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# BAEL PRESERVE-SYRUP AS BOOSTER OF HUMAN HEALTH AS A HEALTH DRINK

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**ABSTRACT**
The experiments were carried out in the Laboratory of Post Harvest Technology, Research Complex, Kalyani (Bidhan Chandra Krishi Viswavidyalaya) West Bengal during the year 2008-2010 to assess the physico-chemical characteristics and sensory attributes of fresh fruit and its processed product. The two cultivars of bael viz., Local cultivar of West Bengal and NB-5 were used for this experiment. Fruits of both cultivars were large in size and greenish yellow to yellowish green in colour. The average fruit weight (723.50 and 1212.50 g), pulp per cent (75.40 and 79.62), TSS (12.2 and 14.4 °Brix), ascorbic acid (13.12 and 27.36 mg/100 g pulp) and ² carotene (1868.01 and 1155.37 IU) were obtained from freshly harvested of fruits. The fruit slices were dipped in alum solution (2 per cent) for two hours and it's blanched. The bael preserve syrup was prepared with the combination of sugar, acid, water and preservative. The recipe of bael preserves syrup was found best and it was stored at room (25-37°C) and refrigerated temperatures (8-10°C) up to 8-12 months as well as organoleptic score 4.64 and 4.88 was found best among all treatments of local and NB-5 cultivars respectively.

## INTRODUCTION

India is second largest producer of fruits and vegetables in the world after china, the present quantity of fruit and vegetable processing is very meager (around 2.2%) as compared to 80% in USA, 70% France, 80% Malaysia and 30% Thailand. The slow growth of Indian fruit and vegetable processing is still prevailing. The fruit and vegetable processing in India is highly decentralized, small-scale industries accounting for 33%, organized 25%, unorganized 42% and large number of units in cottage/household and small scale sector, having capacities of up to 250 tonnes/ annum. Bael (*Aegle marmelos* Corr.) is an indigenous fruit of India belongs to family Rutaceae and it is commonly known as Bengal quince, Indian quince, Golden apple, Holy fruit, Bel, Belwa, Sriphal and Maredo in India (John and Stevenson, 1979; and Maity *et al.,* 2009). The bael fruit contains 28-39 per cent total soluble solids (TSS), 19-21 per cent carbohydrates, 11-17 per cent sugar, 1 per cent protein, 0.2 per cent fat and 7-21 mg/100g vitamin C (Jauhari and Singh, 1971). In addition, it is rich in vitamin A (186 IU/ 100g pulp), volatile oils and marmlosines (bioactive compound isolated from bael fruit, has shown antihelmintic as well as antibacterial activities). Its food value is 88 calories/ 100g. Thus, it is richer than most of the major fruits like apple, guava and mango which have a calorific value of only 64, 59 and 36 respectively.

This is one of the most useful medicinal plants of India. Its medicinal properties have been described in the ancient medical treatise in Sanskrit in *Charaka Samhita* (Aiyer, 1956). The fruit's medicinal value is very high when it just begins to ripen. Fruit is truly popular for its ability to combat constipation and its have aromatic, cooling and laxative properties. Bael is considered to be one of the richest sources of riboflavin (Mukharjee and Ahmad 1957) and provides lots of minerals and vitamins to diet (Barthakur and Arnolds, 1989). The pulp also contains a balsam-like substance and 2 furocoumarins-psoralen and marmelosin ($C_{13}H_{12}O_3$) highest in the pulp of the large cultivated forms. There is as much as 9% tannin in the pulp of wild fruits whereas the rind contains up to 20% (Singh *et al.,* 2009). According to Jauhari *et al.,* (1969), it can be processed into various delicious products like candy, squash, toffee, slab, pulp powder, and nectar from bael fruit. The method of making bael preserve have been described by Lal *et al.* (1960) and they also standardized the extraction method of bael fruit pulp and preparation of nectar, squash, slab, toffee and fruit powder.

Attempt has been made to prepare value added product namely bael preserve syrup from the best selected local and NB-5 cultivars on the basis of bio-chemical attributes and to study on their storage life at ambient and refrigerated condition. This research paper reports the feasibility for the development of value added product from local cultivar of West Bengal and Cv. NB-5.

