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A COMPREHENSIVE REVIEW OF BILVA LEAVES TO IT'S ANTI – TOXIC ACTIVITY

***[1]Neha G. Deokate, [2]Dr. Amita B. Dongare, [3]Prof. Sandhya R. Kolekar**

*[1]Ekanath Sitaram Divekar College of Pharmacy, Varvand 412215.

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***Corresponding Author**
Neha G. Deokate
Ekanath Sitaram Divekar College of Pharmacy, Varvand 412215.

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ABSTRACT

Commonly referred to as bilva, Aegle marmelos is a traditional medicinal plant that has long been used in Unani and Ayurvedic medicine. The goal of this thorough review is to provide an overview of the state of our understanding on the pharmacology, phytochemistry, and therapeutic uses of bilva leaves. The plant's therapeutic potential is enhanced by a variety of bioactive components, such as terpenoids, flavonoids, and alkaloids. The anti-inflammatory, antibacterial, antioxidant, and antidiabetic qualities of bilva leaves have been demonstrated, making them a viable option for the treatment of a number of illnesses, such as cancer, diabetes, and cardiovascular disease. The potential of bilva leaves in the creation of novel medications and treatments has also been investigated in recent research. A staple of Ayurveda and Hinduism, bilva leaves represent the fusion of science and spirituality. This thorough analysis explores the pharmacological, botanical, and phytochemical profiles of the leaf, demonstrating its antibacterial, anti-inflammatory, and antioxidant qualities. This thorough examination highlights Bilva's potential as a comprehensive treatment for a range of illnesses by examining its historical applications in Ayurvedic medicine, its spiritual importance in Hindu ceremonies, and its contemporary usage in preventive and curative healthcare. An organ or system can be harmed by toxicity, and studies have shown that hepatoprotective and nephroprotective properties, antioxidant, antibacterial, and antifungal properties, as well as efficient protection against genotoxicity, are beneficial. Numerous studies have been conducted and have demonstrated the anti-toxic properties of bilva under various

circumstances. The paper examines and evaluates the anti-toxic qualities of bilva from both Ayurvedic and modern perspectives, drawing on both recent research and original literature.

KEYWORDS: Bilva Leaves, Aegle Marmelos, Ayurveda, Hinduism, Phytochemistry, Pharmacology, Traditional Medicine.

INTRODUCTION

The bael tree, or bilva (Aegle marmelos Corr.), is a member of the Rutaceae family. In addition to mixed deciduous and dry dipterocarp forests, the tree grows wild in the hills and plains of central and southern India, Bangladesh, and Burma. Bael is a tree of intermediate size, growing between 6.0 and 7.5 meters. It features cream-yellow or yellowish-brown, leathery, and faintly scented bark, as well as a robust, woody, rather big, and frequently bent root. Its branches have axillary, straight, pointed spines that are 2.5 cm long. Bilva features globose, grey or yellowish fruit with sweet, thick, orange pulp, trifoliate, sometimes five-foliate leaves, and greenish-white flowers. Ripe fruit is used to treat stomach and digestive issues. For many years, A. marmelos's leaves, fruits, stem, and roots have been utilised in ethnomedicine. Astringent, antidiarrheal, antidysenteric, demulcent, antipyretic, antiscourbutic, haemostatic, aphrodisiac, and an antidote to snake venom are just a few of its therapeutic qualities.[1,2]

Its trifoliate leaves have spear-shaped leaflets that resemble Lord Shiva's weapon, the thrisoolum. This tree is linked to numerous myths and folklore. Another feature about bael is that it has a greater capacity to absorb and emit Sattvik frequencies since it contains a larger percentage of the Sattva component than bilwa patra. This has a number of consequences. The decrease of raja-tama particles in the atmosphere is one of them. When a Sattvik leaf, such as bilva patra, is placed close to a person experiencing negative energy or distress, the black energy that is inside of him is lessened. The plant's therapeutic potential is enhanced by its abundance of bioactive substances, such as terpenoids, flavonoids, and alkaloids. Bilva leaves have been shown in recent research to have anti-inflammatory, antibacterial, and antioxidant properties, making them a prospective treatment option for a number of illnesses.[3,4]

