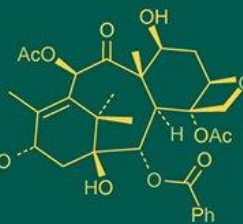
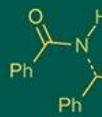


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Studies on chemical attributes of Bael (*Aegle marmelos* Corr.) genotypes under Central Uttar Pradesh region

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Abstract

Bael (*Aegle marmelos* Corr.) occupies an important place among indigenous fruits of India due to its nutritional, pesticidal and medicinal values. Expected growth in production of this crop has not been accomplished yet. Identification of suitable genotypes, therefore, becomes imperative for increasing its production, productivity and quality. A wide range of variation is encountered in Bael (Rai *et al.* 2005). The present investigation entitled "Evaluation of growth and quality attributes in Bael (*Aegle marmelos* corr.) genotypes Under Central Uttar Pradesh Region" was conducted during summer season. The detail study of selected varieties/genotypes was carried out in relation to growth and qualitative traits of fruits. Genotypic and phenotypic variation in the vast population have a greater chance of producing a desirable type of variety, with this view keeping in mind 14 varieties/genotype were taken for the study of various parameters and the results in mind are discussed in the light research work done in India and abroad.

Keywords: Bael, nutritional, genotype, phenotype and qualitative traits

Introduction

One of India's most significant underutilized indigenous fruit crops for medicine is Bael (*Aegle marmelos* Corr.) which belongs to the Rutaceae family. It can be found all over India which includes Madhya Pradesh, Uttaranchal West Bengal, Rajasthan, Uttar Pradesh, Bihar, Madhya Pradesh, Uttaranchal, Chhattisgarh, and Odisha, which are all extensively scattered throughout the nation. On a smaller scale, it is also grown internationally in places like Bangladesh, Pakistan, southern Nepal, Cambodia, Sri Lanka, the northern Malay Peninsula, Java, the Philippines, Vietnam, Laos, Cambodia, Thailand, etc. Due to its mythical importance, it is mostly planted close to the temples and is only farmed on a modest scale across an area of nearly 800 hectares, producing just 2000 Metric Tons. Sandy loam soils with adequate drainage are best for its growth. It demands a subtropical environment with dry, hot summers and mild winters as it can be cultivated even at a height of 1200 meters. Although it is grown in all the states of India, there aren't many systematic plantations dedicated to this fruit crop. Due to its hardiness, Bael trees may thrive in a variety of challenging soil and climatic conditions, even in places where other crops cannot. It is from the Rutaceae family. It is referred to locally by a variety of names in several languages, including holy fruit, Bael fruit, Bael Giri, Bengal quince, Bael patra, Bela, Siri-phal, Indian Bael, golden apple, elephant apple and Indian quince stone.

Literature from 300 BC onwards refers that it originated in the Eastern Ghats and central India and is indigenous to India. Dry woodlands in plain and hilly locations are good places for Bael to flourish. It is cultivable all over the world and can adapt to a broad variety of habitats. Bael cultivation is best suited to sandy loam soils that are moderately rich and well drained, as well as sunny, warm, and humid weather. Although it was discovered to be appropriate in a variety of soils, including sandy, clay, stony, acidic, alkaline, salt affected soils, wastelands, etc., due to its hardiness. Above data and analysis suggest that Bael is an ecosystem-friendly tree species that can thrive in a variety of soil types (pH range 5-10) in challenging circumstances, such as hot and dry regions. It can also sustain in a harsh environment of -7 °C temperature. There are two to three species of Bael, also known as *Aegle marmelos* Correa, which belongs to the Rutaceae family. While the species name, marmelos, is of Portuguese provenance, the genus name, Aegle, is of Greek origin. Chromosomes $X=9$ and $2n=36$ make up Bael. The tree has fragrant, trifoliate leaves and a whitish/gray trunk that can reach heights of 2 to 6 to 8 metres. The petals are typically five thick, oblong, oval, blunt, pale greenish white, and granularly spotted. It is a deciduous tree. The calyx is shallow, has five thin, board-shaped teeth, and is externally hairy. It has long, shallowly wrinkled, corky, thorny branches. Bael's blooms are 2 cm in

