± 0.60	7.4 ± 0.49	8.6 ± 0.37
Overall acceptability	5.94 ± 0.32	6.32 ± 0.39	7 ± 0.14	7.18 ± 0.45	8.34 ± 0.41

All values are mean ± SD of five values.

Table 6: Optimization of sapota: papaya pulp combination of fruit bar by organoleptic evaluation

Parameter	K	L	M	N	O
Colour	7.9 ± 0.49	8 ± 0.63	8.7 ± 0.40	6.2 ± 0.40	4.4 ± 0.80
Flavour	6.9 ± 1.02	7.4 ± 0.37	8.3 ± 0.40	6.8 ± 1.16	4.8 ± 0.74
Texture	6.8 ± 0.40	7.9 ± 0.20	8.4 ± 0.37	6 ± 1.09	5 ± 0.89
Taste	7.1 ± 0.66	8 ± 0.31	8.7 ± 0.24	6.1 ± 0.66	5.3 ± 1.16
Chewability	6.9 ± 0.80	8.2 ± 0.24	8.6 ± 0.37	6.4 ± 0.58	4.8 ± 0.74
Overall acceptability	7.12 ± 0.41	7.9 ± 0.22	8.54 ± 0.16	6.3 ± 0.64	4.86 ± 0.52

All values are mean ± SD of five values.

Table 7: Optimization of SMP content of fruit bar by organoleptic evaluation

Ingredients	Amount
Sapota pulp (g)	50
Papaya pulp (g)	50
Sugar (g)	55
Citric acid (g)	0.90
Pectin (g)	1.50
Maltodextrin (g)	1
Skim Milk Powder (g)	6

Table 8: Optimized recipe for Sapota-Papaya fruit bar.

Conclusion

Conclusively, it emerges that the Sapota-papaya fruit bar fortified with skim milk powder can be successfully prepared by using sapota pulp (50%) + papaya pulp (50%) + Sugar (50%) + Pectin (2.5%) + Citric acid (1%) + Maltodextrin (1%) and drying the mixture in a mechanical dehydrator at 55 ± 2°C for 8-10 h and thus the recipe was optimized. As regards the organoleptic qualities, of all the fruit bars processed, bar fortified was excellent followed by Nutritional quality particularly protein, fat, crude fibre and calorie content increased with increasing SMP (0-6%) in fruit bar. This type of value addition by way of nutrient fortification / enrichment does certainly help in income generation of the entrepreneurs at large & promote good nutrition. Supplementing the value added sapota-papaya fruit bar to preschool children and adolescents will be a promising effort to reduce malnutrition.

References

1. Bose TK, Mitra SK (1990) Fruits: Tropical and subtropical. Naya Prakash, Calcutta, India.
2. Broughton WJ, Wong HC (1979) Storage conditions and ripening of chiku fruits (*Achras zapota*). Scientia Horticulture 10: 377-385.
3. AOAC (1970) Official methods of analysis. (15th edn.), Association of Official Analytical Chemists, Washington, DC, USA.
4. Ranganna S (1986) Handbook of Analysis and quality control for fruit and vegetable products. (2nd edn), Tata Mc. Graw Hill Publishing Company, New Delhi, India.
5. Amerine MA, Rose Marie P, Roessier EB (1973) Principles of sensory evaluation of food. Academic press, New York, USA.
6. Gopalan C, Ramashastri BV, Balasubramanyam SC (1977) Nutritive Value of Indian Foods. NIN, Indian Council of Medical Research, Hyderabad, India.