## MATERIALS AND METHODS

The experiments were carried out in the Laboratory of Post Harvest Technology, Research Complex, Kalyani (Bidhan

Chandra Krishi Viswavidyalaya) West Bengal during the year 2008-2010 with a view to analyze the physico-chemical characteristics and sensory attributes of fresh fruit and its processed product. The two cultivars of bael fruit were procured from the Narendra Dev University of Agriculture & Technology, Kumarganj, Faizabad (U.P.) cv. NB-5 and second of the Local cultivar of West Bengal from B. C. K. V. Campus, Kalyani, Nadia, West Bengal. Climatically the region comes under tropical humid with rainfall of 0.00 to 241.2 mm, temperature maximum 37.58ºC and minimum 9.26ºC along with RH (%) 93.25 to 57.5 (Annual average) by *AICRP on Agricultural Meteorology,* BCKV, Kalyani (2008-2010).

**Standardization of bael preserve**

Fully matured with turn up of pulp colour (light yellow colour) of bael fruits were used for processed product and washed with tap water as well as made into half horizontally. The half cut fruits along with seeds were sliced into suitable size of pieces (2.5 X 6.0 X 0.3cm) for preparing product with the help of a cutter machine (made by local mechanic with set two arms and the fruit kept between two arms, the fruit was tied with attached nut and bolt in two arms after that the fruit was cut by tancer blade). The pieces were treated by alum at different concentration (0.0, 1.0, 1.5, 2.0 and 2.5%). These treatments were used to develop the firmness and check the oxidation process in fruit slices and blanched (28 minutes at 7kg/cm$^2$). The product was prepared with the combination of sugar syrup, citric acid and dipped were fruit pieces in 40 $^0$Brix sugar syrup and kept overnight. The same process was repeated for three times and added citric acid (0.6%). The different formulations were used to prepare the bael preserve and coded as $BPL_1$, $BPL_2$, $BPL_3$, $BPL_4$, $BPL_5$ and $BPL_6$ for local cultivar and $NBP_1$, $NBP_2$, $NBP_3$, $NBP_4$, $NBP_5$ and $NBP_6$ for cultivar NB- 5. The TSS was raised to 40 to 65 $^o$Brix or above and added the potassium meta-bisulphite (KMS) 100 ppm. The prepared product was filled in to sterilized broad mouth glass bottle with the capacity of 500 gram and closed air tight with cap and stored at room (25-37ºC) and refrigerated (8-10ºC) temperatures. Roy and Singh (1972) also stated the method of extraction of bael fruit pulp for making some other bael products.

**Table 1: Physical and biochemical characteristics of Bael fruit**

| Physical characters | Local cultivar of W.B. | Cv. NB- 5 |
|---|---|---|
| Fruit shape | Roundish | Oblong |
| Fruit colour | Light Greenish | Greenish yellow |
| Pulp colour | Yellowish | Light yellow |
| Biochemical character | | |
| Fruit weight (g) | 723.5 | 1212.5 |
| Rind weight (g) | 154.7 | 231.2 |
| Pulp + seed weight (g) | 568.8 | 981.2 |
| Pulp recovery (g) | 545.5 | 965.4 |
| Pulp per cent | 75.40 | 79.6 |
| Rind per cent | 21.4 | 19.1 |
| T.S.S. ($^o$ Brix) | 12.2 | 14.4 |
| Total Sugar (%) | 6.4 | 8.9 |
| Reducing sugar (%) | 2.11 | 2.0 |
| Acidity (%) | 0.3 | 0.6 |
| Ascorbic Acid (mg/ 100mL of product) | 13.1 | 27.3 |
| Protein (%) | 3.6 | 8.8 |
| ²-carotene (IU) | 1868.0 | 1155.4 |
| S Ed | 18.75 | 15.29 |
| CD (0.05) | 38.55 | 31.42 |

n (replicate) = 3

**Physico-chemical analysis**

The physiochemical properties of fresh and processed product (bael-syrup) of bael fruit were analyzed by mentioned methods viz., TSS by Hand Refractometer, sugars (Lane and Eynon, 1923), titrable acidity (AOAC, 1984), ascorbic acid by (2, 6-dichlorophenol indophenols- Dye) titration method and β carotene analyzed with the help of spectrophotometer at 452 nm (Ranganna, 2004). The protein was estimated by Lowry's method (1951) and also the stored preserve syrup was analyzed at monthly intervals.

