

## A Review on Aegle Marmelos: A Potential Medicinal Tree

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### ABSTRACT

The purpose of this review is to impart fundamental knowledge about the medicinal plant known as bael (AEGLE MARMELOS). The delectable fruitpulp, which can be used to make jam, syrup, and pudding, is what makes the ripened bael fruits so popular. Due to its many medicinal qualities, bael is used in the preparation of Ayurvedic medicines. Bioactive chemicals present in Bael's fruits, leaves, seeds, and roots include coumarin, xanthohumol, imperatorin, Angeline, and marceline. These substances have been used traditionally in medicine to treat a variety of illnesses, including antibiotics, antidiabetic, anticancer, antifertility, antibacterial, immunogenic, and antioxidants. Extensive research on a variety of components of Aegle marmelos has resulted in the isolation of a wide range of chemicals, including fatty acids, amino acids, coumarins, terpenoids, alkaloids, tannins, flavonoids, and saponins.

This study provides an overview of the pharmacological study aliases, traditional use, and phytochemicals of A. marmelos (bael).[1]

**Keywords:** Aegle marmelos (Bael) phytochemical, pharmacological properties. Nutritional component, historical use, and marketed product

### I. INTRODUCTION

The use of plants in all types of medicine serves as an example of their ubiquitous importance in the treatment of sickness. The primary medical system, regardless of the fundamental philosophical idea.[2] Numerous negative events have occurred with few adverse effects of the synthetic medication number together with the originating plant. India is home to a wealth of plants as a herbal or natural remedy, and it has been utilized since ancient times. Herbal medicine is widely used in poor nations. Indian Medicinal plants are said to be an abundant source of several pharmacologically active ideas and active ingredients, which are frequently utilized in home cures for a variety of illnesses.[6] Due to the

conventional understanding of development, the World Health Organisation is currently actively supporting them to employ the herbal medicines that have been a part of their heritage for millennia.[7] Bael is a low-cost herbal mixture. Among the thousands of medicinal trees, Bael is one therapeutic plant.[1] In traditional medical systems, Aegle marmelos is referred to as Bael and is said to have several medicinal benefits. One of the Hindus' sacred trees is the ball. Bael is a widely recognized plant among people in all of India in connection with the Hindu religion. Well, it is thought that the bael fruit represents the lord Shiva.

Leaves have been presented as prayers to Parvathi and Shiva since the beginning of time.[35]The bael fruit is acknowledged during the "RAMAYAN" era. Bael tree is mentioned in the text of "CHARAKA SAMHITA".[1] A sacred deciduous tree known as Bael is linked to gods and is said to have beneficial medical qualities, particularly as a cooling agent. Bael is an aromatic medicinal plant used in Ayurveda medicine to treat a variety of ailments. The fruit, leaves, bark, roots, and seeds of the tree are also considered medicinally significant. High nutritional content is found in bael fruit, which includes minerals (phosphorous, potassium, calcium, magnesium, iron, copper, and zinc), protein, carbohydrates, vitamins B1, B2, B3, and C, and fatty acids.[1]

Bael fruit's phytochemical composition includes carotenoids, flavonoids, tannic alkaloids, and coumarins. The leaves and fruit of the Bael plant are used to cure edema, vomiting, dyspepsia, and diarrhea. It is crucial to the processing of food. The nutritional makeup, phytochemical content, and antioxidants found in bael trees contribute to the food's quality. Many studies have demonstrated the pharmacological activity, which includes anti-diarrheal, antioxidant, Anti-diabetic, Hepatoprotective, radio-protective, anti-cancer, and Anti-ulcer activities in pharma products.[1]

**II. TAXONOMICAL CLASSIFICATION[61] :**

• Kingdom	• Plantae.
• Order	• Sapindales.
• Family	• Rutaceae.
• Subfamily	• Aurantioideae.
• Genus	• Aegle.
• Species	• Aegle marmelos



**Fig .Leaves and fruits of Aegle marmelos**



**Fig 1 . Plant of Aegle marmelos**



Fig . Aegle marmelos leaves



Fig : Aegle marmelos seeds

• **Morphology of Aegle marmelos (bael) :**

Color : Green

Odor : Terpene like aroma

Taste: sweet, aromatic, and pleasant, although tangy and slightly astringent in some varieties