Since ancient times, several plants have been utilised for their therapeutic qualities. For their primary medical requirements, almost 80% of people worldwide rely entirely or in part on traditional medicine. Ayurveda, Siddha, Tibetan, and all other medical systems use these

plants. Their qualities and use in the therapy of various disorders are also described in our ancient literature, including the Rigveda, Yajurveda, Atharvaveda, Charak Samhita, and Sushrut Samhita.[5] One of these is the bilwa, often known as the wood apple plant. One of the sacred trees in Hinduism is the bael.[6]

Recent research has confirmed the traditional usage of bilva and found that it contains a rich phytochemical profile that includes flavonoids, glycosides, and alkaloids. Its anticancer and antioxidant qualities have been shown in studies, highlighting its potential as a comprehensive solution to contemporary health issues. By combining traditional knowledge with current scientific study, this thorough review seeks to offer an in-depth analysis of bilva leaves. This investigation aims to shed light on the many facets of bilva's significance, including its potential uses in curative and preventive healthcare, by examining its botanical, phytochemical, pharmacological, and spiritual elements.[7,8,9]

EXAMPLE

1. **Anti – Diabetic Activity:** It has been demonstrated that bilva leaves lower blood glucose levels in diabetics.
2. **Antimicrobial Activity:** It has been demonstrated that bilva leaves have antibacterial properties against a variety of microbes.
3. **Antioxidant Property:** Antioxidants found in bilva leaves can aid in preventing oxidative stress and cell damage.
4. **Anti - Inflammatory Property:** It has been demonstrated that bilva leaves have anti-inflammatory qualities, which may help lessen inflammation and ease the symptoms of diseases like arthritis.

Figure 1: Leaves Of Bilva Plant.

Taxonomical Classification

1. Kingdom: Plantae
2. Phylum: Angiospermophyta
3. Class: Magnoliopsida
4. Order: Sapindales
5. Family: Rutaceae
6. Genus: Aegle
7. Species: A. marmelos
8. Subspecies: A. marmelos subsp. marmelos
9. Variety: A. marmelos var. marmelos
10. Forma: A. marmelos fo. marmelos
11. Botanical Name: Aegle marmelos Corrêa.
12. Common Names: Bilva, Bael, Bel, Indi**an** Bael, Holy Leaf.

Vernacular Name

English: Wood/Stone apple, Indian Quince

Bengali: Bel, Shreefal

Hindi: Sir Phal

French: Oranger du Malabar

Indonesian: Mojo tree

Javanese: Modjo

Khmer: Banu

Latin: Aegle marmelos

Marathi: Kaveeth

Nepali: Bel, Gudu

Sanskrit: Shreephal, Bilva, Bilwa

Tamil: Vilva Maram, vilva Pazham

Telugu: Maredu

Urdu: Bel.

Synonyms

1. Aegle marmelos var.
2. typica.
3. bilva,
4. Aegle armelos.

Biological Source: The biological source of bilva leaves, also known as bael leaves, is the Aegle marmelos tree.

Family: Rutaceae

Geographical Source: India, Nepal, Thailand, Philippines, Bangladesh, Maleshiya, Shrilanka.

Chemical constituents

1. **Flavonoids:** Plant substances that have anti-inflammatory and antioxidant qualities. Such as :

Rutin : A flavonoid glycoside that may be beneficial to health.

2. **Alkaloids:** A class of compounds known for their therapeutic effects.
3. **Phenolic acid:** Compounds with antioxidant properties, including:
4. Protocatechuic acid : An acid that is phenolic with possible medicinal benefits.
5. **Terpenoids:** A broad category of substances with possible therapeutic uses.
6. **Sterols:** Plant compounds with potential health benefits, including:

ß-sitosterol : A sterol that may have medicinal benefits.

y-sitosterol : Another sterol found in Bilva leaves.

