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# Organoleptic scoring of RTS prepared from bael (*Aegle marmelos*) varieties

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ABSTRACT

Bael (*Aegle marmelos* correa) can be cultivated in varied agro-climatic conditions of the most parts of India. The wastelands of country can easily be made productive by growing such a hardy tree having high nutritional and therapeutic significance. It is a rich source of vitamin B (riboflavin) and have long storage life. To make best use of fruits particularly which can not be consumed directly as table fruit, but can easily be commercialized by popularizing the value added products which are rich in nutraceutical and medicinal value. Among the varieties, there was great difference in their physico-chemical and organoleptic rating for RTS. The present study was conducted to find out the best RTS prepared from pulp of different bael varieties which can be stored and used for the further application. Among the varieties, the fruits of Goma Yashi had all the desirable qualitative characters, i.e. appropriate size, pulp colour, fruit shape, less seed, less fibre, less acidity and thin shell. In all the varieties, the highest organoleptic rating score in terms of acceptability (8.40), appearance (7.94), taste (8.15) and colour (8.41) was observed in Goma Yashi followed by NB 5, Thar Divya and CISHB 1 from the prepared RTS. These factors play a significant role in preparation of quality RTS. Amongst the varieties, Goma Yashi, NB 5, Thar Divya and CISHB-1 had high qualitative characters and found to be suitable for RTS preparation. These varieties can be commercialized by popularizing value added product RTS.

**Key words**: Bael, Goma Yashi, Organoleptic rating, Ready to Serve Drink (RTS), Thar Divya

The bael (*Aegle marmelos* correa) belongs to family Rutaceae, an indigenous, medicinally and nutritionally important underutilized fruit tree. It is known by different names, viz. *bael, bel, bengal quince, bil, bilva, bilpatra, shal, shriphal, vilum*, etc. In ancient treatises, the fruit is considered as auspicious, sacred and emblem of prosperity. This fruit is considered as symbol of great prosperity and also possesses great mythological and religious significance (Sharma and Bhagvan 1988). It is a deciduous tropical tree, found all over India. It is grown in Sri Lanka, Pakistan, Bangladesh, Burma, Thailand and most of the south eastern Asian countries (Rakesh *et al*. 2005). The plant withstands temperatures as low as -7º C to very high temperature (48 $^{o}$C). Owing to its drought resistance and tolerance to temperature and having certain bestowed character, it is becoming the choicest fruit of arid and semi-arid zones. It shows immense potential in adapting to the fragile agro-climatic conditions and is used in various ways to treat the ailments.

It has been already proved that various parts of plants such as leafs, fruits, seeds, etc. provide health and nutrition promoting compounds in human diet, which has enormous traditional uses against various diseases (Patel *et al*. 2012). Bael possesses antimicrobial, antihelminthic, antiviral, antipyretic, antiscorbutic, antidiarroheal, laxative, antiparasitical, anticancerous, antioxidant and hypoglycemic activities. All Indian and foreign medicinal authorities agree that the bael has a most statutory influence on body system.

The maturation period of bael fruit is too long (09-12 months) from fruit setting to ripening. Bael fruits can be retained ripened in the tree itself (Roy and Singh 1981). Generally, there is wastage of huge amount of fruits after the ripening stage against its uses. Owing to its wastage of fruits, its different value added products can be prepared from the fruit and can be preserved for the long time. Bael fruit pulp has excellent aroma which is not destroyed even during processing. Pulp powder is enriched with ascorbic acid and can be stored for 3 months for making cold drinks (squashes). Therefore, there is a tremendous potential for processing of bael fruit into various value added products, refreshing beverages, powder, leather, squash, nectar, toffee, syrup. In recent times, to make better uses of fruits, there has been a renewed interest in the bael as a primary constituent in *ayurvedic* proprietary medicines (Singh *et al.* 2012). These products are highly nutritive and therapeutically important, easily stored for long time and can be act as

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internal as well as external commodity into the market.

There are several bael varieties available which vary in their fruit qualitative and quantitative characteristics. In spite of tremendous utilitarian, nutraceutical and therapeutical values, this fruit is still struggling for commercialization. In present study, the bael varieties fruit pulp was used for preparation of delicious value added product (RTS) which were assessed through organoleptic rating.