diameter, greenish white in colour, bisexual, and sweetly perfumed. They are produced in clusters. The pulp of the Bael fruit encompasses a wide range of bioactive beneficial substances, like coumarins, flavonoids, carotenoids, antioxidants that may guard against long-term illnesses, terpenoids, and phenolic alkaloids. By delivering exceptional fruits for human consumption and animal feed, it may guarantee the security of food and nutrition, leading to stability in the production of all biomass. The therapeutic application of Bael fruit is in demand. In the summer, drinks are made because of their calming and cooling properties. In addition, it also contains many vitamins and minerals, including vitamin C, vitamin A, thiamine, riboflavin, calcium, and phosphorus. In the 1500s, British colonists and Portuguese used this fruit as a remedy to treat diarrhoea and dysentery. Bael is used to treat stomach ailments and enhance digestion as it can be transformed into a variety of drinks and jams. There are no well-organized Bael orchards known in the nation, despite the Bael's Indian origin and use for its high medicinal and nutritional benefits. Fat, minerals like Ca and Fe, Proteins, and vitamins, including Vitamin C, riboflavin, beta-carotene, and, are all abundant in Bael fruit. It can be encouraged for the development of waste and underutilized areas since it can adapt to unfavorable environmental circumstances and thrive where other fruit trees cannot. The processing potential of Bael fruit is tremendous, and it may be used to make a variety of goods for export markets, including jam, candies, syrups, and squash. Seed locules may be used to extract gum, which has use in coatings for oil emulsions, waterproofing, and adhesives. Its bark is used to treat diabetes, while the Bael tree's root extract possesses anti-inflammatory and wound-healing effects. Compared to plants produced vegetatively, seedling plants begin to yield fruit in 6 to 7 years and 12 to 15 years, full output is achieved. After the litter has fallen, the fruits are often collected at a yellowish-green stage and stored for a week while they lose their green tinge. During this time, the fruits' stems easily split from them. When managed properly, a mature budded bael tree that is 10-12 years old can produce 100-150 fruits, whereas seedling trees will yield 300-400 smaller fruits. The age of the tree, the cultivar, and care techniques all affect fruit output, though. Bael cultivation has several difficulties in spite of its many advantages. Fruit fly, wilt, and leaf spot are just a few of the diseases and pests that are likely to affect the tree. Reduced yields and poor-quality fruit are frequently the result of farmers' lack of expertise and resources to control these pests and illnesses. Bael is also up against competition from more well-known and better-marketed fruit crops like mango, guava, and banana. The development of the bael sector in India is further hampered by a lack of market connections and infrastructure. Examining both the morphological and fruit traits is crucial for differentiating the many bael varieties. But because there isn't a good genotype, the desired growth, blooming, and fruit set haven't happened. To increase productivity, output, and fruit quality in humid sub-tropical environments, it is necessary to choose a genotype that is appropriate for the area. In several parts of India, including GBPUAT, Pantnagar, CISH, Lucknow, NDUA&T, Faizabad and Regional Station numerous land races have recently been established for commercial farming. It has not been investigated if they can adapt to the humid sub-tropical environments in Lucknow. Due to their lack of familiarity with the traits of many bael types, farmers in this area have trouble recognizing the cultivars. Desirable growth,

blooming, and fruit set have not taken place in the absence of an appropriate genotype. To increase the yield, productivity, and fruit quality of the region's fruit trees in humid sub-tropical circumstances, it is required to identify the genotype that is most suited for the area and suggest the best cultivars which can be suitable for commercial cultivation

Materials and methods

The present investigation entitled, "Evaluation of growth and quality attributes in Bael (*Aegle marmelos* corr.) genotypes Under Central Uttar Pradesh Region". was conducted during summer season with an objective to identify the superior genotypes of Bael. The present investigation was the collection of different varieties of Bael in ANDUAT Ayodhya than carried out in the laboratory Department of Horticulture Baba Saheb Bhimrao Ambedkar University Lucknow. Fourteen varieties of Bael were selected to see their growth and quality attributes. Which were planted at Acharya Narendra Dev University of Agriculture and Technology Ayodhya U.P. Collection of twenty-eight healthy, uniform sized fruit free from diseases, pests and blishes randomly selected from the trees of each cultivar from each direction. When the fruits are nearly matured, then it was picked up and taken for experiment in the month of April. The present study assessed fourteen guava genotypes: T₁(NB-3), T₂(NB-4), T₃(NB-5), T₄(NB-7), T₅(NB-9), T₆(NB-14), T₇(NB-15), T₈(NB-16), T₉(NB-17), T₁₀(CISHB-1), T₁₁(CISHB-2), T₁₂ (Pant Sujata), T₁₃ (Pant Aparna) and T₁₄ (Pant Shivani). Measurements were taken for fruit acidity, T.S.S., ascorbic acid, reducing sugar, non-reducing sugar and total sugar. The collected data underwent statistical analysis.

