

# Bael- Fruit for Dryland

Dr. Sanjay Kumar Acharya

Department of Botany, Govt. Dungar College, Bikaner, Rajasthan, India

**ABSTRACT:** Bael (*Aegle marmelos* L. Corrêa) is an economically valuable tree species in South Asia. The ripen bael fruits are popular among people because of the delicious fruit pulp, which is ideal for making jam, syrup, and pudding. Bael possesses many medicinal values and therefore used as an ingredient in ayurvedic herbal medical preparations. The fruits, bark, leaves, seeds, and roots of bael contain bioactive compounds such as coumarin, xanthotoxol, imperatorin, aegeline, and marmeline. These compounds can provide antidiabetic, anticancerous, antifertility, antimicrobial, immunogenic, and insecticidal activities. Bael is also essential as a species for reforestation, especially in the unfertile marginal lands. Bael seeds possess a unique fatty acid (12-hydroxyoctadec-cis-9-enoic acid or ricinoleic acid), a convertible item into biodiesel. Bael is an underutilized fruit species in South Asian countries. However, numerous studies report the medically significant properties and industrially vital characteristics of bael in India. The present review focused on summarizing and discussing the essential details and potentials of bael for industrial applications towards economic development.

**KEYWORDS:** Bael, juice, dryland, medicinal, reforestation, fruits

## I. INTRODUCTION

Bael (*Aegle marmelos* Correa) is an important indigenous fruit of India and known since ancient times. It is grown in various parts of South East Asia including India, Sri Lanka, Pakistan, Burma, Bangladesh, Thailand etc. In India, bael is being grown throughout the country and is also known by other vernacular names like bela, bili, bilva, belo, maredu, vilwam, sripthal, golden apple, Indian quince and Bengal quince (John and Stevenson, 1979). Often, it is grown near temple of the Lord Shiva in India. As per Hindu customs, the leaves of the tree are considered sacred and offered to the Lord Shiva. The fruits form an essential ingredient of holy offering to the God and Goddess through holy pyre (havan). In the Yajur Veda, the mention of bael tree has been traced to Vedic times (C 2000 B.C.–C 800 B.C.). Mention of bael in Yajur Veda and also in early Buddhist and Jain literature (C 800 B.C. – C 325 B.C.), describing various methods of ripening of the bael fruit along with some other fruits was observed by Om Prakash (1961). During ‘Ramayana’ period, the bael fruit was known and its trees were reported to be growing in ‘Chitrakuta’ hills and ‘Panchvati’. In the ‘Upavana Vinod’ a Sanskrit treatise on silviculture (Majumdar, 1935) and in the ‘Brihat Samhita’ mention had been made of bael [1,2,3] fruit and as the legend goes, in the forest, the Lord Rama performed religious rites by offering various fruits including bael (Aiyer, 1956). Bael fruit has been portrayed in painting of Ajanta Caves along with other fruits (Om Prakash, 1961). Like many other species of Rutaceae family, bael also has fragrant flowers. It is believed that bael tree act as indicator plant for tracing of underground water (Singh and Roy, 1984). It is a nutritious and medicinal fruit plant, which is most suitable to grow in water scarce areas of the country. Its fruit is rich in riboflavin, vitamin A, carbohydrate etc. Various chemical constituents viz., alkaloids, coumarins and steroids have been isolated from different parts of bael plants. Bael is known as the panacea of the stomach ailments and marmelosin is probably the therapeutically bioactive compound of bael fruit (0.03-0.37%) which vary according to variety and locality (Dixit and Dutt, 1932). All parts of the tree, whether stem, bark, root, leaves, flower and fruit at different maturity stages has some use or the other. It is also used in the preparation of several Ayurvedic medicines since ancient times (Sharma et al., 2007). The pulp of ripe fruits is eaten fresh or in the form of sharbat and used for preparation of value added products such as jam, murabba, [4,5,6] squash, powder, pickle, ice cream, slab, nectar, toffee, ice cream, etc. The pulp diluted with water and added with requisite amount of sugar and tamarind, forms a delicious cooling drink. A firm jelly is made by combining pulp of bael with guava. The bael fruit toffee is prepared by combining the pulp with sugar, glucose, skimmed milk powder and hydrogenated fat. Green bael fruits are used for preparing murabba (preserve). The leaves, roots, flower, fruit and other parts are known to have medicinal properties especially for stomach disorders and improvement in digestive system. Besides an infusion of flowers as cooling drink, the fruit pulp dressed with palm sugar, eaten as breakfast, is a common practice in Indonesia. The green bael fruit slices often are dried and stored for future use (Singh and Roy, 1984). The cavity formed in fruit pulp are full of amber or honey coloured viscous very sticky or glutinous, translucent pulp, which is slightly sweet and feebly aromatic. The gummy substance surrounding the seeds serves as a good adhesive and is added to water-paints to improve strength and brilliancy. The shell of the hard fruits is fashioned in to pill and snuff boxes, sometimes decorated with gold and silver. It is more abundant in young fruits. The stem also contains a gum similar to gum arabic. [7,8,9] Being rutaceous plant, the leaves are mildly flavoured and hence chewed as mouth freshener. Bael has enormous traditional uses against various disease and many

