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Effect of storage on chemical constituents and sensory parameters of bael-mango chutney

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Abstract

Chutney prepared from bael-mango blends was analyzed for changes in chemical constituents and sensory parameters at monthly intervals for three months storage period. Total sugars, reducing sugars, acidity and browning increased, while total carotenoids and total phenols decreased significantly in chutney during storage. Chutney prepared with 60 bael: 40 mango pulp ratio was found most acceptable. The overall acceptability of bael-mango chutney decreased significantly during three months storage period.

Keywords: Bael, mango, blends, chutney, chemical constituents, sensory parameters, storage

Introduction

The food processing industry in India exhibits a bright outlook. The demand for value added food products is increasing gradually in India as well as in other countries due to increasing trend towards fast foods and changing consumer taste. The natural fruit products have high nutritional, medicinal and calorific values, which can further be improved by blending pulp or juice of two or more fruits having excellent colour and appearance, refreshing flavour, delicious taste, and high nutritive and therapeutic values.

Bael (*Aegle marmelos* Correa.) has a great demand in our *Ayurvedic* system of medicine, where each part of this fruit tree *viz.*, root, trunk, bark, leaf, flower, fruit and seed is used in one or the another ailment. The ripe bael fruit is a tonic, restorative, laxative and is good for heart and brain, whereas mature bael fruit is astringent, digestive, stomachic and is used for the treatment of diarrhoea and dysentery. Bael fruit is not consumed as a table fruit due to its hard shell, mucilaginous pulp and a large number of seeds and fibres in its pulp, although, it has a great potential for processing into several products *viz.*, ready-to-serve drink, nectar, squash, preserve, candy, cheese and toffee.

Mango (*Mangifera indica* L.) belongs to family Anacardiaceae. It is one of the premier fruits grown in tropical and subtropical climate throughout the World. Mango is generally sweet, although, the taste and texture of its flesh varies from soft pulpy to fibrous texture. Mango pulp contains phytochemicals and nutrients. The fruit contains antioxidants vitamin A, C, B₆ (pyridoxine) and essential nutrients such as potassium, copper and amino acids. Mango pulp can be processed into ready-to-serve drink, nectar, squash, syrup, cheese, toffee, ice cream and desserts.

Blending of pulp/juice from two or more fruits could be an economic requisite to utilize profitably some fruits for processing, which may not, otherwise have favourable characteristics like colour, flavour, aroma, taste, mouthfeel including overall cost and nutrition for the preparation of processed products. People have less preference for bael fruits due to its peculiar taste and flavour. However, blending of mango pulp with bael pulp may improve colour and appearance, taste, flavour, mouthfeel, texture, nutrition and overall acceptability of its blended products. These blended value added fruit products, being highly nutritive and therapeutically important can be made popular in the domestic as well as in export markets.

Keeping all these aspects in view, the research work was planned to standardize an appropriate combination of Bael-Mango blends for preparation of chutney and to evaluate the storage quality of blended product.

Materials and Methods

The present investigation was conducted in Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar during 2015-16. Uniformly ripe bael and mango fruits were procured from local market, Hisar. Bael fruits were washed thoroughly in running water and broken by striking against hard surface. The fruit pulp along with its seeds and fibres was scooped out with the help of a stainless steel spoon. An equal amount of water to the weight of

pulp was mixed with the pulp. The mixture of pulp and water was kneaded, heated at 80 °C and passed through fruit pulper to obtain homogeneous pulp free from seeds and fibres. Sodium benzoate @ 1 g/kg pulp was mixed with the pulp. The pulp was then packed in polypropylene jars and stored in deep freezer (Fig.1).