Results and discussion

Chemical composition of fruit

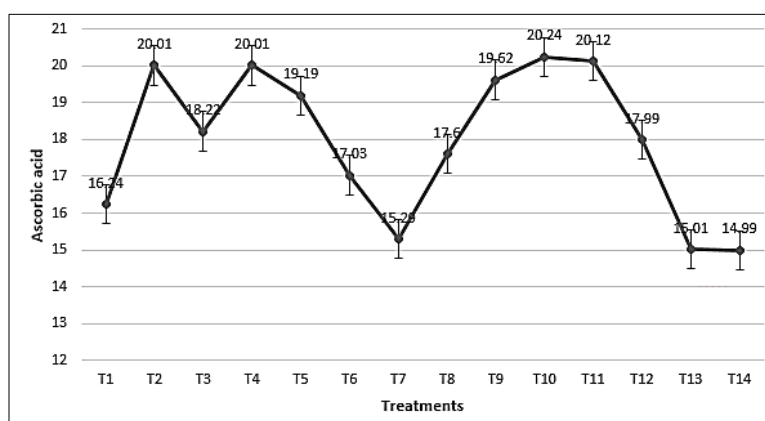
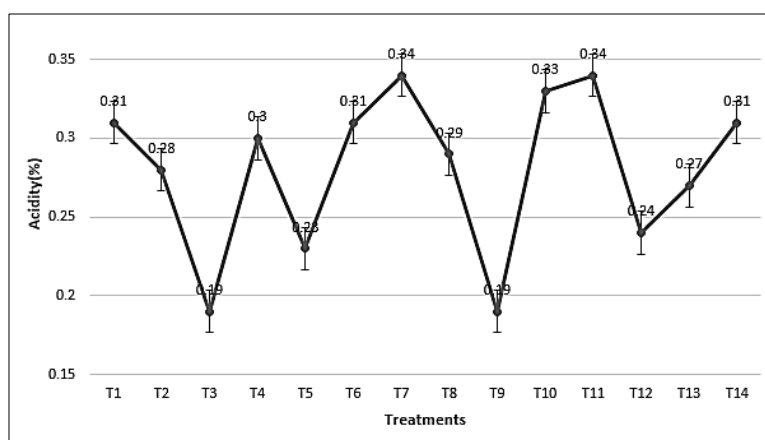
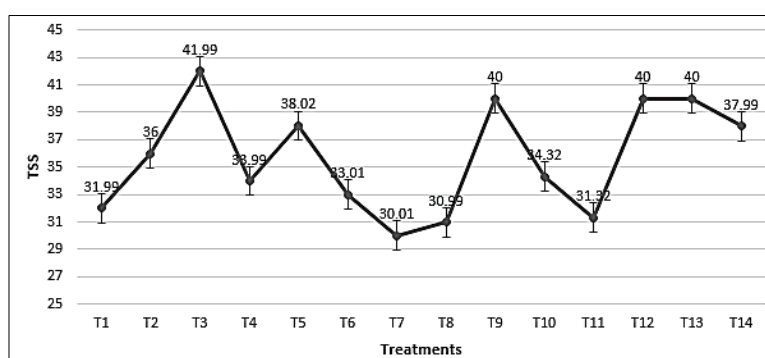
The total soluble solids of fruit pulp were noticed highest (41.99 OB) in NB-5 followed by Pant Aparna (40.01 OB) and minimum TSS (30.01 OB) was recorded in NB-15. Rai et.al, (2002) reported that TSS ranged from 32.6 OB to 36.20 OB in Bael germplasm. Further, Jana et al., (2014) [23] recorded variation in TSS of genotype ranged from 37.00 OB to 39.00 OB under Ranchi condition. More TSS in a fruit is useful in medicinal as well as processing industry.