**Organoleptic Test**

Organoleptic test of freshly prepared product and stored product was evaluated by method of a 5 Point Hedonic scale (Amerine *et al.,* 1965). Bael preserve-syrup samples were evaluated by a panel of 10 members drawn from amongst post graduate students and others. The samples were rated for appearance, colour, taste, consistency, aroma etc. Overall acceptability was measured by adding of individual member

**Table 2: Changes in quality attributes of alum treated bael preserve syrup (Local cultivar of W. B.) during storage**

| Month | TSS ($^O$Brix) | | TS (%) | | RS (%) | | Acidity (%) | |
|---|---|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ |
| 0 | 61.33 | 61.33 | 20.74 | 20.74 | 11.80 | 11.80 | 0.34 | 0.34 |
| 1 | 61.50 | 61.33 | 23.15 | 21.73 | 14.43 | 12.05 | 0.34 | 0.34 |
| 2 | 61.67 | 61.33 | 31.62 | 29.38 | 15.60 | 12.30 | 0.36 | 0.35 |
| 3 | 61.83 | 61.33 | 34.34 | 32.10 | 16.98 | 13.54 | 0.37 | 0.35 |
| 4 | 62.00 | 61.50 | 37.58 | 35.33 | 18.65 | 15.03 | 0.39 | 0.36 |
| 5 | 62.17 | 61.50 | 41.48 | 39.23 | 20.71 | 16.84 | 0.41 | 0.36 |
| 6 | 62.33 | 61.50 | 44.44 | 42.20 | 22.41 | 19.87 | 0.43 | 0.36 |
| 7 | 62.50 | 61.67 | 46.30 | 44.05 | 25.26 | 23.21 | 0.46 | 0.38 |
| 8 | 62.67 | 61.83 | 48.15 | 45.90 | 28.97 | 25.80 | 0.48 | 0.39 |
| | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) |
| M | 1.40743 NS | 1.88719 | 1.98250** | 2.65829 | 4.04145** | 5.41909 | 0.04100 | 0.05498 |
| T | 0.66347 NS | 0.88963 | 0.93456** | 1.25313 | 1.90516* | 2.55458 | 0.01933 | 0.02592 |
| MT | 1.99040 NS | 2.66889 | 2.80368 NS | 3.75939 | 5.71548 NS | 7.66375 | 0.05799 | 0.07775 |

$T_1$- Room Temperature (25 to 37ºC), $T_2$- Refrigerated Temperature (8 to 10ºC), n- 10 (10 panellist), NS- Non Significant, **- Highly significant, * significant, M- Month (0 to 8 month), r (Replication) - 3, T- Temperature

**Table 3: Changes in quality attributes of alum treated bael preserve syrup (Local cultivar of W. B.) during storage**

| Month | Ascorbic acid (mg/100g) | | Protein (%) | | Carotene (IU) | | Organoleptic test (n-10 ) | |
|---|---|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ |
| 0 | 6.42 | 6.42 | 1.26 | 1.26 | 354.17 | 354.17 | 4.64 | 4.64 |
| 1 | 5.30 | 5.68 | 1.19 | 1.11 | 323.87 | 317.53 | 4.58 | 4.62 |
| 2 | 4.62 | 5.50 | 1.13 | 1.05 | 257.24 | 250.90 | 4.28 | 4.32 |
| 3 | 3.52 | 4.67 | 1.08 | 1.00 | 218.84 | 212.50 | 4.20 | 4.22 |
| 4 | 2.82 | 3.90 | 1.01 | 0.93 | 191.35 | 185.01 | 3.86 | 3.92 |
| 5 | 2.02 | 2.99 | 0.69 | 0.64 | 182.95 | 176.61 | 3.02 | 3.20 |
| 6 | 1.94 | 2.72 | 0.56 | 0.51 | 150.86 | 144.52 | 2.72 | 2.88 |
| 7 | 1.65 | 2.38 | 0.45 | 0.40 | 134.72 | 128.38 | 2.54 | 2.68 |
| 8 | 1.15 | 1.80 | 0.28 | 0.23 | 117.27 | 110.93 | 2.24 | 2.38 |
| | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) |
| M | 0.54136** | 0.72590 | 0.12477** | 0.16730 | 16.50200** | 22.12714 | 0.31218** | 0.41860 |
| T | 0.25520** | 0.34219 | 0.05882 NS | 0.07887 | 7.77912 NS | 10.43083 | 0.14716 NS | 0.19733 |
| MT | 0.76560 NS | 1.02657 | 0.17645 NS | 0.23660 | 23.33735 NS | 31.29250 | 0.44149 NS | 0.59199 |

$T_1$- Room Temperature (25 to 37 ºC), $T_2$- Refrigerated Temperature (8 to 10ºC), n- 10 (10 panellist), M- Month (0 to 8 month), r (Replication) -3, T- Temperature, Samples acceptability scores of 2.5 and above were considered acceptable.