## MATERIALS AND METHODS

The experiment was carried out at the Central Horticulture Experimental Station, Vejalur (Panchmahals), Gujarat during the year of 2014-15 using the fruits of different bael varieties, i.e. CHESB 2, CHESB 1, NB 5, NB 7, NB 9, NB 16, NB 17, Pant Aparna, Pant Urvashi, Pant Shivani, Pant Sujata, Goma Yashi and Thar Divya which had been already evaluated for various prospects form past 13 years. Fruits of different varieties were analysed for various physico-chemical properties in laboratory. The fruits were washed with clean water and shell was broken, fruit pulp, seeds, mucilage and fibre was separated manually by hand picking. The pulp of different varieties was meshed with water (1:1) and fibre was removed. The ready to serve drink was prepared from all the varieties in the first week of second fortnight of May during both the years. RTS was prepared by adding sugar @ 500g/litre of pulp to make ready to serve drink and to maintain TSS 14-15º Brix. This drink was further diluted 30:70 for organoleptic test.

Organoleptic testing was carried out on the day of preparation with a panel of 10 judges on score basis (maximum 10 marks). TSS of the drink was monitored by hand refractometer before sensory evaluation. Hedonic Scale method was used for the organoleptic evaluation of drink prepared for colour, flavour, sweetness, acceptability and taste characters. The mean data of score was assessed for sensory evaluation of ready to serve drink (RTS) of each varieties.

## RESULTS AND DISCUSSION

### *Physico-chemical attributes*

The mean data on physical characters of bael varieties fruit is given in Table 1. At maturity stage, the shape of fruit was globose (Goma Yashi and NB 7), ovate (CISHB 1), globose elliptical (CISHB 2, NB 5 and Pant Sujata), round three lobed (NB 17), oblong elliptical (Thar Divya) and uneven globose (Pant Shivani and Pant Urvashi). The colour of fruit was yellow in NB 9, Pant Shivani, Pant Urvashi; pale yellow in NB 5, Pant Sujata and Pant Aparna; light yellow in NB 7, NB 16, CISHB 2 and dark yellow in NB 17, CISHB 1, Thar Divya and Goma Yashi variety. An average fruit weight ranged between 0.43-4.25 kg, being highest in NA 7 and the lowest in NB 16.The maximum fruit length was observed in CISHB 2 (19.59 cm) and the minimum in NB 16 (10.61 cm). Fruit girth was maximum in NB 7 (70.00) and it was minimum in CISHB 1 (34.53cm). The