Chemical Structure

1. Chemical Structure of marmelosin.

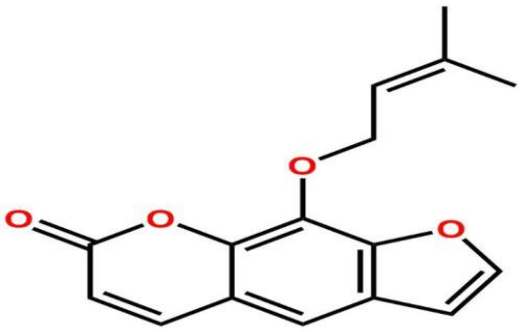

Figure 2: Marmelosin.

2. Chemical Structure of Aegeline

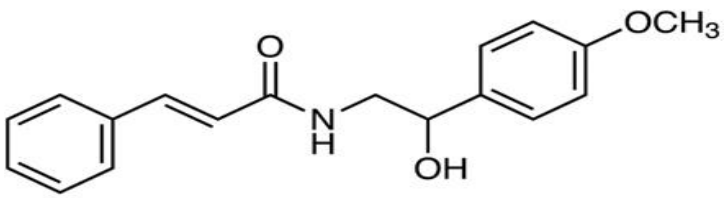

Figure 3: Aegeline.

CELESTIAL USES

1. After reciting the Shrisuktam a thousand times, the bilvaroot powder ingested during Pushyanakshtra should be combined with ghee, honey, and gold. It provides prosperity and health every morning.[10]
2. For Vishtambhajambhana, Dusvapnanashana, Rakshoghna, Rasayana, Prajasthapana, Vishaghna, and Shamaka in ShankhyanaAranyaka, it is recommended to wear "Bailvamani" (fruit) as an accessory.[11]
3. The Nakshtra shanti poojas, specifically those of Dhanishtha, Shatabhisha, Purva Bhadrapada, Uttara Bhādrapadā, and Revati Nakshtras, are conducted with the aid of the Bilva stem. Wearing Bilva-danda during an Upanayan Samskara is advised.[12,13]
4. Bilva flower is one of the Ashtapushpa that Lord Shiva likes, and its flower is useful in Nakshtra puja.[14]

Hepatoprotective activity of bilva

Research has indicated that Aegle marmalos possesses hepatoprotective properties. Aegle marmelos crude leaf powder may be able to prevent CCl4-induced liver damage in albino rats, according to a recent study that used an animal model. A comparison between the usual medication Liv 52 and the hepato-protective action of Aegle marmelos leaf powder revealed a favourable outcome.[15]

Anti-genotoxic activity of Aegle marmelos

Recent research using Escherichia coli PQ37 and the Comet assay in peripheral human blood lymphocytes has demonstrated that methanol and acetone extract of Aegle marmelos fruit reduces the SOS response induced by hydrogen peroxide and aflatoxin B1 in the SOS chromotest.[16]

Anti-inflammatory activity of Bilva

Inflammation and pain are prevalent symptoms of many illnesses. A variety of chemical components are present in bilva (Aegle marmalos). Among these, Marmin, a coumarin that was extracted from bilva roots, demonstrated an anti-inflammatory impact on rats' inflammation caused by carrageenan. Bilva's bark and root are used to extract marmin, marmesin, umbelliferine, and skimmianine, which also have anti-inflammatory properties.[17]

Anti-oxidant activity of Bilwa

Recent research on Bilwa has demonstrated that Aegle marmelos extract successfully decreased the oxidative stress brought on by alloxan. According to a different study, Aegle marmelos leaf extract exhibits potent antioxidant properties.[18,19]

Nephroprotective activity of Bilwa

Aegle marmelos leaf aqueous extract significantly reduces Gentamycin-induced nephrotoxicity in wistar rats, according to an experimental investigation.[20]

Antibacterial and antifungal activity

Bilva extract has been shown to have an impact on both gram-positive and gram-negative bacteria. Additionally, it has been demonstrated that bilva leaf extract can suppress fungal spore germination.[21]