**Table 4: Changes in quality attributes of Alum treated bael preserve (cv. NB 5) during storage**

| Month | TSS ($^O$Brix) | | TS (%) | | RS (%) | | Acidity (%) | |
|---|---|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ |
| 0 | 63.67 | 63.67 | 35.22 | 35.22 | 16.65 | 16.65 | 0.30 | 0.30 |
| 1 | 63.67 | 63.67 | 36.23 | 35.68 | 17.94 | 16.87 | 0.30 | 0.30 |
| 2 | 63.67 | 63.67 | 37.63 | 37.03 | 19.11 | 17.71 | 0.32 | 0.30 |
| 3 | 63.83 | 63.67 | 39.99 | 38.37 | 20.50 | 19.09 | 0.33 | 0.31 |
| 4 | 64.00 | 63.67 | 41.03 | 39.75 | 22.17 | 20.76 | 0.34 | 0.32 |
| 5 | 64.17 | 63.83 | 42.71 | 41.12 | 24.23 | 22.82 | 0.35 | 0.33 |
| 6 | 64.33 | 63.83 | 45.94 | 42.98 | 25.92 | 23.22 | 0.36 | 0.33 |
| 7 | 64.50 | 64.17 | 47.75 | 43.99 | 26.11 | 24.71 | 0.36 | 0.34 |
| 8 | 64.67 | 64.17 | 49.85 | 45.01 | 29.48 | 26.70 | 0.38 | 0.35 |
| 9 | 64.83 | 64.33 | 52.81 | 46.02 | 32.85 | 28.35 | 0.40 | 0.36 |
| 10 | 65.00 | 64.50 | 53.26 | 46.62 | 36.22 | 30.09 | 0.41 | 0.36 |
| 11 | 65.17 | 64.50 | 54.66 | 47.25 | 39.59 | 31.83 | 0.42 | 0.37 |
| 12 | 65.33 | 64.67 | 56.51 | 48.88 | 42.96 | 33.57 | 0.44 | 0.39 |
| | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) |
| M | 2.20872 NS | 2.94308 | 5.88638** | 7.84349 | 5.17584** | 6.89672 | 0.02901** | 0.03865 |
| T | 0.86633 NS | 1.15437 | 2.30883** | 3.07647 | 2.03013** | 2.70512 | 0.01138** | 0.01516 |
| MT | 3.12360 NS | 4.16214 | 8.32460 NS | 11.09237 | 7.31975 NS | 9.75343 | 0.04102 NS | 0.05466 |

$T_1$- Room Temperature (25 to 37$^O$C), $T_2$- Refrigerated Temperature (8 to 10$^O$C), n- 10 (10 panellist), M- Month (0 to 8 month), r (Replication) – 3, T- Temperature

scores. The data obtained were subjected to Complete Randomized Design (CRD) as suggested (Raghuramula *et al.,* 1983). The critical difference (CD) value at 5% level of probability was used for comparing the treatments and to find out the significant difference in between them. Each treatment was replicated for three times.

## RESULTS AND DISCUSSION

The data of physico-chemical composition of fresh bael fruit is presented in Table 1. The local cultivar of West Bengal and NB-5 were observed that the shape, colour of fruit and pulp colour was roundish and oblong, light green and greenish yellow, yellow and light yellow respectively.

The average fruit weight of NB-5 (1212.50g) was more than the local cultivar (723.50g). Similarly, other physical parameter particularly pulp recovery and pulp per cent were also observed higher in NB-5 cultivar, among different chemical parameters was found that the content of TSS (14.4), total sugar (8.89%), acidity (0.67%), ascorbic acid (27.36 mg/100g) and protein (8.77%) were found higher in cv. NB-5, while reducing sugar (2.05%) and ²-carotene (1155.37 IU) were found higher in Local cultivar of West Bengal (Table 1). The results are in supported with the findings of (Kenghe, 2008).