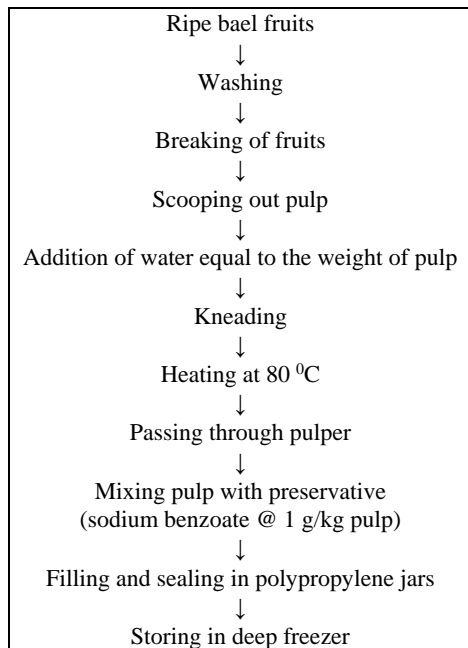


Fig 1: Flow sheet for extraction of pulp from bael fruits

Mango fruits were washed thoroughly in clean running water and peeled off. The pulp was separated from the stone with the help of a stainless steel knife and it was blended in a mixer to obtain fine pulp. Sodium benzoate @ 1 g/ kg pulp was mixed with the pulp. The pulp was then packed in polypropylene jars and stored in deep freezer (Fig. 2).

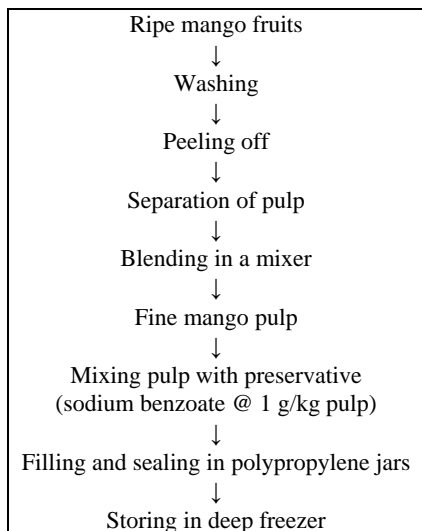


Fig 2: Flow sheet for collection of pulp from mango fruits

The bael and mango pulp was blended in the ratio of 100:0, 60:40 and 0:100. Chutney was prepared by cooking 1 kg pulp with 400 g sugar, 200 g onion paste, 20 g ginger paste, 10 g garlic paste, 15 g common salt, 15 g black salt, 2.5 g red chilli powder, 7.5 g hot spice mix and 5 ml glacial acetic acid. Chutney was filled hot in clean, 150 g capacity sterilized glass bottles, screw capped properly, cooled in air, labelled and stored at room temperature for three months (Fig. 3).

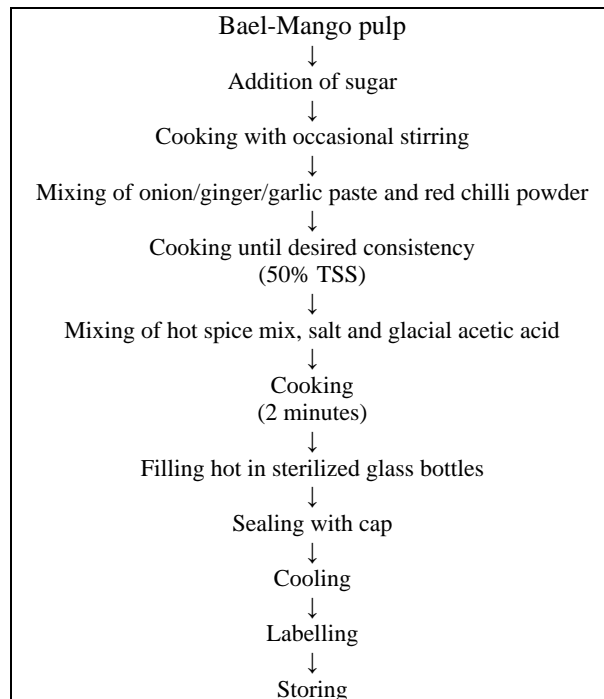


Fig 3: Flow sheet for preparation of bael-mango chutney

Bael-Mango chutney was analyzed for changes in chemical constituents and sensory parameters at monthly interval for three months. Total and reducing sugars were estimated by the method of Hulme and Narain (1931) ^[4]. Acidity was determined by method of Ranganna (2014) ^[6]. Total carotenoids were analyzed by Rodriguez-Amaya method (1999) ^[7]. Total phenols were estimated as per the methods given by Amorium *et al.* (1997) ^[1] and browning was estimated by method of Ranganna (2014) ^[6]. The overall acceptability of bael-mango chutney was based on mean scores obtained for all the sensory characters *i.e.*, colour and appearance, flavour, texture, taste and mouthfeel. The characters with mean scores of 6 and above out of 9 were considered acceptable (Ranganna, 2014) ^[6]. The treatments were replicated thrice and the data were analyzed statistically using completely randomized design. The critical difference value at 5 per cent level was used for making comparison among different treatments during storage.