Table 1 Physico-chemical properties of different bael varieties

| Characters | NB 5 | NB 7 | NB 9 | NB 16 | NB 17 | CISHB 1 | CISHB 2 | Pant Shivani | Pant Urvashi | Pant Sujata | Pant Aparna | Goma Yashi | Thar Divya | CD (P=0.05) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fruit shape | Globose elliptical | Globose ellipsoidal | Elliptical | Elliptical | Round three lobed | Ovate | Globose ellipsoidal | Uneven globose | Uneven globose | Globose ellipsoidal | Ellipsoid | Spheroid | Oblong elliptical | |
| Colour | Pale yellow | Greenish yellow | Yellow | Greenish yellow | Yellowish green | Yellowish green | Greenish yellow | Dark yellow | Dark yellow | Light yellow | Light yellow | Yellowish green | Dark yellow | |
| Fruit weight (kg) | 1.20 | 4.25 | 1.75 | 0.43 | 1.92 | 0.96 | 2.58 | 2.45 | 2.90 | 1.22 | 1.10 | 1.32 | 1.62 | 0.14 |
| Fruit girth (cm) | 43.20 | 70.00 | 49.30 | 29.10 | 48.62 | 34.53 | 54.12 | 52.24 | 61.70 | 41.25 | 43.20 | 44.20 | 45.80 | 2.95 |
| Length × width | 15.03 × 14.90 | 16.54 × 13.50 | 18.50 × 22.00 | 10.61 × 13.50 | 16.50 × 9.40 | 17.15 × 10.30 | 19.59 × 17.50 | 19.05 × 11.80 | 18.20 × 19.40 | 14.12 × 16.30 | 13.15 × 16.10 | 15.28 × 13.50 | 18.60 × 14.80 | |
| Number of seed locules | 16 | 18.18 | 19.00 | 13.50 | 18.00 | 10.50 | 13.50 | 14.00 | 17.00 | 13.00 | 14.50 | 14.53 | 14.72 | 0.81 |
| Shell thickness (cm) | 0.17 | 0.31 | 0.27 | 0.26 | 0.22 | 0.18 | 0.27 | 0.23 | 0.23 | 0.30 | 0.22 | 0.16 | 1.19 | 0.01 |
| Number of seed/fruit | 114.43 | 160.14 | 114.78 | 162.50 | 212.25 | 191.12 | 140.29 | 171.00 | 103.25 | 121.89 | 110.30 | 90.34 | 120.75 | 0.82 |
| Weight of seed (g) | 27.30 | 31.50 | 23.40 | 21.89 | 43.41 | 38.44 | 23.05 | 34.47 | 28.86 | 25.75 | 34.47 | 17.34 | 32.00 | 1.97 |
| Fibre weight/fruit (g) | 25.24 | 49.30 | 63.80 | 15.91 | 106.50 | 22.70 | 67.00 | 101.50 | 92.96 | 30.77 | 35.60 | 28.50 | 61.10 | 4.87 |
| TSS pulp (°Brix) | 36.21 | 30.57 | 37.00 | 35.90 | 34.88 | 32.20 | 31.50 | 35.40 | 36.44 | 33.25 | 34.23 | 37.45 | 38.50 | 2.78 |
| TSS mucilage (°Brix) | 49.50 | 42.35 | 45.30 | 47..23 | 42.00 | 49.50 | 44.50 | 50.00 | 42.50 | 43.50 | 45.00 | 45.70 | 51.00 | 2.77 |
| Titrable acidity (%) | 0.32 | 0.35 | 0.32 | 0.48 | 0.31 | 0.28 | 0.45 | 0.47 | 0.49 | 0.44 | 0.34 | 0.30 | | 0.02 |

shell thickness was recorded maximum in CISHB 2 (0.31cm) followed by Pant Sujata (0.30 cm) and NB 9 (0.27 cm) and the same was measured the minimum (0.16 cm) in the varieties Goma Yashi followed by NB 5 (0.17 cm) and CISHB 1 (0.18 cm). The seed locules of fruit observed among all the varieties ranged between 10.50-19.00. There was a remarkable difference in TSS (30.57-37.45ºBrix), seed weight (17.34-43.41 g) and fibre weight (15.91-106.5 g) of the fruit of different varieties. The highest TSS value of pulp (38.50ºBrix) was recorded in variety Thar Divya followed by Goma Yashi (37.45ºBrix), NB 9 (37.00ºBrix) and Pant Urvashi (36.44ºBrix) and the same was recorded the lowest in the variety NB 7 (30.57ºBrix) followed by CISHB 2 (31.50ºBrix) and CISHB 1 (32.20ºBrix) among the varieties evaluated for sweetness and taste. Variation with respect to mucilage TSS was observed in the fruit of different varieties. The maximum number of seed per fruit (191.12) was observed in the variety CISHB 1 followed by Pant Shivani (171.00), NB 16 (162.50) and NB 7 (160.14), whereas, it was minimum in Goma Yashi (90.34 ) followed by Pant Urvashi (103.25) and Pant Aparna (110.30). The weight of fibres per fruit was counted to be the maximum in NB-17(106.50 g) followed by Pant Shivani (101.50 g) and it was measured the minimum in CISHB 1 (22.70 g) followed by NB 5 (25.24g) and Goma Yashi (28.50 g). The value of titratable acidity was estimated the maximum (0.49%) in Pant Urvashi followed by NB 16 (0.48 %) and Pant Shivani (0.47%), whereas, the same was minimum in CISHB 1 (0.28 %) followed by Goma Yashi (0.30 %) and NB 17 (0.31%). Such kind of variability in several fruit traits may be due to genetic make up and environmental conditions. Similarly, variation into the fibre weight, shell thickness and fruit size was recorded in bael varieties by Roy and Singh (1978), Ram and Singh (2003) and Jauhari *et al.* (1969), it might be due to genetic features of the varieties and growing environment. Generally, in wild bael fruits, more number of seeds and high mucilage content is found in comparison to improved cultivars.