Total soluble solids content of alum treated of both preserve syrup were found an increasing trend during storage at both temperatures (Table 2 and 4). The TSS content of preserve syrup varied from 61.33 $^O$Brix to 62.67 ºBrix and 61.83 $^O$Brix at room and refrigerated temperatures up to 8 months storage for local cultivar (Table 2), whereas the product of cv. NB-5 was found more TSS (63.67 ºBrix to 65.33 ºBrix and 64.67 ºBrix) content up to 12 months at room and refrigerated temperatures (Table 3) respectively. The TSS of NB-5 was slightly more increased than local cultivar. The increase in TSS might be due to depletion of moisture in the form of water vapour from the packaging material (broad mouth glass bottle with plastic capping) through the ceiling points. The loss of moisture increases the concentration of solids in the product. In this case also the moisture loss was more at room temperature as compared to under refrigeration condition. Similar results

**Table 5: Changes in quality attributes of Alum treated bael preserve (cv. NB 5) during storage**

| Month | Ascorbic acid (mg/100g) | | Protein (%) | | Carotene (IU) | | Organoleptic test (n-10 ) | |
|---|---|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ |
| 0 | 4.39 | 4.39 | 1.62 | 1.62 | 369.44 | 369.44 | 4.88 | 4.88 |
| 1 | 4.08 | 4.27 | 1.54 | 1.62 | 339.14 | 333.93 | 4.82 | 4.86 |
| 2 | 3.71 | 4.04 | 1.46 | 1.57 | 272.51 | 267.30 | 4.76 | 4.80 |
| 3 | 3.03 | 3.98 | 1.48 | 1.52 | 234.11 | 228.90 | 4.68 | 4.72 |
| 4 | 2.98 | 3.66 | 1.44 | 1.45 | 206.62 | 201.41 | 4.60 | 4.68 |
| 5 | 2.85 | 3.28 | 1.36 | 1.39 | 198.22 | 193.01 | 4.54 | 4.62 |
| 6 | 2.61 | 3.21 | 1.29 | 1.33 | 184.61 | 177.09 | 4.46 | 4.54 |
| 7 | 2.45 | 3.08 | 1.22 | 1.27 | 176.21 | 166.13 | 4.32 | 4.46 |
| 8 | 2.34 | 2.93 | 1.04 | 1.12 | 160.92 | 151.52 | 4.24 | 4.34 |
| 9 | 2.07 | 2.80 | 0.91 | 1.02 | 152.34 | 149.99 | 3.98 | 4.12 |
| 10 | 1.95 | 2.59 | 0.80 | 0.98 | 145.63 | 137.16 | 3.72 | 3.82 |
| 11 | 1.08 | 2.42 | 0.72 | 0.89 | 144.78 | 132.54 | 3.44 | 3.54 |
| 12 | 0.87 | 1.73 | 0.64 | 0.72 | 127.33 | 115.09 | 3.38 | 3.48 |
| | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) | CD(0.05) | CD(0.01) |
| M | 0.46074** | 0.61392 | 0.55487 NS | 0.73936 | 14.32791** | 19.09168 | 0.12667** | 0.16878 |
| T | 0.18072** | 0.24080 | 0.21764 NS | 0.29000 | 5.61987* | 7.48837 | 0.04968** | 0.06620 |
| MT | 0.65158 NS | 0.86822 | 0.78471 NS | 1.04561 | 20.26273 NS | 26.99972 | 0.17913 NS | 0.23869 |

$T_1$- Room Temperature (25 to 37$^{O}$C), $T_2$- Refrigerated Temperature (8 to 10$^{O}$C), n- 10 (10 panellist), M- Month (0 to 8 month), r (Replication) – 3, T- Temperature, Samples acceptability scores of 2.5 and above were considered acceptable.

were reported (Verma and Gehlot, 2007) in bael RTS and in the bael products (Kenghe, 2008). The total sugar content of alum treated bael preserve syrup was found 20.74 to 48.15 and 45.90 per cent in local cultivar at both temperatures up to 8 months storage (Table 2). Whereas, in NB-5 the value varied from 35.22 to 56.51 and 48.88 per cent up to 12 months storage (Table 4) at both temperatures (room and refrigerated). Under refrigerated condition, the per cent of sugar was increased comparatively at a lower rate than room temperature and it is due to hydrolysis of polysaccharides to increase the sugar per cent for long time storage was reported by (Chand and Gehlot, 2006).