Results and Discussion

There was a gradual and significant increase in total and reducing sugars of bael-mango chutney with the advancement in three months storage period. The increase in level of sugars might be attributed to hydrolysis of polysaccharides into sugars and inversion of sugars. The results are in conformity with those of Chaudhary and Verma (2012) ^[3] in aonla chutney.

Acidity increased significantly in bael-mango chutney during three months storage. This might be due to rise in the concentration of weakly ionized acids by degradation of polysaccharides and oxidation of reducing sugars or by break down of pectic substances and uronic acid. Similar observations were reported by Mishra *et al.* (2011) ^[5] in ready-to-eat amla chutney, and Chaudhary and Verma (2012) ^[3] in aonla chutney.

A significant decrease in total carotenoids of bael-mango chutney was observed during storage. This might be due to auto-oxidation of β -carotene leading to loss of total carotenoids and also due to its highly unsaturated chemical structure, which made the constituent very susceptible to

thermal degradation and oxidation. The results are in accordance with those of Balaswamy *et al.* (2004)^[2] in curry leaf chutney powder.

There was also significant decrease in total phenols of bael-mango chutney during storage. Total phenols are easily volatile and oxidized, hence, its content decreased in the samples regardless of exposure to light or darkness. Moreover, cell structure disrupted during processing and the materials became prone to non-enzymatic oxidation, which could be one of the major causes for loss in total phenols of the products. Similar decrease in total phenols was also reported by Shivani *et al.* (2008)^[8] in jamun jam and chutney. There was significant increase in browning of bael-mango chutney during storage. This might be due to action of acidity,

which enhanced hydrolytic reaction causing browning. Acids also enhanced maillard reaction and caramelization, which caused more browning in the products. Polyphenolic compounds present in fruit pulp also reacts with the enzymes to get discoloration. Similar increase in browning was also reported by Verma and Chopra (2010)^[9] in aonla-mango mixed fruit slab.

Chutney prepared with 60 bael: 40 mango pulp ratio was found most acceptable. The overall acceptability of bael-mango chutney decreased significantly during three months storage period. Similar results were reported by Mishra *et al.* (2011)^[5] in ready-to-eat amla chutney.

Table 1: Changes in chemical constituents and sensory parameters of bael-mango chutney during storage

Treatments* Bael: Mango	Storage period (months)	Total sugars (%)	Reducing sugars (%)	Acidity (%)	Total carotenoids (mg/100 g)	Total phenols (mg/100 g)	Browning (440nm)	Overall acceptability (9 point hedonic scale)
100:0	0	37.86	25.69	0.78	1.22	21.12	0.62	7.78
	1	38.31	26.36	0.84	1.18	20.66	0.63	7.62
	2	40.56	27.49	0.88	1.16	20.52	0.65	7.32
	3	44.16	27.72	0.92	1.07	19.61	0.73	6.96
60:40	0	35.15	25.01	0.81	1.18	31.98	0.51	8.16
	1	36.50	26.14	0.88	1.09	31.48	0.52	7.94
	2	37.86	26.81	0.92	0.97	30.99	0.53	7.74
	3	41.46	27.26	1.01	0.82	30.16	0.56	7.34
0:100	0	33.35	23.21	0.83	0.99	45.90	0.20	7.92
	1	34.70	24.11	0.92	0.71	44.87	0.21	7.80
	2	35.15	25.46	0.96	0.69	44.27	0.22	7.62
	3	37.87	26.36	0.99	0.63	43.09	0.25	7.56
CD at 5%	Treatment	1.94	0.44	NS	0.08	0.75	0.02	0.16
	Storage	2.24	0.51	0.08	0.09	0.86	0.02	0.18
Treatment x Storage		NS	NS	NS	NS	NS	NS	NS

*Recipe- 1 kg blended pulp, 400 g sugar, 200 g onion paste, 20 g ginger paste, 10 g garlic paste, 15 g common salt, 15 g black salt, 2.5 g red chilli powder, 7.5 g hot spice mix and 5 ml glacial acetic acid

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