- **Botanical name** – Aegle marmelos
- **Common names or Vernacular names [62]**
- English: Bengal quince, beal fruit, golden apple, Indian quince stone apple.
- Hindi: bel,bili, spiral, and bela.
- Orissa: belo.
- Kannada : bela bill
- Gujrat: Billi
- Sanskrit : ashram, bilva, adhararutha .
- Bengal: beal, bel.
- **Botanical Description[38]:**

- Aegle marmelos is a medium-sized, slowly growing tree that can reach a height of 12 to 15 m. It has a short trunk, thick, soft bark that flakes, and spreading, occasionally prickly branches that droop at the bottom. The deciduous, alternating leaves are borne alone or in groups and consist of 3 to 5 oval, pointy, shallowly toothed leaflets that are 4–10 cm long and 2–5 cm broad, with the terminal leaf having a long petiole. Young suckers have many strong, straight spines.

**Soil type :**

Although bael is supposed to thrive best in rich, well-drained soil, it has also flourished and produced fruit on southern Florida's oolitic limestone. It also thrives in areas that are swampy,

alkaline, or have a reputation for flourishing where other fruit trees cannot.[39]

#### Tree management :

The tree thrives with little fertilizer and irrigation and doesn't require strict cultural conditions. trees vegetatively propagated in years, with a spacing of 6–9 years in orchards. When it turns yellowish-green, the entire crop is harvested and stored for eight days to allow the green hue to fade.



Fig. Native Range.

After that, the stem and fruit easily separate. Up to 800 fruits can be produced by a tree in a single season[39].

- **ORIGIN AND DISTRIBUTION :**

The bael tree originated in central and eastern India. It grows wild in sub-Himalayan regions of central and southern India extending from Jhelum eastward to west Bengal. It is indigenous to India. Bael grows on the slopes of Madhya Pradesh, Uttaranchal, Bihar, Chattisgarh, Jharkhand, and Jharkhand. Additionally, certain Egyptian gardens in Surinam and Trinidad cultivated it.[40]

#### Documented species distribution :

**Native Range: India**

**Exotic Range: Bangladesh, Egypt, Malaysia, Myanmar, Pakistan, Sri Lanka, Thailand,[36,42]**

### III. CHEMICAL CONSTITUENTS :

The significance of plants and the compounds they generate in combating illness has long been recognized by scientists. More than 25% of all medications prescribed still employ plants as their main component.[10] Bael is claimed to

include a variety of alkaloids, coumarins, essential oils, and steroids. Fruits and roots include coumarins such as scopoletin, scoparone, parmesan, umbelliferone, and skimming. Fruits within include imperatorin, xanthohumol, and alkaloids like Angeline and alloimperatorin caramel. Additionally, it has polysaccharides like uronic acid, galactose, arabinose, and L-hydrolyzed rhamnose, which is obtained after hydrolysis

Various forms of carotenoids have been documented. These in the Aegale Marmelos are in charge of the process of giving fruit a pale golden hue. Umbelliferone, skimmianine, and marmelosin are the Bael plant's medicinally active ingredients. Ascorbic acid, sitosterol, tannins,  $\alpha$ -amyrin, carotenoids, and crude proteins are examples of minor elements that are also present. Other than these chemical components that comprise over 100 chemicals are the following: skimming, aegelin, cineole, cuminaldehyde, citral, citronellal, lupeol, luvangetin, eugenol, marmesinin, marceline, margarine, marmalade, psoralen, auraptin, margin, and tennis have demonstrated biological activity against a range of serious and mild diseases.[6,8,10,20,]

#### i. Alkaloids :

All secondary plant compounds, alkaloids make up the biggest single class. It has been reported that new alkaloids, such as ethyl cinnamate and OHalfordinol 3,3-(di dimethylallyl) and N-2-methoxy-2-[4-(3',3'-ethyl cinnamate, dimethylallyl oxy) phenyl] etc.[42,54]

#### ii. Terpenoids :

Aegle marmelos (L.) Correa's essential oil. In India, leaves have been thoroughly researched by several employees since 1950. As discovered,  $\alpha$ Phellandrene was the common component of leaves and twigs' essential oil as well as fruits. p-cymene (17%) and  $\alpha$ -Phellandrene (56%) were from leaf oil, according to a similar study that was later released on leaves essential oil by numerous employees. 3-en3,5-diol P-Menth-1 was isolated and described from the leaves of Aegle marmelos. The primary component was discovered to be limonene (82.4%). Limonene was demonstrated to be present in Aegle marmelos leaves.[42,54]

