



Investigating the biochemical makeup of various bael (*Aegle marmelos* Correa.) cultivars under semi-arid condition of Madhya Pradesh

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ABSTRACT

The present study was carried out to investigate the biochemical properties of various Bael (*Aegle marmelos* Correa.) cultivars under Semi Arid Condition of Madhya Pradesh during 2021-22. The experiment has seven cultivars of the bael i.e. Goma Yashi, NB-5, NB-7, NB-9, NB-17, CISH-1 and CISH-2 to assess the biochemical properties of fruits and to indentify the superior. The study analyzed with Randomized Block Design. The results revealed that the different varieties of bael exhibited considerable variation for biochemical attributes. Significantly highest total soluble solid (39.22°Brix) and lowest acidity (0.30%) was recorded in the cultivar Goma Yashi. Significantly higher reducing sugar (4.95%) and total sugar (20.03%) was recorded in the cultivar NB-9 while non-reducing sugar (15.66%) was relatively higher in the cultivar CISH-1.

Introduction

Bael (*Aegle marmelos* Correa) is one of the important under-utilized medicinal and indigenous fruit crop of India. It belongs to family Rutaceae. Locally, it is known by different names in different languages viz., Bael fruit, Indian Bael, holy fruit, golden apple, Elephant apple, Bengal quince, Indian quince, stone apple in English; Baelputri, Bela, Siri-phal, Kooralam in Hindi. Each and every part of this tree i.e. fruit, seed, trunk, bark, leaf,

and root are important ingredients of several Ayurvedic prescriptions (Jauhari and Singh, 1971). Bael has been used in traditional medicine for its numerous health benefits. The fruit, leaves, roots, and bark of the tree are all utilized for medicinal purposes. Bael is known for its digestive properties and is used to treat various digestive disorders such as diarrhea, dysentery, and indigestion (Dongre and Choudhary, 2023). It is also believed to have antimicrobial, antifungal, and anti-inflammatory properties. Bael fruit is also used in the preparation of jams, jellies, chutneys, and

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desserts. The fresh fruit is not consumed freely because of eating difficulties due to its hard shell, mucilaginous texture, numerous seeds, and fibers. Seeds are flattened oblong, about 1 cm long, bearing woolly hairs and each enclosed in a sac of adhesive, transparent mucilage.

The percentage content of some of the minerals *viz.* phosphorus, potassium, calcium, magnesium and iron is 0.137, 0.746, 0.188, 0.127 and 0.007%, respectively. It is also rich in riboflavin, vitamin A, carbohydrates, *etc.* (Gopalan *et al.*, 1985). Various chemical constituents *viz.* alkaloids, coumarin and steroids have been isolated and identified from different parts of the bael tree. Marmelocin is probably the therapeutically active factor of bael fruit and is known as the panacea of the stomach ailments. The aroma component of bael fruits was studied by Totikoma *et al.* (1982). As an estimate, about 0.084 lakh ha area under plantation of improved variety of bael in country with about 0.81 lakh tonnes of production. Madhya Pradesh, kymore plateau and Satpura hills region have a wide distribution of bael cultivars, particularly in dry, undulating, forest, and tribal areas, providing enormous scope and potential for cultivation of this fruit tree. The total area and production of Bael in Madhya Pradesh are 250 ha and 0.02 lakh tonnes respectively (Anonymous, 2021). Therefore, the prime objective of present investigation was to find out a cultivar of better biochemical attributes which is qualitatively superior to other cultivars growing under semi arid condition of Madhya Pradesh.

Materials and Methods

The present investigation was carried out during 2021-22 at Department of Horticulture, College of Agriculture, JNKVV, Jabalpur (23.10° N latitude, 79.58° E longitude and 411.73 meters above sea level), located in the Kymore plateau agro-climatic area of Madhya Pradesh. This region has a semi-arid and subtropical climate. Summers are hot, while winters are moderately cool. The annual rainfall ranges from 1100 to 1400 mm, with an average of 1191 mm from June to September. About 99% rainfall is received during June to September and the rest during October and January. Winter occurs during November- February with occasional frost. The soil of the experimental site has clay loam texture with average fertility. It is tenaciously sticky when wet and hard when dry. Seven bael cultivar selected *viz.*, Goma Yashi, NB-5, NB-7, NB-9, NB-17, CISH-1 and CISH-2 were planted at spacing of 8 x 8 m. Properly ripened, healthy and uniform size fruits were harvested and selected for the biochemical

characterization. The flesh was carefully extracted for estimation of total sugar solids (TSS) with the help of digital refractometer. Acidity was determined by titrating the juice against N/10 NaOH and was expressed as per cent citric acid. Total sugars were analyzed as per method given by Lane and Eynon (1943) and the non-reducing sugar content was computed by subtracting reducing sugars from total sugars and value was expressed in percentage. The data was statistically analysed under the method of Randomized Block Design by OPSTAT software.