*Sensory evaluation*

The results presented in the figure (1-6) showed that the acceptance level of RTS prepared from the pulp of

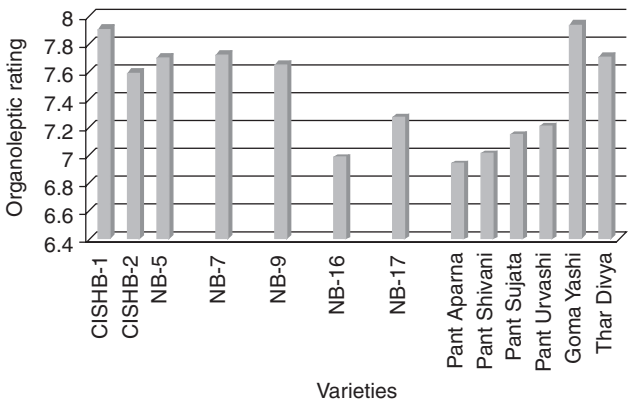


Fig 1 Organoleptic rating for appearance among bael varieties

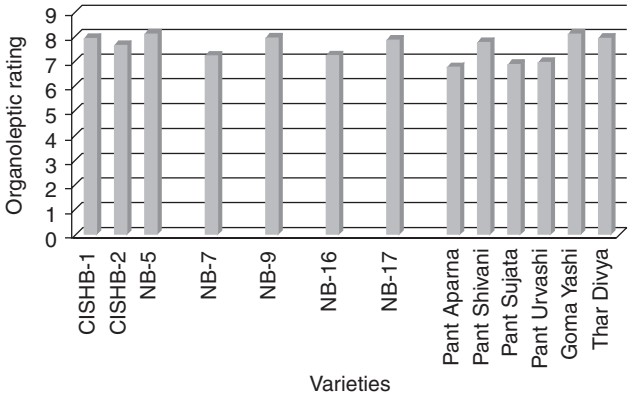


Fig 2 Organoleptic rating for taste among bael varieties

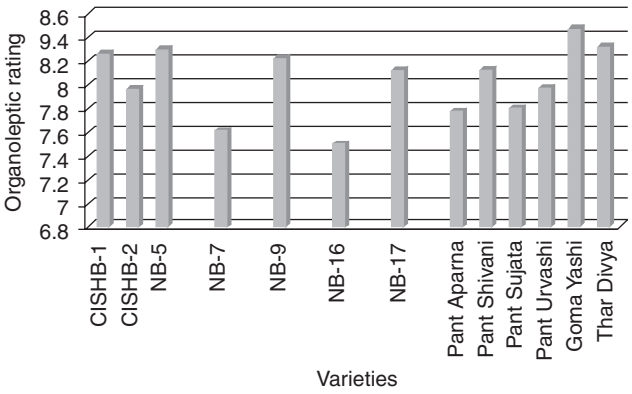


Fig 3 Organoleptic rating for flavour among bael varieties

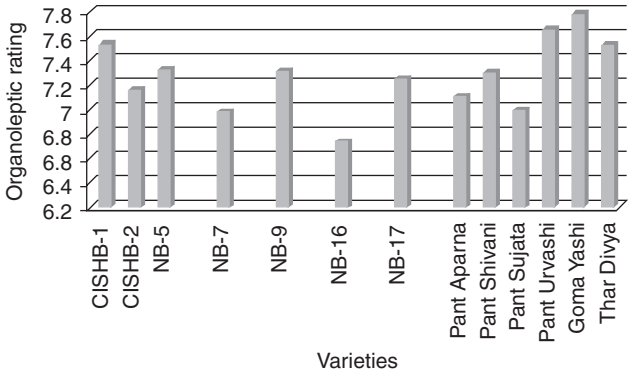


Fig 4 Organoleptic rating for sweetness among bael varieties

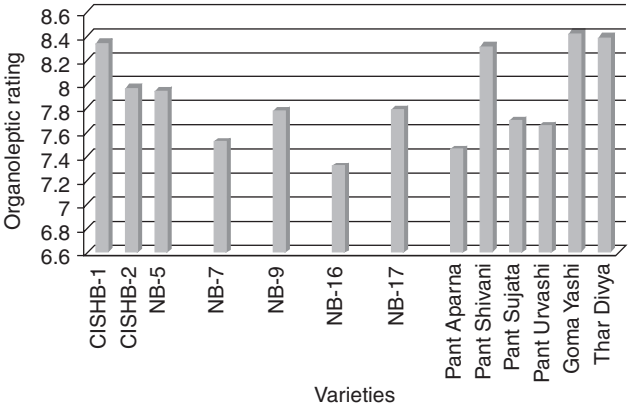


Fig 5 Organoleptic rating for colour among bael varieties

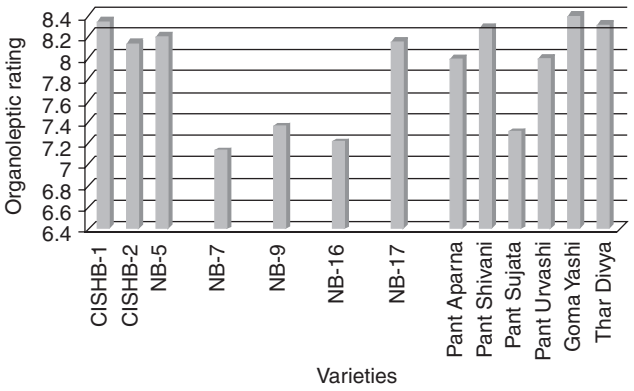


Fig 6 Organoleptic rating for acceptability among bael varieties

Goma Yashi was having adequately high quality for its different sensory evaluation by the panel of judges on score basis when compared to rest of the varieties for RTS. At the first stage of testing, the appearance of RTS of Goma Yashi was dark yellowish having score (7.94) followed by CISHB-2 (7.52), whereas, the highest acceptability score (8.40) and colour rating score (8.43) were maximum in Goma Yashi followed by CISHB 1 (8.34, 8.35) by the panel of judges. Rating of RTS for taste and flavour was maximum in Goma Yashi (8.15, 8.48) followed by NB 5 (8.15, 8.30) and NB 9 (7.98) for taste and CISHB 1 (8.27) for flavour. The colour of product is an important attribute of any value added products. There was no artificial colour mixed in drink as the pulp retains the natural