#### iii. Comargins:

Marmelosin, parmesan, imperatorin, margin, alloimperatorin methyl ether, xanthohumol,

scopoletin, scoparone, umbelliferone, psoralen, and marmelide have also been reported.[43]

#### I. Phenyl Propanoids :

These are naturally occurring phenolic compounds, which have an aromatic ring to which a side chain is attached. Among the phenylpropanoids are hydroxycoumarins, phenylpropenes, and lignans. The most widespread plant coumarin is the parent compound, coumarin itself which occurs in over twenty-seven plant families.

Marmesin was established as a new compound from leaves, which is also a constituent of heartwood and root.[45,53]

#### II. Tannins:

The maximum tannin content in bael fruit was recorded in January. There is as much as 9% tannin in the pulp of wild fruits, less in cultivated type. Tannin is also present in leaves as gallocatechin, it is also named 4, 7, 8 – trimethylxanthone - quinolone.[45]

#### III. Polysaccharides:

Galactose, arabinose, uronic acid, and L-rhamnose are obtained on hydrolysis [45,53].

#### IV. Flavonoids:

Mainly includes Rutin, Flavone, flavan-3-ols, and flavone glycosides.[46]

#### V. PHYSICOCHEMICAL PROPERTIES

##### Physical properties of bael fruit

- **Average weight:**

The weight of randomly selected three fruits is taken individually on an electronic weighing balance. Then average weight of the fruit is calculated and expressed in Grams.

- **Average length:**

The length of five fruits was measured with the help of Vernier Caliper and the average was calculated and expressed in cm.

- **Average diameter :**

The diameter of five fruits is measured and then the average is calculated and expressed in cm.

- **Number of seeds per fruit:**

The number of seeds per fruit of five fruits is measured manually then the average is calculated and expressed in numbers.

- **Thickness of rind:**

The thickness of the rind of five fruits is measured by Vernier Caliper and then the Average is calculated and expressed in mm.

- **Volume:**

For measuring the volume, the fruits are put in a measuring cylinder. The water is poured into this measuring cylinder up to the mark (A ml). After a few minutes, the water is drained in another measuring cylinder and the volume of water (B ml) is was. The volume displaced by fruits = (A -B) ml.

- **Specific gravity:**

The specific gravity of the fruits is calculated by applying the formula given below:

Specific gravity (g/cc) = Weight of fruits /Volume of water displaced

- **Pulp yield:**

It is the ratio of the edible part of the fruit i.e. pulp to the total weight of the fruit multiplied by 100. Pulp yield is calculated and expressed in percent.

Percent edible index = Pulp weight / Total weight of fruit x 100

- **Waste index :**

It is the ratio of the waste part of fruit i.e. pomace to the total weight of fruit multiplied by 100 and expressed in percentage.

Percent waste index = Weight of waste / Total weight of fruit x 100.

#### VI. CHEMICAL PROPERTIES

- **Chemical properties of bael :**

##### Extraction of pulp from bael fruits :

Before extraction of pulp, firstly ripe Bael fruits of uniform maturity, having greenish yellow color are selected. Then flesh of the fruit is separated manually from the rind fiber and seeds. The Bael fruits are thoroughly washed in running tap water and broken by striking against a hard surface. The fruit flesh along with its seeds and fiber is scooped out with the stainless steel spoon. An equal amount of water to the weight of the pulp is mixed which was kneaded, heated for 1 minute at

80 °C, and passed through a pulper to obtain homogenized pulp free from seeds and fiber. (Nidhi et al., 2007) .[59]

For analyzing the chemical properties of the fruit, the fruit is broken and the pulp, seed, and pericarp of the fruit are separated. Moisture, titrable acidity, crude fiber, crude fat, crude protein, and ash content are estimated by employing the standard methods of analysis. pH is measured by a control dynamic digital pH meter. Total sugar content is estimated by the phenol-sulfuric acid analysis using glucose as standard. The nature of the carbohydrate is confirmed by Molisch tests, Fehling's test, and the Iodine test. The total carbohydrate content is determined by the anthrone method.