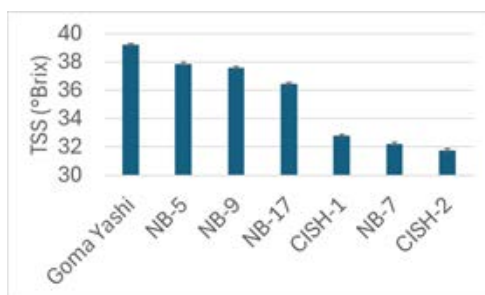
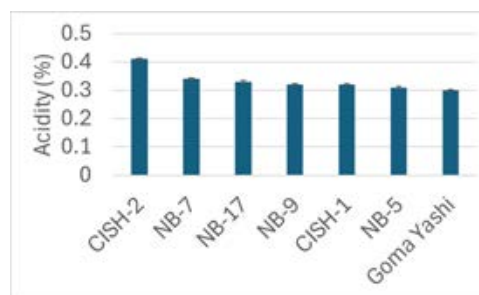
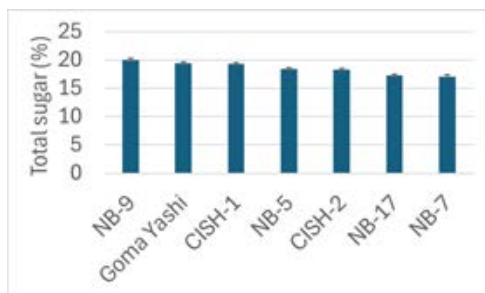
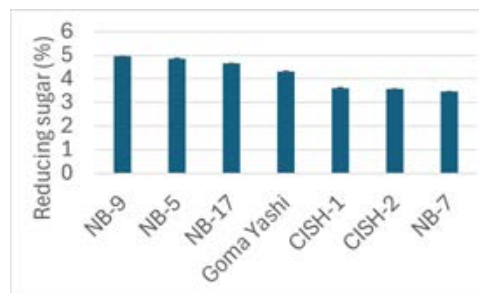
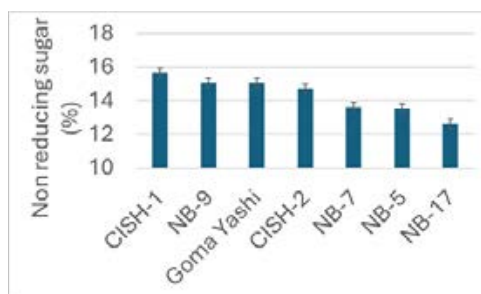
Result and Discussion

The biochemical characteristics of fruit play a crucial role for tree improvement purpose as well as processing industries. Quality of any fruit can be assessed by the important biochemical traits. The data on biochemical characteristics of ripened bael fruits are presented in Table-1 and Figures (1-5) with respect to TSS, acidity %, total sugar (%), reducing sugar (%) and non reducing sugar (%). The mean performance of the genotypes revealed a wide range of variability for all traits under study.

Total soluble solid was significantly high in Goma Yashi (39.22°Brix) followed by NB-5 (37.88°Brix) and NB-9 (37.60°Brix) at ripe stage. However, the lowest 31.77°Brix T.S.S. was noted in cultivar CISH-2. Significantly lowest acidity (0.03%) was noted in cultivar Goma Yashi followed by NB-5 (0.31%) and NB-9 (0.133%). However, the highest acidity (0.41%) was recorded in the cultivar CISH-2. Total sugar was found maximum in NB-9 (20.03%) followed by Goma Yashi (19.37%) and NB-5 (18.41%), whereas the same was recorded the minimum in NB-7 (17.09%). Reducing sugar was estimated the highest in NB-9 (4.95%) followed by NB-5 (4.86%) and NB-17 (4.65%) whereas the lowest in NB-7 (3.46%). The significantly maximum non-reducing sugar (15.66%) was recorded in the cultivar CISH-1 followed by NB-9 (15.08%) and Goma Yashi (15.06%). While, the minimum non-reducing sugar (12.63%) was noted in cultivar NB-17. Variations in the biochemical parameters of the cultivar might be due to the root distribution pattern of individual cultivar, adaptability to varied agro-climatic conditions, availability of nutrient to individual cultivar and genetic makeup of the cultivar. The findings are in agreement with findings of Ram and Singh (2003), Verma and Gehlot (2007), Mitra *et al.* (2010), Kuldeep *et al.* (2023) and Pale *et al.* (2019).

Table 1. Biochemical composition of fruits of bael cultivars under semi-arid condition of Madhya Pradesh.

Cultivars	TSS (°Brix)	Acidity (%)	Total sugar (%)	Reducing sugar (%)	Non reducing sugar (%)
Goma Yashi	39.22	0.30	19.37	4.31	15.06
NB-5	37.88	0.31	18.41	4.86	13.55
NB-7	32.22	0.34	17.09	3.46	13.63
NB-9	37.60	0.32	20.03	4.95	15.08
NB-17	36.44	0.33	17.28	4.65	12.63
CISH-1	32.77	0.32	19.26	3.60	15.66
CISH-2	31.77	0.41	18.28	3.57	14.71
SEm±	0.363	0.003	0.271	0.016	0.276
CD at 5%	1.00	0.009	0.834	0.048	0.849

**Fig. 1:** T.S.S. (°Brix) of bael cultivars under semi-arid condition of MP**Fig. 2:** Acidity (%) of bael cultivars under semi-arid condition of Madhya Pradesh**Fig. 3:** Total sugar (%) of bael cultivars under semi-arid condition of Madhya Pradesh**Fig. 4:** Reducing sugar (%) of bael cultivars under semi-arid condition of Madhya Pradesh**Fig. 5:** Non reducing sugar (%) of bael cultivars under semi-arid condition of Madhya Pradesh

Conclusions

On the basis of findings of the present study, it is revealed that the significant variation exist within the genotypes

based on biochemical characters. The best genotype having the highest T.S.S. (39.22 %) and lowest acidity (0.30%) is Goma Yashi. The maximum reducing sugar (4.95%) and total sugar (20.03%) was recorded in the cultivar NB-9

while non-reducing sugar (15.66%) was recorded in the cultivar CISH-1. On the basis of biochemical characteristics Goma Yashi cultivar may be recommended for semi-arid condition of Madhya Pradesh.

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