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Short Communication

Physico-chemical Changes in Bael Jam During Storage

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Bael (*Aegle marmelos* L.), member of the family Rutaceae, is an important and useful medicinal plant indigenous to India. Its juice and squash are prescribed for diarrhea and dysentery. Marmelosin is probably the therapeutically active ingredient of its fruit. In view of medicinal value, the research work has been started at CAZRI, Jodhpur, for the preparation of various processed products from bael fruit. The method and recipes have been standardized for the preparation of squash, jam, murabba and powder from this fruit at this institute (Prasad *et al.*, 1997). It has been observed that after some time discoloration starts in bael jam during storage at room temperature. Therefore, an attempt was made to check the discoloration and to study the organoleptic quality of bael jam during storage at different temperatures.

The mature golden yellow color fruits were selected and pulp was homogenized in the mixie by adding water just sufficient for mixing. The seeds and fiber were removed by sieving and the pulp was cooked. While cooking pectin was added and raised the temperature to dissolve the same. The sugar was sprinkled and was boiled till the required total soluble solids (71°Brix) reached. The citric acid was added when end point was to reach. The jam was filled in sterilized glass jar and sealed airtight. The recipe containing 1.0 kg of pulp, 1.3 kg sugar, 10.0 g citric acid and 5.0 g of pectin was found best for the preparation of bael jam. The jam was having a total soluble solid (TSS) of 71.0°Brix and 0.960% acidity with a pH of 3.04. No synthetic color and essence were added to the jam.

The prepared jam was divided in two lots. One lot was kept at ambient temperature (25-30°C) and another was kept at low temperature (4-5°C). TSS were measured with the help of a hand refractometer and values were expressed in °Brix. The total acidity and sugars were determined by the method of Ranganna (1986) and Yemm and Willis (1954), respectively. Reducing sugars were estimated as per method of Nelson (1944) and non-reducing sugars were estimated by subtracting reducing sugars form the total sugars. The quality of bael jam was evaluated using the method of Amerine *et al.* (1965) on Hedonic scale, i.e., lower the scale, poor the quality and higher the scale better the quality of the jam.

The physico-chemical changes in bael jam during storage were faster at ambient temperature than at low temperature (Tables 1 and 2). For long-term storage (one year),

Table 1. Chemical changes in bael jam stored at ambient temperature

Storage period (months)	TSS °Brix	pH	Acidity (%)	Sugar (%)		
				Total	Reducing	Non-reducing
0	71.00	3.04	0.960	64.88	19.11	46.14
3	71.00	3.05	0.963	65.09	30.71	35.03
6	71.05	3.06	0.965	65.08	40.61	24.06
9	71.16	3.06	0.974	65.23	50.71	14.80
12	71.16	3.06	0.974	65.05	61.73	3.47
CD at 5%	NS	0.02	0.008	0.20	8.54	9.83

low temperature storage was found better. During 3 months of storage, there was not much change in TSS, pH, acidity and total sugars in both the lots (Tables 1 and 2) of bael jam. Significant changes were observed in reducing and non-reducing sugars at ambient temperature. The per cent acidity in all the treatments increased with a corresponding increase in pH, irrespective of their storage temperature. At ambient temperature, the increase was found to be more as compared to low temperature. However, TSS did not increase significantly with the increasing duration of storage both at room as well as low temperature. These results are in accordance of Sethi (1993).

The reducing and total sugars increased in all the samples at ambient and low temperature (Tables 1 and 2), where as non-reducing sugars declined. The results are in conformity with the findings of Prasad and Mali (2000). The color, taste and flavor of the jam (Table 3) remained optimum at low temperature, whereas the original color of the jam disappeared at ambient temperature after 3 months of storage, but no fungal infection was observed in either condition during storage. The greater intensity of browning/discoloration of jam at room temperature may be attributed to the increased rate of oxidation of phenolic compounds and organic acids present in

Table 2. Chemical changes in bael jam stored at low temperature

Storage period (months)	TSS °Brix	pH	Acidity (%)	Sugar (%)		
				Total	Reducing	Non-reducing
0	71.00	3.04	0.960	64.88	18.73	46.15
3	71.00	3.04	0.964	64.99	18.74	46.25
6	71.00	3.05	0.969	65.02	18.97	46.05
9	71.05	3.05	0.969	65.10	19.15	45.95
12	71.16	3.06	0.970	65.14	19.67	45.47
CD at 5%	NS	0.01	0.004	0.22	0.67	0.42

The increase in acidity may be due to the formation of organic acid by ascorbic acid degradation (Palaniswamy *et al.*, 1974).

jam as compared to low temperature (Srivastava and Kumar, 1994).

Table 3. Organoleptic quality of bael jam stored at ambient and low temperature

Storage period (months)	Ambient temperature			Low temperature		
	Color	Flavor	Taste	Color	Flavor	Taste
0	9.2	9.0	9.0	9.2	9.0	9.0
3	8.6	8.2	8.0	8.6	8.4	8.4
6	8.2	7.6	7.6	8.4	8.2	7.8
9	7.6	7.4	7.4	8.0	8.0	7.6
12	7.4	7.2	7.2	7.6	7.6	7.2

Scale: 1.0-3.5: Poor quality, 3.6-7.5: Good quality; 7.6-10: Best quality.

References

Amerine, M.A., Pangborn, R.M. and Roesster, E.N. 1965. *Principle of Sensory Evaluation of Food.* Academic Press Inc., New York.

Nelson, N. 1944. A photometric adoption of the Somogyi method of determination of glucose. *Journal of Biological Chemistry* 153: 375-380.

Palaniswamy, K.P., Muthukrishnan, C.R. and Shanmuguvelu, K.G. 1974. Studies on the evaluation of certain mango varieties of Tamil Nadu for pulp and squash. *Indian Food Packer* 28: 21-28.

Prasad, R.N. and Mali, P.C. 2000. Changes in physico-chemical characteristics of pomegranate squash during storage. *Indian Journal of Horticulture* 57(1): 18-20.

Prasad, R.N., Vashishtha, B.B. and Singh, G.K. 1997. Bael and its products. *Udyan Patrika* 20: 7-10.

Ranganna, S. 1986. *Handbook of Analysis and Quality Control for Fruit and Vegetables Products*, 2nd edition. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

Sethi, V. 1993. Changes in physico-chemical characteristics of litchi squash during storage at different temperature. *Indian Journal of Horticulture* 50(4): 327-332.

Srivastava, R.P. and Sanjeev Kumar 1994. Browning Reaction. In *Fruits and Vegetable Preservation Principles and Practices*, pp. 64-67. International Book Distributing Company, Lucknow.

Yemm, E.W. and Willis, A.J. 1954. The estimation of carbohydrate in plant extracts by anthrone. *Biochemical Journal* 57: 508-514.