bioactive compounds have been isolated from different part of tree. Different parts of the plant viz., leaves, roots, stem, flower and fruit have been used in enthno medicine to exploit its therapeutic properties including astringent, antidiarrhoeal, antidycentric, antipyretic, antiulcer, antidiabetes, antibacterial, antiviral antifungal, anticancer, analgesic, radioprotective, because compounds purified from bael have been proven to be biologically active against several diseases. Crude extract from various parts of bael plant are used to treat various disorders in different Indian traditional systems (folklore medicine). Roots are used to cure cardiac malfunction, abdominal pain, fever, urinary trouble, hypochondriasis and melancholia; leaves are used as astringent, laxative, digestive and febrifuge while unripe fruit is helpful in curing dysentery and ripe fruit is used as astringent, appetizer, laxative, tonic, restorative and febrifuge (Kirtikar and Basu, 1935). Besides the fruits, the root is an ingredient of 'dasmula' (ten roots), used as Ayurvedic medicine. The roots as well as bark are used in the form of a decoction as a remedy in melancholia, intermittent fever and palpitation of heart. Root has also anti-amoebic and hypoglycemic properties. The leaves are bitter and used [10,11,12] as febrifuge. Poultice made of leaves is used for ophthalmia and ulcers. Fresh leaves are also used as remedy for dropsy and beri-beri associated with weakness of heart. The astringent rind of ripe fruits and bark are employed in dyeing and tanning. The diluted leaf juice is used for catarrh. The alkaloid aegelin present in the leaves are efficacious in asthma. Utilization of bael fruit has been reported by Roy and Singh (1979 a). Bael fruit is one of the most nutritious fruits. Analysis of the fruit gave 61.5g moisture, 1.8 g protein, 0.39 g fat, 31.8 g carbohydrates, 1.7 g minerals, 55 mg carotene, 0.13 mg thiamine, 1.19 mg riboflavin, 1.1mg niacin and 8.0 mg vitamin C per 100 g of edible portion (Gopalan et. al., 1985). No other fruit has such a high content of riboflavin. Tannic acid is only phenolic substance detected from bael fruits. Analysis of the leaves gave the values (dry basis) like crude protein (15.13), ether extra (1.54), crude fibre (16.45), N-free extra (52.83), ash (14.05), calcium (5.93) and phosphorus (0.69) per cent. The seed yields oil 34.4% on dry basis and the fatty acid composition of oil includes; palmitic-16.6; stearic- 8.8; oleic-30.5; linoleic-30.0 and linolenic-8.1 per cent. Bael seed contains 62% protein and 3% each carbohydrate and ash. The fruit yields two per cent dried, water soluble gum. Hydrolysis of the gum gave galactose-20.4, arabinose-10.7, D-galacturonic acid-25.2 per cent and traces of rhamnose. Several bioactive compounds have been isolated from various parts of the bael tree such as skimmianine, cineole, citral, citronellol [13,14,15] aegelin, lupeol and marmesinin from bael leaves; marmelosin, luvangetin, aurapten psoralen marmelide from fruit; fagarine, marmin, auroptins, umbelliferone, lupeol and skimmianine from bark; auroptins, umbelliferone, marmin, lupeol and skimmianine, psoralen, xanthotoxin, scopoletin roots (Shoeb et. al. 1973). The bael fruit mucilage on hydrolysis shows the presence of three reducing sugars, galactose, arabinose and rhamnose. There are no systematic plantations of bael trees in our country, now some systematic orchards of improved varieties are being established in the States of Rajasthan, Uttar Pradesh, Punjab and Gujarat; hence, exact data on acreage and production is not available. Generally, the bael plantations are made as boundary plants, premises of temples or in home gardens. Some seedling plantations are available in natural forest areas. However, in recent years, concerted efforts have been made for collection of elite genotypes of bael from all over the country and their evaluation and establishment of germplasm block at ICAR Institutes/ Regional stations and State Agricultural Universities. Some progressive farmers of Rajasthan, Uttar Pradesh, Madhya Pradesh, [16,17,18] Punjab and Gujarat have started planting bael on large scale in the form of orchard or as boundry plantation (Fig. 2). As an estimate, about 1000 ha area is under plantation of improved variety of bael in country with about 10,000 tonnes of production.