- **Moisture:** Moisture refers to the amount of free water and volatile substances that are lost by drying the food under controlled temperature in a Hot air oven. It is expressed in g per 100 g sample.
- **Crude:** fat 5 g sample is weighed accurately in a thimble and defatted with petroleum ether in

Soxhlet apparatus for 6-8 hrs. at 70 °C. The resultant ether extract is evaporated and crude fat content is calculated. [57]

- **Total ash:** Total ash is determined according to A.O.A.C. (1990) . 5 gm sample is weighed into the crucible and ignited at low flame till all the material is completely charred. Then it is kept in a muffle furnace for 6 hrs. at 550 °C and further cooled in desiccators and weighed.

This is repeated till two consecutive weights are constant and the percent ash is calculated. [59]

- **Acidity:** As percent citric acid the acidity of the sample is calculated by the standard A.O.A.C. Method (1990) Acidity is expressed as percent citric acid. [59]
- **Ascorbic acid:** The ascorbic acid is determined by the method of Ranganna (1986). Dye factor = 0.5 Titer value. [60]
- **Dietary Fiber:** Total dietary fiber is analyzed according to standard AOAC methods [58]

Sr.No.	Plant Part	Chemical Constituents
1	Leaf	Skimmianine, Aeglin, Rutin, $\gamma$ -sitosterole, $\beta$ -sitosterol, Flavone, Lupeol, Cineol, Citral, Glycoside, O-isopentenyl, Hallordiol, Mameline, Citronellal, Cuminaldehyde phenylethyle cinnamamides, Euginol, Marmesinin, Aegelin, Glycoside.
2	Fruit	Marmelosin, Luvangetin, Auraptin, Psoralen, Marmelide, Tannin, Phenol
3	Bark	Fagarine, Marmin, Furoquinoline, Alkaloids
4	Seed	Essential oil – D- limonene, A-D-phellandrene, Cineol, Citronellal, Citral, P-cymene, Cumin aldehyde
5	Root	Alkaloid, Halopine, Coumarins, Terpenes.

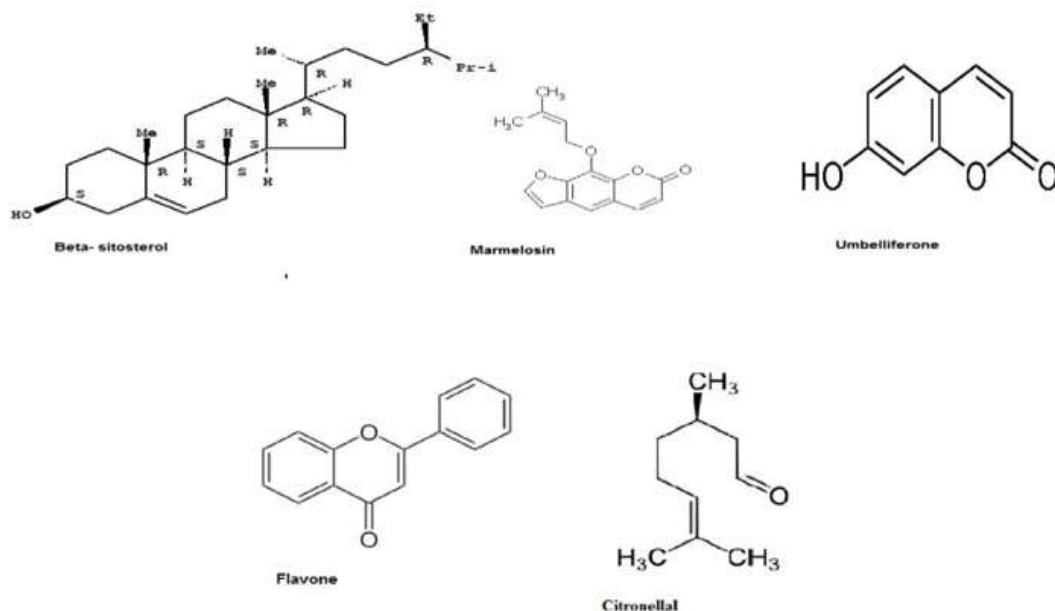


Fig : Structures of few important chemical constituents of Bael .

