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Uttarwar VV

Department of Food Engineering
College of Food Technology,
Vasanttrao Naik Marathwada
Krishi Vidyapeeth, Parbhani,
Maharashtra India

Taur AT

Department of Food Engineering
College of Food Technology,
Vasanttrao Naik Marathwada
Krishi Vidyapeeth, Parbhani,
Maharashtra India

Sawate AR

Department of Food Engineering
College of Food Technology,
Vasanttrao Naik Marathwada
Krishi Vidyapeeth, Parbhani,
Maharashtra India

Studies on evaluation of physicochemical and nutritional properties of bael fruit (*Aegle marmelos*)

Uttarwar VV, Taur AT and Sawate AR

Abstract

India is the botanical garden of the world as it is largest producer of medicinal herbs. Bael (*Aegle marmelos*) has been known to be one of the most important medicinal plants of India since Charak (1500 B.C.). Bael (*Aegle marmelos*) pulp powder were analysed chemically for proximate composition, available carbohydrates, mineral content, fiber, etc. the values has been calculated for 100gm of bael pulp powder. It was found that bael is good source of fat, minerals, crude fiber and energy, also it is rich source of carbohydrates. The plant also contains anti-nutrient content which help in controlling blood sugar. This plant has no side effects, so the diabetic patients should encourage including this medicinal plant in their daily diet to control blood sugar level.

Keywords: Bael fruit, nutritional properties, protein, fat, proximate

1. Introduction

Bael (*Aegle marmelos*) is one of the medicinal plants of India. It is also known as golden apple or Bengal quince. It is a medium sized deciduous tree belonging to family Rutaceae. Other names of bael include maredu, bill, bill patra, balwa, vilwam and kuvalam in India. Bael is native of northern India, but is found widely throughout the Indian peninsula and in Ceylon, Burma, Thailand and Indo-China. The bael tree is Indigenous to India and the history of this tree has been made in "Yajurveda" In early Buddhist and Jain literature (8000-325 B.C), methods of ripening this fruit have been described. Bael fruit has also been portrayed in paintings of Ajanta caves. It grows wild throughout the low hills of Himachal Pradesh, ascending up to 1000 meters. It is found in plenty in wild forms in the states of Uttar Pradesh, Orissa, West Bengal, and Madhya Pradesh. However, the fruits of the wild trees are considerably smaller than those of the cultivated types grown in the plains (Amarjeet Kaur, 2017) [3].

WHO has estimated that 80 per cent of the population of developing countries still relies on traditional medicines mostly plant drugs for their primary health care needs and ensure patient safety by upgrading the skills and knowledge of traditional medicine providers (WHO 2008) [7]. Leaf extract of *Aegle marmelos* (Bilva) was effective in restoring blood glucose, body weight to normal values and significantly reversed the altered (histological and ultra-structural) parameters in tissues of streptozotocin induced diabetic rats seen by light and electron microscopy to near normal and improved the functional state of pancreatic beta cells. The hypoglycaemic effects of this plant drug appear to be mediated through regeneration of damaged pancreas (Dahanukar *et al* 2000) [4]. Bael leaf enhances ability to utilize the external glucose load in the body by stimulation of glucose uptake similar to insulin. Bael extract significantly lowers blood urea, reduction in lipid peroxidation and cholesterol and increased levels of super dioxide dismutase, catalase, glutathione peroxidase and glutathione level in serum as well as in liver in experimental diabetic animals (Sharma *et al* 2007) [6].

The fruit is of considerable medicinal value when it just begins to ripen. The ripe fruit is aromatic, astringent, cooling and laxative. The unripe or half ripe fruit is astringent, stomatic (a drug that strengthens the stomach and promotes its action), antiscorbutic (a drug which prevents or cures scurvy), and digestive. The fruit is said to act as a tonic for heart and brain. It is best given in sub-acute or chronic cases of diarrhoea and dysentery and in irritation of the alimentary canal. It is a useful adjunct in the after treatment of bacillary dysentery as it helps to remove constipation which hinders the healing of ulcerated surfaces of intestine. The ripe fruit is prescribed in intestinal disorders and certain terms of dyspepsia (indigestion), characterized by alternate constipation and diarrhoea. A 'Shortbet' of the ripe fruit is given for chronic constipation and dyspepsia. (Sampath kumar *et al*, 2012) [5].

Correspondence**Uttarwar VV**

Department of Food Engineering
College of Food Technology,
Vasanttrao Naik Marathwada
Krishi Vidyapeeth, Parbhani,
Maharashtra India

2. Materials and methods

The Bael fruits (*Aegle marmalos L.*) will be obtained from local market of Parbhani region. Raw materials for leather preparation will be procured from a local market, while reagents (analytical grade) and standards will be taken from laboratory, Department of Food Engineering, College of Food Technology, Parbhani.