## II. DISCUSSION

Bael is bestowed with a natural gift to tolerate the extremes of high temperatures and during minimum soil moisture regime by shedding its leaves during summer. However, young plants need to be protected from the temperature below 40 C and desiccating hot winds. It can thrive well in swampy, alkaline and stony soils having pH range from 5.0 to 10.00, where many other fruit trees fail to establish. It can also be successfully grown in saline, sodic and sandy wastelands provided the soil is treated with gypsum and pyrite before plantation. The extent of hardiness of bael plants under Thar desert have been observed that the plant even after being buried under sand for 2-3 months are capable of rejuvenating itself and can tolerate salinity up to 9 dsm-1. However, well-drained sandy loam soil is ideally suitable for bael orchards. Bael plants can grow easily in wasteland and in sandy soils of arid ecosystem, having low fertility status and poor moisture holding capacity. Marked reductions in the contents of leaf NPK and Ca were observed in response to increase in salinity and sodicity levels in the soil in which plants were grown. Salinity caused significant increase in leaf Mg, while sodicity decreased it. Leaf Na was at toxic levels in both saline and sodic soils. It has wide range of adaptability to adverse soil and climate. Owing to its hardy nature, it can be grown in wide range of soil viz., sandy, clay, stony, acidic, alkaline, salt affected soils and wastelands etc. The bael tree grows successfully and produces higher yield in sub-tropical climate where summer is hot and winter is mild. In semi-arid and tropical regions, it can be successful grown under rainfed conditions. Under arid conditions of western part of Rajasthan, the leaves and tender parts of budded bael cultivars and young seedlings were severely affected by low temperature/frost during winter season (Saroj et al., 2006). The genus *Aegle* belongs to the subfamily: Aurantioideae, family Rutaceae and order:

Sapindale. Other members of Rutaceae are Citrus, Casimiroa, Clausena, Eremocitrus, Limonia, Feroniella, Fortunella, Poncirus, Triphasia etc. The generic name is of Greek origin [18,19,20] and the species marmelos is of Portuguese origin. The chromosome number is  $x=9$  and  $2n=36$ . The tree is a medium to tall, deciduous, slow growing and 5-10 m in height. Botanically, the fruit is berry with hard pericarp. The number of cells in the fruit, arranged in a circle, is equal to the number of cells in ovary. Seedling tree requires 7-8 years to produce flower while grafted one starts flowering at the age of 3 years. Bael tree flowers in April-June, fruit setting takes place by the end of May and continues till July. Time of flowering may vary according to agro-climatic condition and genetic makeup of varieties. The bisexual flowers are born in clusters and they are greenish, white, axillary or terminal cymes (Fig.3). The calyx is shallow with 4 or 5 short (tetramerous), broad teeth, pubescent outside. Petals are oblong oval, 4 or 5 in numbers and pale greenish white in colour. Stamens are numerous, hypogynous with short filaments. Ovary is oblong-ovoid, slightly tapering in to the thick, short style which is thickened upward; stigma capitate, deciduous multi celled (8-20), arranged in a circle with numerous ovules (1-5) in each cell. The style is open type having variable number of stylar canals depending on the number of carpels. The stigma is classified as wet stigma as it is covered by a sticky secretion at the time of pollination. Flower bud emergence, flowering duration, time of anthesis, dehiscence of anther, stigma receptivity and pollen viability vary according to variety and locality (Srivastava and Singh, 2000, Singh et al., 2008 & 2011b). Size and shape of floral organs in terms of bud size, flower size, petal size etc. of the varieties evaluated at CHES, Godhra under rainfed condition of semi-arid ecosystem (Singh et al., 2014e) which has been illustrated in table 1, 2 & 3. Floral biology of bael varieties and main pollinating agents has been reported by Singh et al. (2014b). The nectar secreting disc found beneath the ovary is main source of attraction for the insects (Srivastava and Singh, 2000). Singhal et al. (2011) reported that the diploid and tetraploid trees showed normal meiosis and high pollen fertility. Phenological events which included leaf fall, leaf emergence and floral bud break, flowering and fruiting are nearly the same in wild and cultivated trees (Singh et al., 2011b & 2014d; Mishra et al., 1999 & 2000). Natural pollen transfer in the species was highly efficient. Levels of fruit set following open pollination were quite high and it is reduced considerably by following hand pollination probably due to injury caused to stigma during emasculation. In spite of synchronous nature of anther dehiscence and stigmatic receptivity, selfing in a flower is avoided due to herkogamy.