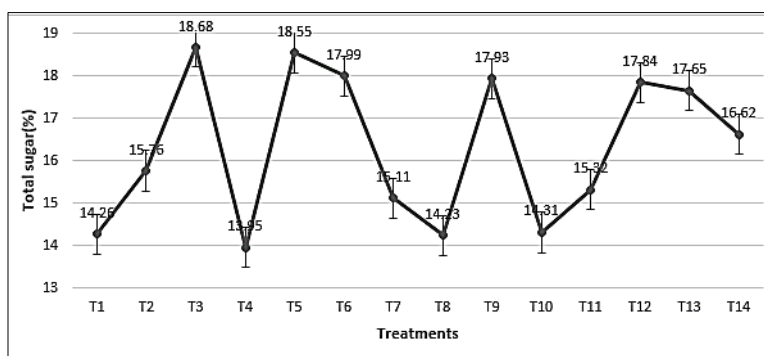
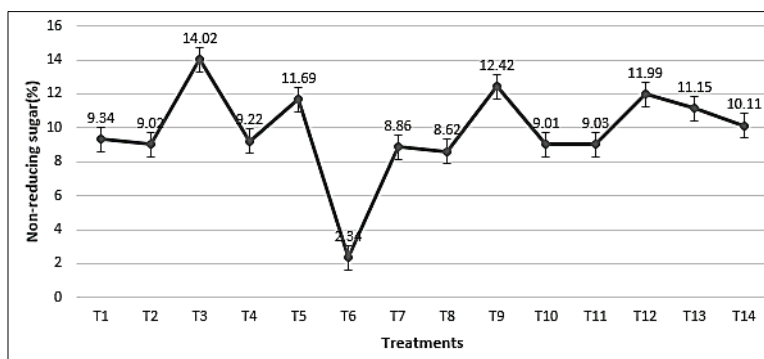
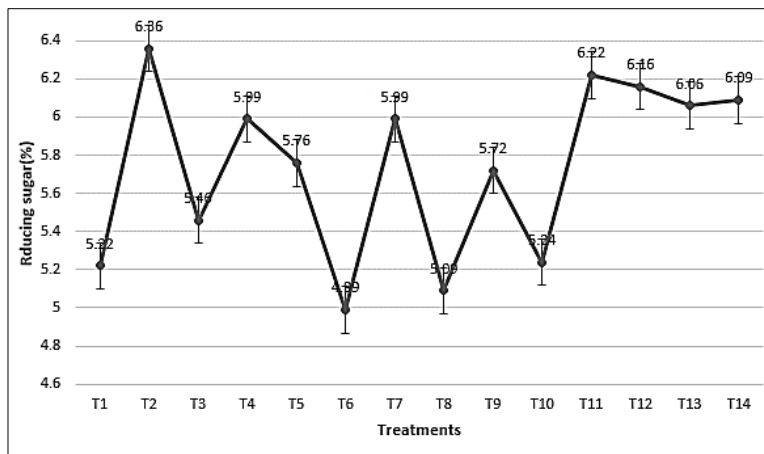
The acidity of different varieties/genotypes varied from 0.19% (NB-5) to 0.34% (NB-15). The maximum Ascorbic acid was recorded in genotype NB-7 (21.54 mg/100 gm). Whereas, minimum (14.99 mg/100 gm) Ascorbic acid content was found in variety Pant Shivani. The variation in acidity among Bael genotypes was also reported by Kumar et.al, (2014). The results regarding variation in ascorbic acid among different genotype in line with the finding of Pandey et.al, (2006) and Pandey et.al, (2013), Singh et.al (2014), also studied ascorbic acid content in Bael genotypes and reported maximum ascorbic acid in Goma Yashi followed by NB-5 and NB-7 [16, 17, 1, 22].

There reducing sugar in fruit was estimated to be maximum (6.22%) in CISHB. The lowest reducing sugar was observed in NB-16 (5.09%). Highest non-reducing sugar was recorded in NB-5 (14.02%). The minimum non-reducing sugar was observed in cv. NB-16 (4.82%). The total sugar content of fruit was found to be highest in NB-5 (18.68%). Lowest total sugar percentage was noted in cv. NB-3 (14.26%).

Chemical Parameters

S.N O.	Treatments	Genotypes	T.S.S (0Brix)	Acidity (%)	Ascorbic acid (mg/100g pulp)	Reducing sugar (%)	Non reducing sugar (%)	Total sugar (%)
1	T ₁	NB-3	31.99	0.31	16.24	5.22	9.34	14.26
2	T ₂	NB-4	36	0.28	20.01	6.36	9.02	15.76
3	T ₃	NB-5	41.99	0.19	18.22	5.46	14.02	18.68
4	T ₄	NB-7	33.99	0.30	20.01	5.99	9.22	13.95
5	T ₅	NB-9	38.02	0.23	19.19	5.76	11.69	18.55
6	T ₆	NB-14	33.01	0.31	17.03	4.99	2.34	17.99
7	T ₇	NB-15	30.01	0.34	15.29	5.99	8.86	15.11
8	T ₈	NB-16	30.99	0.29	17.60	5.09	8.62	14.23
9	T ₉	NB-17	40	0.19	19.62	5.72	12.42	17.93
10	T ₁₀	CISHB-1	34.32	0.33	20.24	5.24	9.01	14.31
11	T ₁₁	CISHB-2	31.32	0.34	20.12	6.22	9.03	15.32
12	T ₁₂	PANTSUJATA	40	0.24	17.99	6.16	11.99	17.84
13	T ₁₃	PANTAPARNA	40	0.27	15.01	6.06	11.15	17.65
14	T ₁₄	PANTSHIVANI	37.99	0.31	14.99	6.09	10.11	16.62
15	C.D.		2.23	0.01	1.34	0.26	0.43	0.76
16	SE(m±)		0.76	0.005	0.46	0.09	0.14	0.26





Conclusion

The results one valuation of chemical attributes of bael genotypes revealed that the NB-5 was found superior to other genotypes as regards to minimum acidity, maximum total sugar percentage, maximum non-reducing percentage in this study. So, on the basis of data, I was observed that the best variety for suitable commercial cultivation and processing industries is NB- 5 in central UP.

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