Physical-chemical analysis of fruits:

The randomly selected samples of the bael and aonla fruit will be analysed for the weight, peel percentage, pulp percentage.

Moisture

Moisture content will be determined by drying a known quantity of the sample in an oven at 55 ± 2 °C till it gave a constant weight. It will be calculated and expressed in %, taking the weight of fresh sample as initial weight (Ranganna, 2009).

$$\% \text{ Moisture content} = \frac{\text{Loss in weight}}{\text{Weight of sample}} \times 100$$

Fibre will be determined by subjecting the sample paste to simultaneous acid-base treatments, cooled in desiccators and weighed to determine the percentage crude fibre content (AOAC, 2004).

Total soluble solids (TSS)

TSS will be determined with the help of hand refractometer of range 0-32oB. The results will be expressed as °Brix (Ranganna, 2009).

Titrateable acidity

Titrateable acidity will be measured as content of H⁺ ions by NaOH (0.1N) titration using phenolphthalein indicator (AOAC, 2004) [4]

Ascorbic acid

Ascorbic acid content will be determined as per AOAC (2004) [4] method using 2, 6- di-chloro-phenol indophenol dye.

3. Results and Discussion

3.1 Physical properties of bael fruits:

The physical properties of bael fruits such as fruits weight, pulp weight, pulp %, seed weight, seed %, average length, and average diameter is illustrated in table 1.

Table 1: Physical properties of Bael fruit

Parameters	Values
Colour	yellowish orange
Fruit weight(gm)	190.93
Diameter (cm)	8.5
Length (cm)	6.5
Pulp weight (gm)	114.5
Pulp %	68
Seed weight (gm)	7.06
Seed %	3.7
Peel weight(gm)	45.82
Peel%	24

*Each value represents the average of the three determinations.

The data given in Table 1 concluded various physical properties of bael fruit. Physical properties of bael was color yellowish orange, fruit weight 190.93gm, average diameter

8.5cm, average length 6.5cm, pulp weight (114.5gm), pulp%(68%), seed weight(7.06gm), seed%(3.7), peel weight(45.82gm), peel%(24%).

3.2 Chemical properties of Bael:

The data containing various chemical and nutritional compositions such as Titrateable acidity, total soluble solids, reducing sugar, pH and ascorbic acid content, protein, ash, moisture, fat, fiber content and carbohydrates and results obtained are illustrated in Table 2. And 3.

Table 2: Chemical composition of Bael fruit

Parameters	Values
Moisture (%)	56.91
Ash (%)	2.32
Fat (%)	0.47
Protein (%)	2.79
Carbohydrates (%)	29.21
Fiber content (%)	5.79
Titrateable Acidity (%)	4.72
Total Soluble Solids	16.79 °B x
Reducing Sugar (%)	7.52
Total Sugar (%)	13.25
pH	4.62

*Each value represents the average of the three determinations.

The data given in table 2 revealed various chemical compositions of bael fruits. The chemical properties of bael are moisture content (56.91%), carbohydrates content (29.21%), protein content (2.79%), fat content (0.47%), Ash (2.32%), Fiber content (5.79%), TSS (16.79°B_x), Titrateable acidity (4.72%), pH (4.62), Total sugar (13.25%), Reducing Sugar content (7.52%).

3.3 Mineral composition of bael fruit

The mineral content of bael fruit are calcium, phosphorus, iron, zinc, copper, manganese were determined and results obtained were illustrated in Table 3.

Table 3: mineral composition of bael fruit

Mineral	Values found (mg/100gm)
Calcium	82
Phosphorus	49.32
Iron	1.23
Copper	0.48
Zinc	7.3

*Each value represents the average of the three determinations.

Different mineral content of bael pulp were studied which were calcium, phosphorus, iron, zinc, copper and were found to be 82mg/100gm, 49.32mg/100gm, 1.23mg/100gm, 7.3mg/100gm and 0.48 mg/100gm respectively.

4. Conclusion

Ripe bael fruit is one of the best known natural laxatives. Unripe or half-ripe fruit is very useful in treating chronic diarrhoea and dysentery. It is also used for the treatment of hepatitis, tuberculosis, colitis and dyspepsia. The fruit is also regarded as a heart and brain tonic. The pulp of raw fruits is effective in treating bleeding piles and bacillary dysentery. Apart from the fruit, bael leaves are also highly effective medicinally. This plant has no side effects, so the diabetic patients should encourage including this medicinal plant in their daily diet to control blood sugar level. It is good source of all nutrients and micronutrients.

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