The conversion of reducing sugar (11.80 to 28.97 per cent) was found more at room temperature than refrigerated condition (25.80 per cent) up to 8 months storage in local cultivar while in NB-5 it varied from 16.65 to 42.96 per cent was more at room temperature as compared to refrigerated condition 33.57 per cent (Table 2 and 4). The conversion of value was due to the breakdown of sugars and more inversion of sucrose (Rani and Bhatia, 1985). A similar result was recorded in bael products (Chand and Gehlot, 2006). The acidity content of bael preserve syrup for both cultivars were observed a continuous increase, the rate of increase being more at room temperature (0.34 to 0.48 per cent) than refrigeration condition (0.39 per cent) in local cultivar up to 8 months while in NB-5 also more at room temperature (0.30 to 0.44 per cent) than under refrigerated condition (0.39 per cent) up to 12 months storage (Table- 2 & 4). It could be increase the acidity by adding of KMS due to conversion of sulphurous acid in products and break down of ascorbic acid. Similar findings were found in bael products (Kenghe, 2008).

The value of ascorbic acid (6.42 to 1.15 mg/100g) was noticed that the decrease in more at room temperature than refrigerated condition (1.80 mg/100g) in local cultivar up to 8 months storage (Table 3). While in NB-5 decrease was more at room temperature (4.39 to 0.87 mg/100g) than refrigerated condition (1.73 mg/100g) up to 12 months storage (Table 5). The reduction was due to oxidation of ascorbic acid into dehydro ascorbic acid by oxidase enzyme like ascorbic acid oxidase. The similar finding was given in jamun beverages (Das, 2009). The protein content was showed decrease with the increase in storage life at both temperatures, the rate of decrease in protein was measured slightly low (1.26 to 0.28 per cent) at room than refrigerated condition (0.23 per cent) up to 8 months in local cultivar (Table- 3) whereas, NB-5 preserve syrup of protein was 1.62 to 0.64 per cent at room temperature and slightly less decrease (0.72 per cent) at refrigerated temperature up to 12 months storage (Table 5). The decrease in protein content during storage of bael preserve syrup might be due the denaturation of protein caused by heat in presence of moisture. Similar trend of declining in protein content of stored aonla syrup was noticed (Reddy and Chikkasubbanna, 2009). Results revealed that the ²-Carotene values (354.17 I.U. to 117.27 I.U. and 110.93 I.U.) was found low in decreasing order during storage at room temperature but more in refrigerated condition up to 8 months in local cultivar (Table-3), while in NB-5 preserve syrup was 369.44 I.U. to 127.33 I.U. and 115.09 I.U. during storage at room temperature and refrigerated condition up to 12 months respectively (Table- 5). However, the rate of decrease showed more at refrigerated temperature and the retention of ²- Carotene was noticed more at room temperature of cultivar NB-5 than local cultivar. Because, it is light sensitive and more stable in neutral pH. Madan and Dhawan (2005) reported that the retention of ²-carotene was 13.29 to 11.25, 13.24 to 11.30 and 11.19 to 8.02 mg/100g in candy in sugar, sugar + coconut powder and jaggery after 2 months storage at room temperature respectively. The organoleptic quality of standardized alum treated (2%) bael preserve was evaluated at both temperatures and found that the product acceptance score was 4.64 to 2.24 and 2.38 at room temperature and under refrigerated condition up to 8 months respectively in local cultivar (Table 3) while, in NB-5 scores were 4.88 to 3.38 and 3.48 at room temperature and under refrigerated condition up to 12 months respectively. The overall acceptance of NB-5 preserve was found more safer than local cultivar (Table 5). Organoleptic

scores were judged on the basis of 5 point Hedonic Scale. In this study was considered slightly acceptable on the basis of organoleptic rating of 2.5 and above by the panelist. Similar finding were observed (Prasad and Singh, 2001) in bael products and in pear candy (Rani and Bhatia, 1985).

## CONCLUSION

From the results were obtained that the two cultivars of bael fruit viz., Local cultivar of West Bengal and NB-5 with alum (2%) treated preserve-syrup found best among all treatments and it also found that the product of cv. NB-5 was best for human consumption as compare to local cultivar by overall acceptance score (4.88). Both the products were kept under the room (25-37ºC) and refrigerated (8-10ºC) temperatures, thus local cultivar could not accept after 8 months storage at both condition whereas preserve-syrup made by cv. NB-5 was found more acceptable up to 12 months storage at both condition.

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