



## **A Succinct Exploration on *Bilwa* (*Aegle marmelos*) Plant – A Literature Review**

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### **Authors' contributions**

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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### **ABSTRACT**

*Aegle marmelos* (L) Correa (family: Rutaceae) is used to treat a wide range of ailments. This plant has been around since prehistoric time. As it produces a number of alkaloids, all aspects of the plant, including fruits, leaves, bark, stem, and root, are used to treat variety of diseases. Antidiarrheal, antidysenteric, antipyretic, and anti-inflammatory properties are some of the most important medicinal properties of *Bilwa*. Fruit-derived compounds have been shown to have biological promise in the treatment of diseases such as diabetes, gastric ulcers, and hyperlipidaemia. Many experiments have been conducted on its medical properties and uses which demonstrate its importance in today's environment. The anatomy, distribution, dietary action, Ayurveda applications, and pharmacological properties of this plant is outlined in this review manuscript.

**Keywords:** *Pharmacological properties; antidiabetic; antidysentery; Aegle marmelos.*

### **1. INTRODUCTION**

Thousands of years have passed as many plants have been used for their medicinal properties.

Around 85% of the world's population relies on conventional medicine for primary health care, either entirely or partly. *Ayurveda*, *Siddha*, and other systems of medicine use these herbs. Our

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ancient literature, such as the *Rigveda*, *Yajurveda*, *Charaka Samhita*, and *Sushruta Samhita*, *Astanga Hridaya*, has mentioned their properties and applications for treating various diseases [1]. *Bilwa* is one of them, and it's also known as the wood apple vine.

*Bilwa* is one of Hinduism's sacred plants. Since ancient times, leaves have been offered in prayers to *Shiva* and *Parvati* [2]. It has trifoliate leaves with spear-shaped leaflets that resemble *Trisula*, Lord *Shiva's* shield. This tree is connected to many legends and myths [3]. Another interesting aspect about *Bilwa* is that the *Sattva* portion is higher in its *patra*, giving it greater ability to absorb and emit *Sattvika* frequencies. This has a variety of outcomes.

The roots of *Bilwa* have antiemetic property. Paste prepared out of its root are used as an external application in poisonous bites. Decoction made out of its root bark is used in curing fever, hypochondriasis and insomnia. The juice of fresh leaves of *Bilwa* is used to cure jaundice. The unripe fruit is used in diarrhoea and dysentery [4].

The removal of *Raja-Tama* particles in the atmosphere is one of them. When a *Sattvika* leaf, such as *Bilwa Patra*, is put near a person who is feeling negative emotion, the black energy inside him is reduced [5]. *Bilwa* is said to include antimicrobial, anti-diabetic, anti-inflammatory, analgesic, anti-pyretic, wound healing properties [6].

## 2. AIM AND OBJECTIVE

To evaluate the study of *Bilwa* plant according to its *Ayurveda* Pharmacology and Pharmacognosy

## 3. MATERIALS AND METHODS

The collection of data of *Bilwa* (*Aegle marmelos*) plant from literary sources such as Articles, Samhithas, Nighantus and research works.

### 3.1 Plant Morphology According to Modern Science

*Aegle marmelos* is a slow-growing medium-sized tree with a small trunk, dense, fuzzy, flaking bark, and sometimes spiny branches that can rise up to 12-15 metres tall. Often rigid, straight spines are worn by young suckers. *Bilwa* is a deciduous tree with alternating leaves that are borne singly or in clusters and are made up of 3-5 oval,

pointed, and shallowly toothed leaflets that are 10 cm long and 2-5 cm thick, with a long petiole [7].

### Classification:

- Kingdom- *Plantae*
- Family- *Rutaceae*
- Subfamily- *Aurantioideae*
- Genus- *Aegle*
- Species- *marmelos*

### Ayurvedic Pharmacodynamics of *Bilwa*:

- Rasa - *Madhura*
- Guna -*Laghu*
- Virya -*Sheeta*
- Vipaka- *Madhura*
- Karma -*Mutrala, Tridoshaghna, Shothahara, Vedanasthapana, Raktastambhana, Deepana.*

### 3.2 Plant Habitat and Geographical Distribution

*Bilwa* is a native of India, and it is most commonly found in the Himalayan and West Bengal regions. It rises in Uttar Pradesh, Chhattisgarh, Bihar, Madhya Pradesh, and Jharkhand [8] Egypt, Malaysia, Bangladesh, and Sri Lanka are some of the exotic places where *Bilwa* can be found.