### III. RESULTS

Bud emergence in all the varieties started at different time, but lasted from April to late June. The peak period of it was observed during 2nd fortnight of May in all the varieties. All the buds are globose, spheroid in shape in each variety and green in colour which commenced to full bloom from 13th May to 26th June among all the varieties. An early blooming was observed in (mid May) in the varieties CISHB-1, NB-16, Pant Urvashi and in Goma Yashi, the peak period started from 6th June to 11th June whereas rest of the varieties had blooming in between 20th May to 26th June with peak period started from 7th June to 18th June (Singh and Mishra, 2004 & Singh et al., 2014e). The varieties which have long flowering period may serve as a long-term resource whereas flowering phenology of different cultivar affects reproductive success which allows the presence of a constant population of pollinators. Abnormal number of petals in flower may be observed in almost all genotypes. There were deviation in the time of initiation and termination of the anthesis which was observed between 5 to 8 A.M. among all the varieties of bael. It was observed early initiation (5.00 A.M.) in the variety NB-7, [12,13] NB-9, Pant Shivani and Pant Sujata. No flowers of any variety opened completely before 5.00 A.M and followed specific time under semi-arid condition of western India. During anthesis flowers starts loosening their floral organs which later on blooms completely. Some flowers opened all petals at a time while other petals start opening one by one which takes 45 to 60 minutes in complete opening and also vary flower to flower. In the inflorescence, lower side bud opened earlier as compare to rest of buds localized centrally in all varieties, whereas varieties had anthesis vice versa where centrally located buds opened first as compare to lateral buds. After anthesis within half an hour, the anthers dehiscence started which continued between 5.45- 8.30 A.M. The pollens were coming outside by bursting the anther centrally by pore (Fig. 4). The anthers and floral organs shrunk and turn into brick red after dehiscence as time passed on. The findings regarding anthesis clarified that the anthesis and anther dehiscence in bael varieties took place early in the morning (5.30 -8.30 A.M.) where low temperature and high humidity prevailed (Srivastava and Singh, 2000). Existing biodiversity of bael in India can be grouped into two prominent categories i.e. one small fruit type, having bitter pulp with more seeds, mucilage and fiber content and second of large fruit type with thin shell, less seed, fibre and mucilage and more sweet pulp. The earlier type is generally used in ayurvedic preparation because of high marmelosin and psoralen content while the second type is generally used as dessert fruit and for preparation of processed products. Diverse germplasm of bael has been widely collected from various states of India viz., Uttar Pradesh, Bihar, Gujarat, Haryana, Madhya Pradesh and West Bengal by NDUAT, Faizabad, CHES, Godhra (CIAH, Bikaner), CISH, Lucknow, CCSHAU, Regional Research Station, Bawal, CAZRI, Jodhpur; Jharkhand (Pandey et al., 2008a), Bihar (Rai et al., 1991); Uttar Pradesh and Madhya Pradesh (Pandey et al., 2005 & 2008b); Rajasthan (Saroj et al., 2008) and Gujarat (Singh et al., 2014a & 2018). Growth

behavior of bael varieties has been reported by Singh et al. (2008, 2010a & 2016j). Characterization of bael genotypes has been undertaken at CHES, Godhra under rainfed hot semi-arid environment of Gujarat (Singh et al., 2011b)