## VII. NUTRITIONAL USE

One of the most practical medicinal herbs in India is bael or *Aegle marmelos*; it has many applications in daily life. Research in physicochemistry shows that the nutritional value of bael fruit is high, and this has been utilized since a few years back.[3,5]

Bael pulp is an abundant supply of fiber, sugar, and glucose. Within traditional medicine, bael pulp is employed as a milk-based energy drink. That beverage is really helpful in clearing the stomach of hair. Other nutrients included in Bael include minerals, lipids, protein, carbs, calcium, phosphate, fibers, potassium, iron, nicotinic acid, vitamins A and B1, and vitamin C, riboflavin.

## VIII. COMPONENTS WITH MEDICINAL QUALITIES

The Bael is a sacred plant (Fig. 1), and every part of it is beneficial. Typically, one may observe that if one section of any plant exhibits pharmacological effects there's a good chance the other half will provide the same or a similar undertaking. The identical idea is applied to the Bael tree in this case. The Medicinal applications for various components the table contains a listing for *Aegle marmelos*. [4,21-26]

## CLASSICAL OR TRADITIONAL USE

Leaf, fruit pulp, flower, stem bark, root bark, and other elements of the *Aegle marmelos* plant are all valuable medicinally.

### Leaves:

They can be applied topically as an inflammatory or as a mild laxative allowing a free flow of mucous membrane fluid and for respiratory illness. The leaf decoction reduces fever or aids in acting as an expectorant, removing fever, or encouraging the clearing of the bronchial passages of mucus and discharge. The Leaf juice is administered when there is an abnormal buildup of constipation and fluid in the cellular tissue and yellowing of the skin.

Leaves are administered as a heated poultice in optimal hemorrhage or intense conjunctival irritation with sudden various body parts inflammation as well as bronchitis.[44]

### Root :

The infusion of the root and occasionally the bark of the stem is beneficial for treating intermittent fever, hypochondriasis, and heart palpitations. The root decoction is provided with fried rice and sugar to monitor gastric and diarrhea child irritability[49]. One of the components of the root is a common Ayurvedic treatment

for appetite loss. and puerperal illnesses, such as irritation of the uterus.[41]



Fig roots of Aegle marmelos



Fig . fruits of aegle marmelos



Fig flower of Aegle marmelos

**Fruit:** After diarrhea, fruit is consumed to aid in the healing process. Work well as a dysentery treatment and for mild astringency. The South Chhattisgarh traditional healers employ dry Fruit powder mixed with mustard oil to cure burns instances. Two parts mustard oil and one part powder are combined and used externally.

Additionally, fruits are utilized in digestive issues, constipation laxatives, tonic, and stomach problems gastric, cardiac, and brain tonic, ulcerative, antiviral, and intestinal gonorrhoea, epilepsy, and parasites.[38,47]

#### Ripe fruit:

Ripe fruit aids in digestion and can be used to alleviate rectum discomfort. The Ranikhet disease virus was susceptible to the antiviral activities of the ripe fruit extract. Pulp of ripe fruit is nourishing, aromatic, sweet, and refreshing when consumed right away. Marmalade made from fruit pulp is used as a preventative provided during cholera outbreaks, also to stop the spread of pile. Beneficial for individuals with persistent dysenteric illness marked by alternating bouts of constipation and diarrhea treats chronic flatulent colic in patients'

Stomach discomfort. Fresh fruit juice has a strong, bitter flavor. the extract reduces blood sugar levels.[3847]



Fig. ripe fruit of aegle marmelos

#### Unripe fruit:

*Ascaris lumbricoides* and *Entamoeba histolytica* were both well by the finely powdered unripe fruit. It also shows a noteworthy impact on intestinal parasites. Not quite ripe fruit is defined as cardiacal, restorative, tonic, digestive, demulcent, astringent in diarrhoea,



stomachache in diarrhoea, and administered in piles. Unripe fruit decoction is astringent and beneficial for persistent dysentery and diarrhoea. [41,55]

## IX. PHARMACOLOGICAL OR ETHNOBOTANICAL SIGNIFICANCE

### 1. Dysentery and Diarrhoea :

For treating diarrhoea and dysentery, bael fruit that is partially ripe or unripe is the most effective treatment. For this reason, ripe fruit is typically utilized, however the same is also displayed for the dried fruit powder. [3]

Third activity Infections in the digestive system comprise a broad range of symptoms and acknowledged infectious agents. GI illnesses include the One typical indication of intestinal disorder and have continued to pose a worldwide risk to human wellness. It results in morbidity and death over 4 million deaths and 1000 million episodes each year in infants younger than five. [9,27]

### 2. Anti-Diabetic Intent :

Globally, diabetes mellitus is a prevalent metabolic illness. A significant portion of the worldwide population experiences the same problems. The contemporary stress-reduction and consuming a lot of fast food, drinking alcohol and consuming it are the in charge of it.