### 3.3 Active Principles

All the parts of *Bilwa* contains beta sitosterol. The fruits and are rich in amino acids as well as carbohydrate, carotene, tannins, vitamins and marmelosin. Leaves contains skimmianine and alpha-phellandrene. The pericarp contains dictamnine, marmin, umbelliferone. Alkaloids are the most numerous and diverse group of secondary plant compounds, O-3,3-(dimethylallyl) halfordinol, N-2-methoxy-2-[4-(3',3'-dimethylallyloxy) phenyl] ethyl cinnamamide, and others have been isolated from the leaves of *Aegle marmelos*. The therapeutically active principles of *Bilwa* are marmelosin, skimmianine, and umbelliferone [8].

**Nutritive Value:** *Bilwa* has amazing nutritious value, according to a physiochemical study. The fruit pulp of *Bilwa* is a good source of glucose and sugar, and it can be combined with milk to produce an energy drink. Proteins, fats, fibre,

calcium, minerals, iron, vitamin A, vitamin B1, vitamin C, and riboflavin are some of the other nutrients contained in *Bilwa*. The people of Indonesia consume it's leaves and shoots as green vegetable [9].

### 3.4 Pharmacological Properties

**Antioxidant activity:** *Bilwa* is said to have antioxidant properties against a number of free radicals. According to a recent *Bilwa* report, the percentage of free radical inhibition was higher in unripe fruit than in ripe fruit. DPPH radical scavenging was used to test the antioxidant efficacy of an aqueous extract of *Bilwa* fruits [10].

### 3.5 Antimicrobial Action

*Bacillus subtilis*, *Staphylococcus aureus*, *Esteria coli*, and *Pseudomonas aeruginosa* displayed the most antibacterial activity. *Trichophyton mentagrophytes*, *Trichophyton rubrum*, *Microsporum gypseum*, *Microsporum audouinii*, *Microsporum cookie*, *Epidermophyton floccosum*, *Aspergillus niger*, *Aspergillus flavus*, and *Histoplasma capsulatum* have all been shown to have antifungal action from the essential oil extracted from the leaves of the *Aegle marmelos* tree [11]. The antimicrobial activity of various extracts was also measured using the agar well diffusion process. Hexane, cold methanol, hot methanol, and ciprofloxacin extracts were shown to have high antimicrobial activity against *E. coli*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *Micrococcus luteus*, *Enterococcus faecalis*, and *Streptococcus faecalis* [9].

**Antidiarrheal Action:** *Bilwa*'s unripe fruit is an important diarrhoea and dysentery treatment that has been used by humans as a traditional medicine. *Bilwa* has been shown to have antidiarrheal effects in many studies. The ethanolic extract was effective against *Shigella boydii*, *Shigella sonnei*, and *Shigella flexneri*, but only moderately effective against *Shigella dysenteriae* [12].

**Antidiabetic Action:** *Bilwa* has been shown in several experiments to have anti-diabetic properties. In alloxan diabetic rats, the anti-diabetic efficacy of *Bilwa* leaves was discovered. The Methanolic extract of *Bilwa* leaves lowers blood sugar. According to this, after 12 days of consistent administration of the concentrate, blood sugar levels were found to be decreased by 54 percent [8]. Ayurvedic medicine has used leaf extract to treat diabetes. It improves the body's ability to utilise additional glucose loads

by stimulating glucose uptake, similar to insulin [13].

### 3.6 Anticancer Activity

In both developed and emerging nations, cancer is the second leading cause of death of both men and women. *Bilwa* fruit extract is used to boost the immune system, which in turn boosts the body's anticancer response. In an animal model with carcinoma, the *Bilwa* also had an anticancer effect, according to a study [14]. *Aegle marmelos* leaf extracts were found to inhibit the development of leukemic K562, T-lymphoid Jurkat, B-lymphoid Raji, erythroleukemic HEL, melanoma Colo38, and breast cancer cell lines MCF7 and MDA-MB-23122 in preclinical studies.