Aegle marmelos, commonly known as bael (or bili<sup>[4]</sup> or bhel<sup>[5]</sup>), also Bengal quince,<sup>[2]</sup> golden apple,<sup>[2]</sup> Japanese bitter orange,<sup>[6]</sup> stone apple<sup>[7][8]</sup> or wood apple,<sup>[6]</sup> is a species of tree native to the Indian subcontinent and Southeast Asia.<sup>[2]</sup> It is present in India, Pakistan, Bangladesh,<sup>[9]</sup> Sri Lanka, and Nepal as a naturalized species.<sup>[2][9]</sup> The tree is considered to be sacred by Hindus and Buddhists. Aegeline is a known constituent of the bael leaf and consumed as a dietary supplement with the intent to produce weight loss.<sup>[14][15]</sup> In 2013, the U.S. Food and Drug Administration (FDA), Centers for Disease Control and Prevention (CDC), the Department of Defense Armed Forces Health Surveillance Center, and Hawaii state and local health officials identified an outbreak of 97 persons with acute non-viral hepatitis that first emerged in Hawaii. Seventy-two of these persons had reported using the dietary supplement OxyElite Pro, containing aegeline, which was manufactured by the Dallas company, USPlabs.<sup>[14][17]</sup> FDA had previously taken action against an earlier formulation of OxyElite Pro because it contained dimethylamylamine, a stimulant that FDA had determined to be an adulterant when included in dietary supplements, and could cause high blood pressure and lead to heart attacks, seizures, psychiatric disorders, and death.<sup>[17]</sup> USPlabs subsequently reformulated this product without informing FDA or submitting the required safety data for a new dietary ingredient.<sup>[17]</sup> Doctors at the Liver Center at The Queen's Medical Center investigating the first cases in Hawaii reported that between May and September 2013, eight previously healthy individuals presented themselves at their center suffering from a drug-induced liver injury.<sup>[14][18]</sup> All of these patients had been using the reformulated OxyElite Pro, which they had purchased from different sources, and which had different lot numbers and expiration dates, at doses within the manufacturer's recommendation.<sup>[14][18]</sup> Three of these patients developed fulminant liver failure, two underwent [20]urgent liver transplantation, and one died.<sup>[14][18]</sup> The number of such cases ultimately rose to 44 in Hawaii.<sup>[14][18]</sup> In January 2014, leaders from the Queen's Liver Center informed state lawmakers that they were almost certain that aegeline was the agent responsible for these cases,<sup>[19]</sup> but the mechanism of how aegeline may damage the liver has not been isolated.<sup>1</sup>

#### Culinary

Rich in vitamin C,<sup>[11]</sup> the fruits can be eaten either fresh from trees or after being dried<sup>[20]</sup> and produced into candy, toffee, pulp powder or nectar.<sup>[9]</sup> If fresh, the juice is strained and sweetened to make a drink similar to lemonade.<sup>[11]</sup> It can be made into sharbat, also called as Bela pana, a beverage. Bela Pana made in Odisha has fresh cheese, milk, water, fruit pulp, sugar, crushed black pepper, and ice. Bael pana, a drink made of the pulp with water, sugar, and citron juice, is mixed, left to stand a few hours, strained, and put on ice. One large bael fruit may yield five or six liters of sharbat. If the fruit is to be dried, it is usually sliced and sun-dried. The hard leathery slices are then immersed in water. The leaves and small shoots are eaten as salad greens. Bael fruits are of dietary use and the fruit pulp is used to prepare delicacies like murabba, puddings and juices.

#### Traditional medicine

The leaves, bark, roots, fruits, and seeds are used in traditional medicine to treat various illnesses,<sup>[9]</sup> although there is no clinical evidence that these methods are safe or effective.