Leaf extract has been utilized in The Ayurvedic medical system to treat diabetes. It improves utilization of the exogenous glucose burden in the body by promoting the absorption of glucose like insulin. The aqueous extract of bael fruit when taken orally and administered intraperitoneally has a hypoglycemic effect against streptozotocin—rats given artificial diabetes. Oral delivery of 500 mg/kg of an alcoholic and watery extract markedly caused hypoglycemia in healthy rabbits that have fasted. The hypoglycemic action of bael is also shown in male alloxan-induced diabetes rats with albinism. Numerous additional researchers have additionally demonstrated Aegle's hypoglycemic action. Marmelos [3,6,8,23,25,28,-30].

### 3. Anti-tumor activity :

Persistent erosion and damage to the stomach wall that might potentially penetrate and result in massive peritonitis, and hemorrhage induced by synthesis inhibition of prostaglandins, bicarbonate, and mucous [41, 42]. Bael prevents the growth of human tumor cells in vitro such as the

leukemic K562, and T- T-lymphoid [3] The majority of effective anti-cancer drugs are costly, carcinogenic, and mutagenic. 400 mg/kg of extract administered has demonstrated an antitumor effect in Ehrlich ascites animal model carcinoma [4,5]. It was discovered that the Aegle marmelos extract was harmful on all of the employed assays [6]. The fruit Bael extract is also utilized to strengthen the immunosystem mechanism that will ultimately boost the anti-cancer bodily action. [33,34]

### Cardioprotective Exercise :

Aegle marmelos leaf extract shows protective properties against isoprenaline-induced cardiac rats suffering from infarction. The creatine kinase's activity. Moreover, lactate dehydrogenase was considerably up in serum and markedly decreased in rats given isoprenaline in their hearts. Using bael as a heart depressant, as well as in palpitations, has been stated. [3]

### 5. Antifungal and antimicrobial :

In medicine, antimicrobial medications are used to treat food-borne illnesses. Utilizing medications extracted from plants high in antibacterial compounds might be a different approach to getting rid of these microorganisms.

The Aegle marmelos extract possesses antibacterial properties. It's been located active against a variety of animals, including *Proteus vulgaris*, *S. epidermidis*, and *Staphylococcus aureus*. Ranikhet's illness has also been treated with it. intestinal parasites and viruses. The essential oil derived from Bael leaves shows a range of effectiveness against various fungal isolates and the reason for concentration and time-dependent suppression of each investigated fungal species' spore germination. [3]

### 6. Constipation :

The loss of water from the fesses is the cause of constipation, which is why the person feels Aegle marmelos's mature fruit is a challenge. Excellent treatment for those with constipation because it is a supply of fiber because fiber is necessary for directing the GIT material towards the direction of elimination. The intestine is cleaned by Bael fiber. Regular usage up to three months of assistance in the removal of even the old excrement that had been collected in the colon. In the villages, people generally eat it as a source of energy. and its ripe pulp is combined in the summer with milk or water to make a

delicious beverage and as in addition to a remedy for the constipation individual [3]

### 7. Ulcerative peptic :

An ulcer results from an imbalance that causes the mucosal layer of the GIT to fail defensively between an attacking and protective element, such as acid. Numerous causes contributed to the development of peptic consumption of alcohol, acid secretion, and the H. pylori bacteria of smoking, drinking, and many other things. Additionally, Ulcer recurrence after medication discontinuation is common. One in 70 % of ulcers may reoccur. A mixture of leaves is a successful treatment for stomach ulcers. The water is used to soak leaves for a whole night. is tense and taken in the morning, it truly does work can heal ulcers, and provide patients with relief. The mature fruit of Bael is high in fiber and mucilage that covers the surface to form a barrier stomach.[3,5,6,2126]

### 8. Airway Infection:

The oil extracted from Aegle marmelo's leaves can be used to treat colds and infections of the respiratory system. The liquid taken out of the leaves is combined with the same amount of sesame oil and well-cooked; a few black pepper seeds and a scant teaspoon of black cumin are combined, and the heated oil is taken out of the burner and kept for later use.[3]