### 3.7 Antipyretic Properties

*Bilwa* is antipyretic and is used to treat fever and discomfort. The Ethanolic extract provided a substantial reduction in elevated body temperature in a dose dependent manner at doses of 200 mg/kg body weight and 400 mg/kg body weight, according to the *Bilwa* report. The extracts had an antipyretic activity equivalent to paracetamol (100 mg/kg body weight ) [15, 16].

**Hepatoprotective Properties:** *Aegle marmelos* leaves were used as a control group in a trial on animals with four groups receiving 30 percent ethyl alcohol for 40 days. The findings of the experiment show that the leaves of *Aegle marmelos* have a strong hepatoprotective effect [17].

**Cardio protective Properties:** In rats, *Bilwa* leaf extract has a beneficial function against isoprenaline-induced myocardial infarction. *Bilwa* has also been used as a heart depressant and for palpitation [18]. For cardiotoxic operation, fresh *Bilwa* fruit juice was used at various dilutions. The latest research backs up *Bilwa*'s superior cardiotoxic activity over digoxin. Antihistaminic, anti-inflammatory, insecticidal, antioxidant, immunomodulatory, wound healing activity, anticonvulsant, and antifertility effects are some of the other properties of *Bilwa*.

**Therapeutic Actions:** The root treats "*Tridoshaja jwara*, stomach pain, heart palpitations, urinary disorders, hypochondriasis, and eliminates "vata, pitta, and kapha." The leaves are astringent, digestive, laxative, and expel "vata and kapha," making them effective in the treatment of ophthalmic, deafness, and inflammations. The flowers relieve thirst and vomiting, making them effective in the treatment

of dysentery [19]. The ripe fruit is hot and dry, tonic, restorative, astringent, laxative, and useful to the heart and mind. When ripe fruit is turned into morning sherbet, it is soft, aromatic, and refreshing, and it cures dyspepsia. The unripe fruit is a cure for diarrhoea and dysentery.

**Mode of Action of *Bilwa Phala Majja* in *Pandu Roga*:** The effects of *Bilwa Phala Majja* is *Pandugna*, *Varnya*, *Pitta-Kaphagna*, *Balya* and *Rasayana*. It is supposed to increase digestive power and clears *strotorodha*. The *Bilwa Phala Majja* acts most adaptively in this disease condition and attributes to the restoration of dhatubala. *Bilwa Phala Majja* is able to remove *Ama dosha*. Action of the medicine mainly depends upon its subtle constituents like *Rasa*, *Guna*, *Veerya*, *Vipaka*, *Prabhava* etc [20].

#### 4. DISCUSSION

*Bilwa* is a sacred plant with many properties. *Bilwa* can be used to cure a variety of toxins-related ailments. It is used as an antidote for snake venom in *Ayurveda*. *Kashaya*, *Madhura*, and *Tikta Rasa*, as well as *Ushna Virya*, are all present. As a result, the *Bilwa* fruit is said to be very beneficial in diarrheal conditions. Coumarins and Sterols are two components that have antimicrobial, anti-inflammatory, antipyretic, analgesic, antidiabetic, hepatoprotective and anticancer, effects. *Bilwa* is an indigenous plant that is used to treat a variety of toxins. Toxicity can damage an organ or a system, and testing has shown that *Bilwa* can help treat a variety of toxins-related disorders. CCl 4 and Gentamycin, respectively, have hepatoprotective and nephroprotective effects on *Bilwa*.

*Bilwa's* antioxidant, antibacterial, and antifungal activities also refer to its antitoxic abilities. The most prominent signs of corrosive and irritant poisoning are pain and inflammation, both of which *Bilwa* can help with. It also defends against genotoxicity efficiently. Furthermore, a recent study found that activated carbon made from *Bilwa* fruit shells is an effective adsorbent for removing the radioactive metal chromium from the aqueous process.

#### 5. CONCLUSION

*Bilwa* is an auspicious plant with many beneficial properties. Our ecosystem is rich with medicinal plants, but most of the people are ignorant of their significance. As a consequence, it is a means of telling people about what they have left behind. The presence of numerous

phytochemicals in *Bilwa*, it has antimicrobial, antioxidant, antidiabetic, antipyretic, and anti-inflammatory function, it is cost efficient too. For improved economic and productive use of goods, a systematic research and development initiative should be pursued.

#### CONSENT

It's not applicable.

#### ETHICAL APPROVAL

It's not applicable.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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