#### In culture

Bael is considered to be one of the sacred trees of Hindus,<sup>[21]</sup> (known in Sanskrit as बिल्व bilva<sup>[22]</sup>), and thus they are used in Hindu rites.<sup>[23][24]</sup> Earliest evidence of the religious importance of bael appears in the Sri Sukta of the Rigveda, which reveres this plant as the residence of goddess Lakshmi, the deity of wealth and prosperity.<sup>[25]</sup> Bael trees are also considered an incarnation of the goddess Sati.<sup>[26]</sup> Bael trees can be usually seen near Hindu temples and home gardens.<sup>[27]</sup> It is believed that Shiva is fond of bael trees, to a point of having earned the epithet बिल्वदण्ड Bilvadaṇḍa or "bel-staffed".<sup>[22]</sup> Its leaves and fruit still play a main role in his worship, because the leaf's triple shape is seen to symbolise his trident.<sup>[28]</sup>

In the traditional practice of the Hindu and Buddhist religions by people of the Newar culture of Nepal, the bael tree is part of a fertility ritual for girls known as the Bel Bibaaha. Girls are "married" to the bael fruit; as long as the fruit is kept safe and never cracks, the girl can never become widowed, even if her human husband dies. This is a ritual that guarantees the high status of widows in the Newar community compared to other women in Nepal.<sup>[29]</sup>

## IV. CONCLUSION

Aegle marmelos L. (Bael) is an indigenous tree fruit species in the Indian subcontinent and Southeast Asia. Bael is a perennial crop in India, Sri Lanka, Pakistan, Bangladesh, Myanmar, Thailand, Vietnam, the Philippines, Cambodia,



Malaysia, Java, and other southeastern Asian countries [1, 2]. Bael is a sacred tree in India. The gardens of many Indian Hindu temples have bael trees [3]. The ripe fruit, which contains a delicious pulp, is the most valuable part of the bael tree [4]. People mainly consume bael as fresh fruit. However, the value-added products of bael, such as drinks, traditional sweets, jam, and pudding, are available in the market [5]. People prefer bael primarily because of its rich taste and ability to cure constipation [6]. Bael fruit is an expensive commodity in supermarkets and street fruit-stalls. All parts of the bael tree possess medicinal values [7]. Thus, bael is famous as a valuable crop with immense medicinal and nutritional potentials [8]. There are many reports available on the medicinal and industrial values of bael in India [9–13]. However, bael is an underutilized crop species in Sri Lanka [14].

Bael can grow well under adverse conditions. Bael trees thrive well in high altitudes as high as 1,200 m and withstand without any significant growth retardation at extreme temperatures such as  $-7^{\circ}\text{C}$  and  $50^{\circ}\text{C}$  [1]. The prolonged droughts cease fruiting in bael. However, the tree can flourish well under low moisture levels in alkaline, stony, and shallow soils. For example, the 'oolitic-limestone' soils of South Florida provide successful growth and fruit set. Fruitful bael trees dominate many vegetations in arid soils and marginal desert lands of India and Sri Lanka [1].

Bael is the solitary species in the genus *Aegle* of the subfamily Aurantioideae, which has a well-established phylogeny [15]. However, only the samples collected from India provided the basis for estimating the phylogenetic position, origin, and distribution from the natural range of bael [16, 17]. None of the published phylogenetic studies have considered the bael germplasm in Sri Lanka. Thus, the origin of bael germplasm and the genetic diversity of bael germplasm in Sri Lanka are not known.

The Fruit Crop Research and Development Station (FCRDS) of the Sri Lankan Department of Agriculture assessed the bael germplasm in Sri Lanka based on the fruit quality and the information collected from the national network of agricultural extension workers. Thereby, FCRDS identified five elite bael accessions for mass propagation using grafting and micropropagation. However, no details exist on the variation of the fruit size, pulp yield, organoleptic preference, elemental content, and genetic diversity of the elite bael accessions. Therefore, the present study assessed the morphometric variation, organoleptic desire, and elemental composition of the fruits of elite bael accessions in Sri Lanka. We also studied the phylogenetic relationships and molecular dating of the elite bael accessions in comparison to the related germplasm worldwide.[20]