GENERAL USES

1. The wood is strong, shiny, and fragrant, with a yellowish or grayish white color. The wood can be used to make livestock shelters, agricultural tools, carts, and houses (22).
2. The leaves and twigs are used as fodder, and the twigs are used to produce chewing sticks or tooth brushes.
3. The fruit's shell is used to smell hair oil in Siam. Marmelle oil is an essential oil extracted from the rind of crops.
4. The highly nutritious, sweet, aromatic fruit pulp is used to make Sharbat and, due to its detergent qualities, is also used in place of laundry soap.[23]

ETHANOMEDICINAL USES

The plant, Aegle marmelos, is well known for its many ethnomedical uses, including its fruit, roots, bark, leaves, and flowers. Aegle marmelos has astringent, carminative, and anti-venom properties. It is also used to treat thyroid-related conditions.[24] In addition to treating anaemia, fractures, swelling joints, pregnancy issues, typhoid, coma, colitis, bleeding sores,

and cramping, it is also utilised as a heart stimulant.[25] Fruit is one of the essential components that can treat the greatest number of illnesses. Fever, abdominal pain, anorexia, urinary problems, hypochondriasis, melancholy, and heart dysfunction are all treated with roots. Asthma, bronchitis, influenza, cough, cold, and other respiratory conditions are all alleviated by leaves, which are also used to reduce inflammation, high blood pressure, and menstrual issues. Bael is used to treat haemorrhoids by consuming a mixture of dried and powdered Bel leaves, carom seeds, dried ginger, and black pepper in a glass of lukewarm water or buttermilk. The pulp and dried leaves of Bael are used to get rid of helminths and boost appetite. When fresh, leaves are used as a febrifuge, laxative, astringent, and digestive aid. They also help with inflammation, hearing loss, and ophthalmia. The unripe fruit is used to treat diarrhoea. Astringent, appetising, laxative, tonic, restorative, and febrifuge are further uses for the ripe fruit. Aegle marmelos fruit powder possesses anti-cancer and anti-proliferative properties. Pregnancy vomiting can be treated by eating a mixture of boiled rice water and unripe fruit pulp twice day. To treat urinogenital diseases, unripe fruit pulp is combined with milk and sugar. Unripe pulp that has been partially boiled and combined with sugar is crucial for treating abscesses and dysentery. When taken daily, the leaf extract of Aegle marmelos is used to treat intestinal worms, ulcers, and ophthalmia. Leaf juice from A. marmelos has several therapeutic uses, particularly in the management of diabetes.[26]

TOXICITY STUDIES

Aegle marmelos is used as a nutritious food and has a number of therapeutic uses. However, because A. marmelos leaves have historically been used to sterilise women and induce abortions, they are not given to pregnant or nursing women. A. marmelos leaves have recently been investigated for their acute and subacute toxicity characteristics. Wistar albino rats were used to investigate the LD50 values of acute and subacute toxicity effects of various extracts of A. marmelos leaves. The findings showed that the LD50 value of the various extracts ranged from 1300 mg to 1700 mg/kg body weight of different animal groups. The histological investigations showed no alterations following the administration of 50 mg/kg body weight (daily, 14 days). The topological profile of A. marmelos's dried fruit pulp was examined. Swiss albino mice were given ethanol extract of A. marmelos dried fruit pulp at doses of 550 and 1250 mg/kg body weight to test for acute oral toxicity.[27]

The test extract did not exhibit any toxicity at these doses. The mice's behaviour and physiological activities did not change during the course of the 14-day investigation. The findings showed that the test extract's LD50 values exceeded 1250 mg/kg body weight.[28]

CONCLUSION

The review emphasises the potential of bilva as a holistic remedy for a range of illnesses by fusing traditional wisdom with cutting-edge scientific research. To completely investigate its medicinal potential and applications, more research is required. The anti-inflammatory, antibacterial, antioxidant, and antidiabetic properties of bilva leaves are among its many medicinal potentials. The molecular processes and therapeutic uses of bilva leaves require more investigation. Alkaloids, terpenoids, vitamins, coumarins, tannins, carbohydrates, flavonoids, fatty acids, essential oils, and a few additional unidentified substances are among the compounds that have been isolated. The primary focus of this review was on a number of phytochemicals and documented pharmacological investigations of A. marmelos (Bilva leaves).

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