**Anti-inflammatory, antipyretic, and analgesic activity:** The anti-inflammatory properties of Aegle marmelos leaf extracts were examined in sequence. The pain killer and its antipyretic qualities were assessed as well. The majority of Extracts from the Aegle marmelos plant produced a substantial reduction of the paw edema caused by carrageenan and granuloma in cotton pellets in rats. Additionally, the excerpts demonstrated a significant analgesic effect by lowering the early and the last stages of mouse paw licking. An important Rat's hyperpyrexia was also reduced as a result of the majority of the extracts. This research was started in opposition to the antipyretic, antinociceptive, and inflammatory properties of the Aegle marmelos leaves.[48]

### 9. Cardiotoxic activity:

Aegle marmelos plant fresh fruit juice was utilized in varying dilutions for this purpose. To assess the activity, a single frog heart was used. Putting together. The current preliminary

research validates that superior Aegle marmelos have greater cardiotoxic action than digoxin. Additionally, Research demonstrates the decreased toxicity, and this will be the Aegle Marmelos's superiority against Digitalis.[50]

### 10. Antifertility activity:

The purpose of the study was to determine how efficient an aqueous extract of Aegle marmelos leaves was in reducing the number of eggs in albino rats' male reproductive system. There were three groups of six animals each in the study. As a control, I, the first group, was given distilled water. The animals in the second and third groups (II and III) were given the 250 mg/kg weight and 350 mg/kg bodyweight of aqueous leaf extract every day respectively for 45 days. Notable drops in the testicular weights, Seminal vesicles, and epididymis were seen. An amount associated decrease in the number of testicular sperm, epididymal aberrant sperm count, motility, and sperm count were noted. The outcomes demonstrated the effects of Aegle marmelos on the reproduction of male rats.[51]

### 11. Contractile Activity:

In the ileum and tracheal chain isolated from guinea pigs, an alcoholic bael extract at 1 mg/mL and 2 mg/mL can demonstrate contractile action. Maximum relaxation has been seen in the H1 receptor as a result of depression.

### 13 Anti-microfilariae:

Filariasis is a parasitic worm disease caused by filarid worms. Microfilariae motility loss can be aided by Vitex negundo L root extract and Bael leaf extract at a dosage of 100 ng/mL.

### 14. Antidandruff Activity:

The rind of the A. marmelos fruit is utilized in dandruff treatment. Excess hair loss and flaky scalp skin can also be treated by soaking the rind in coconut oil or ginger oil

### 15 Antiarthritic Activity:

Arthritis and gout are treated with raw bael fruit. When combined with heated mustard oil, its pulp can be administered to inflamed joints to relieve pain.

Sr.No.	Part	Pharmacological Use
1	Leaves	Anti-inflammatory, Ulcer, Cause Sterility, or abortion, laxative, asthma, Ophthalmia and eye affection, expectorant, cold and respiratory infection, backache, abdominal disorder, vomiting, cut and wounds, dropsy, beriberi, weakness of heart, cholera, diarrhea, cardiac tonic, control blood sugar, nervous disorders, hair tonic, acute bronchitis, veterinary medicine for wound healing, anti worms stimulation of respiration.
2	Root Bark	Intermittent fever and fish poison, palpitation, melancholia, anti-dog bite, gastric troubles, heart disorders, fever, anti amoebic, hypoglycemic, and rheumatism.
3	Flower	Stomach tonic, anti-dysenteric, Antidiabetic, diaphoretic, and as a local anesthetic, epilepsy, and as an expectorant.
4	Fruit	Dysentery, diarrhea, gastric troubles, constipation, laxative, tonic, digestive, stomachic, brain and heart tonic, ulcer, antiviral
	Ripe	Treatment of rectum inflammation, antiviral, sweet, cooling, aromatic, nutritive, dysentery.
	Unripe	Astringent, dysentery, stomachache in diarrhea, tonic, digestive, demulcent, treatment of piles.
5	Seed	Antibacterial, antifungal.