yellow colour. The scores for the colour was given the maximum to Goma Yashi (8.41) followed by CISHB 1, Pant Shivani (8.32) and the minimum rating was acquired in the variety NB 16 (7.32) followed by Pant Aparna (7.45). The sensory things, the taste are the other important factor which indicates its value towards its utility after colour and flavour. The 2nd highest score for taste given by testers was observed in NB 5 (8.10) followed by NB 9 (7.98) and least value for the taste was observed in Pant Aparna (6.79).The sweetness of the RTS was observed the highest in Goma Yashi (7.78) followed by NB 5 (7.32) and the lowest in the NB 16 (6.73) followed by NB 7 (6.97) as compared to rest of the varieties. These results are similar to the findings reported by Godara and Pareek (1985) in date juice and in bael by Verma and Gehlot (2007).

Based on the above physico-chemical and organoleptic rating of the RTS of the different bael varieties, the sensory evaluation of RTS prepared from the variety Goma Yashi was found to be the best for all the organoleptic rating parameters. However, Thar Divya, NB-5 and CISHB-1 had also showed better rating among the rest of the varieties. The score of acceptability and taste characters indicated that the ready to serve drink can be a better value added product of bael fruit because of its curative properties. However, this technique can be adopted by growers for better utilization of produce profitability under dryland conditions.

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