## REFERENCES

1. Plummer, J. (2019). *Aegle marmelos*. The IUCN Red List of Threatened Species 2019: e.T156233789A156238207. doi:10.2305/IUCN.UK.2019-3.RLTS.T156233789A156238207.en. Downloaded on 07 March 2019.
2. ^ c d e f g "Taxon: *Aegle marmelos* (L.) Corrêa". GRIN Global, National Plant Germplasm System, US Department of Agriculture. 19 September 2017. Retrieved 16 March 2018.
3. ^ "genus *Aegle*". Germplasm Resources Information Network (GRIN) online database. Retrieved 20 June 2017.
4. ^ "FOI search results". [flowersofindia.net](http://flowersofindia.net). Archived from the original on 12 August 2017. Retrieved 20 January 2016.
5. ^ Wilder, G.P. (1907), *Fruits of the Hawaiian Islands*, Hawaiian Gazette, ISBN 9781465583093
6. ^ b "M.M.P.N.D. - Sorting *Aegle* names". [unimelb.edu.au](http://unimelb.edu.au). Retrieved 20 January 2016.
7. ^ "Bael: *Aegle marmelos* (L.) Correa". *Philippine Medicinal Plants*.
8. ^ b c Orwa, C (2009). "*Aegle marmelos*" (PDF). *Agroforestry Database: a tree reference and selection guide version 4.0*. Archived (PDF) from the original on 9 May 2016.
9. ^ f g Misra KK (1999). "Bael". *NewCROP, the New Crop Resource Online Program*, Department of Horticulture and Landscape Architecture, Center for New Crops & Plant Products, Purdue University, W. Lafayette, IN. Retrieved 20 January 2016.
10. ^ Gardner, Simon (2007). *Field guide to forest trees of Northern Thailand*. Bangkok: Kobfai Publishing Project. p. 102. ISBN 978-974-8367-29-3.
11. ^ *The Complete Guide to Edible Wild Plants*. United States Department of the Army. New York: Skyhorse Publishing. 2009. p. 23. ISBN 978-1-60239-692-0. OCLC 277203364.
12. ^ Boning, Charles (2006). *Florida's Best Fruiting Plants: Native and Exotic Trees, Shrubs, and Vines*. Sarasota, Florida: Pineapple Press, Inc. p. 35.
13. ^ Rasadah Mat Ali; Zainon Abu Samah; Nik MUSAADAH Mustapha; Norhara Hussein (2010). *Aegle marmelos* (L.): In *ASEAN Herbal and Medicinal Plants* (page 107) (PDF). Jakarta, Indonesia: Association of Southeast Asian Nations. p. 43. ISBN 978-979-3496-92-4. Archived (PDF) from the original on 12 June 2017.

14. <sup>^ g h</sup> Chatham-Stephens K, Taylor E, Chang A, et al. (2017). "Hepatotoxicity associated with weight loss or sports dietary supplements, including OxyELITE Pro™ - United States, 2013". *Drug Test Anal.* 9 (1): 68–74. doi:10.1002/dta.2036. PMC 5579712. PMID 27367536.
15. <sup>^ Jump up to:</sup><sup>a b</sup> Avula, B; Chittiboyina, A. G; Wang, Y. H; et al. (2016). "Simultaneous Determination of Aegeline and Six Coumarins from Different Parts of the Plant *Aegle marmelos* Using UHPLC-PDA-MS and Chiral Separation of Aegeline Enantiomers Using HPLC-ToF-MS". *Planta Medica.* 82 (6): 580–8. doi:10.1055/s-0042-103160. PMID 27054911. S2CID 205000525.
16. <sup>^</sup> Laphookhieo, Surat (2011). "Chemical constituents from *Aegle marmelos*". *J. Braz. Chem. Soc.* [online]. 22: 176–178.
17. <sup>^ c</sup> "FDA Investigation Summary: Acute Hepatitis Illnesses Linked to Certain OxyElite Pro Products". US Food and Drug Administration. 30 July 2014. Archived from the original on 14 November 2017. Retrieved 19 November 2015.
18. <sup>^ c d</sup> Roytman MM, Pörzgen P, Lee CL, et al. (August 2014). "Outbreak of severe hepatitis linked to weight-loss supplement OxyELITE Pro". *Am J Gastroenterol.* 109 (8): 1296–8. doi:10.1038/ajg.2014.159. PMID 25091255. S2CID 28252720.
19. <sup>^</sup> Daysong, Rick (January 28, 2014). "Months after recall, new OxyElite Pro illnesses reported". *Hawaii News Now.* Retrieved 19 November 2015.
20. <sup>^</sup> Hazra, Sudipta Kumar (2019). "Characterization of phytochemicals, minerals and in vitro medicinal activities of bael (*Aegle marmelos* L.) pulp and differently dried edible leathers". *Heliyon.* 6 (10): e05382. Bibcode:2019Heliy...605382H. doi:10.1016/j.heliyon.2019.e05382. PMC 7610326. PMID 33163665.