**Miscellaneous Properties:**

Apart from the activity listed above, there is a little more important activity. The leaves of Aegle marmelos are useful in the treatment of jaundice and leucorrhoea, conjunctivitis, and defense and shown to exhibit antiepileptic action. Fruits give energy and nutrition. It is used in the carminative and astringent and is also a good remedy for snake bites. Application has also been reported in fractures, typhoid, coma, and colitis. The methanolic extract of Aegle marmelos gives anxiolytic, antidepressant effects, and anti-anemic action. A marvelous essential oil was found to have insect-controlling properties

**MARKETED PRODUCT'S [1]**

- 1. Food-** Using a bael fruit make a jam, beverages, toffee, Tamarind, sauce, muramba, syrup (sarbat).
- 2. Fodder-** Leaves and twigs are used for fodder.
- 3. Timber-** It is used for cards and construction. it is a base utilized for small-scale turnery, tools, knife handles, pestle combs, etc.
- 4. Gum and resins-** It is commonly used as glue using a bael fruit or seed mixed with lime plaster for waterproofing walls and added cement to make a building wall.

**5. Tannin or Dyestuff-** Tannin is present in fruit and leaves to yield yellow dye for calico and silk fabric.

**6. Essential oil-** The leaves are used as an essential oil for hair oil.

**7. Poison** – The leaves cause abortion and sterility in women. The bark is used as fish poison in the Celebes, The Leaf extract of bael important pest of rice plants in Asia.

**8. Medicine** – Using an unripe bael fruit with funnel and ginger in hemorrhoids, it is maintaining normal skin color. It is used in the treatment of leukoderma. Mermelosin is found in bael fruit for laxatives and diuretics. bael fruit is used in most of the diarrhea and dysentery prevalent in India for the summer month

**9. Other Product** - The bael fruit is used as a detergent action for washing clothes. The flower is used as the perfume.

#### IV. FUTURE SCOPE

There search and investigation indicate that the Aegle Marmelos formulated products business has a promising future.

Based on the herbal researcher's investigation and market comprehensive study, discovered that individuals who choose to use more herbal goods and antiquated treatments nowadays solve their issues. Nowadays, the use of herbal products is growing among individuals. This is the herbal products age. Most people favor therapeutic plants over artificial ones and synthetic substances. Due to their diligence, the current generation selects the appropriate products through comparative analysis of the items made with herbal formulations. The paper includes a thorough examination of the worldwide herbal sector, which seeks to provide an extensive market intelligence analysis related to significant commercial elements. The mentioned two chemical constituents have medicinal use and can be used as a medicine in the future which are as, Skimmianine is a furoquinoline alkaloid present mainly in the Rutaceae family, With an antiplatelet aggregation effect .haloperidol is used to treat nervous, emotional, and

mental conditions (eg schizophrenia). It is also used to control the symptoms of Tourette's disorder. This medicine should not be used to treat behavior problems in older adult patients who have dementia

The study concludes the various parts of A. marmelos; preclinical studies are performed for different activities. Many chemical compounds are isolated, but fewer studies are conducted. In the future, clinical trials will be conducted for those activities. The demand for Bael fruit is likely to increase due to its growing popularity as a health food and ingredient in various food and beverage products. Additionally, the growing interest in traditional and natural remedies for various health conditions is likely to drive demand for Bael fruit.

#### V. CONCLUSION

There are still many people who practice traditional medicine for a variety of reasons. Rapid population growth, a shortage of medications, and adverse effects from various allopathic medications and a growing resistance to the medications used to treat illnesses have caused a rise in the focus on using plant materials as a supplier of human medications. It is quite powerful. I thought that the thorough information provided in this review on the biological characteristics and phytochemicals of the plant extracts may offer comprehensive proof of the use of this plant in a variety of medications. In the past, Aegle marmelos, Or Bael has been utilized for the quantity of for ethnobotanical reasons. Currently, Aegle Marmelos possesses grown to be a significant source of medication for treating a range of illnesses in humans and animals. In addition to investigating the potential for utilizing various Aegle marmelos plant sections to manufacture standardised medications, the creation of jam using its fruits ought to be advertised as a health supplement in commercial scale. In addition to modes of action just a small number of bioactive substances have been found thus far. Therefore, a great deal of research is needed to determine the modes of action and the different substances' bioactivity phytochemicals and the effectiveness and medicinal properties of Aegle's marmelos. Consequently, Aegle Marmelos may soon be used even more as a source of beneficial phytochemicals and could be crucial to contemporary medical system



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