

A Breif Review on the Leavesofaegle Marmelos (Linn.)

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Date of Submission: 01-07-2024

Date of Acceptance: 10-07-2024

ABSTRACT: Dermatophytic infections, such as fungal skin conditions, pose a significant health concern worldwide. Traditional herbal medicine has long been utilized for its therapeutic properties in addressing such ailments. This study explores the potential of wood apple (*Limonia Acidissima*) as a natural remedy for dermatophytic infections. Wood apple, known for its antimicrobial and anti-inflammatory properties, offers a promising avenue for dermatophytosis treatment. This review examines the various bioactive compounds present in wood apple, their mechanisms of action against dermatophytes, and their potential as an alternative or complementary treatment option. Furthermore, the study discusses the importance of research in harnessing the full potential of herbal medicine and the significance of wood apple in combating dermatophytic infections in a natural and sustainable manner. Wood apple also shows the presence of anti-microbial activity which has been proven useful against Bacteria and fungi

Keywords: Herbal formulation, Wood apple, Topical dosage form, Anti Microbial activity

I. INTRODUCTION

Herbal formulations refer to a form of medication comprising one or more herbs or processed herbs in specific quantities designed to offer distinct nutritional and cosmetic benefits. These formulations are intended for use in diagnosing, treating, or mitigating diseases in humans or animals, as well as altering the structure or physiology of individuals. Herbal medicines offer a viable and effective approach to address various minor conditions, including scrapes, rashes, and burns. Moreover, they present a cost-effective alternative for treating more chronic ailments such as migraines, arthritis, and depression. Their affordability is a notable advantage, as they can be easily procured from local supermarkets or cultivated at home, reducing the financial burden on individuals. According to Christopher Golden from Harvard University Center for the Environment, substituting herbal medicines for

pharmaceuticals could lead to substantial annual healthcare savings, ranging from 22% to 63%. It is worth noting that herbal remedies are not confined to obscure sources; they are naturally present in everyday foods like ginger, garlic, and rhubarb.

However, these benefits come with certain drawbacks. Herbal medicines often require a longer time to manifest their effects compared to pharmaceutical drugs, necessitating patience from individuals seeking quick relief. Additionally, the self-administration of herbal medicines lacks specified dosage instructions or warnings, raising concerns about proper usage. Furthermore, when herbal medicines are combined with pharmaceutical drugs, potential interactions may occur, posing risks to one's health. Despite these disadvantages, the holistic and cost-effective nature of herbal medicines makes them a compelling option for those seeking alternative and complementary approaches to healthcare^[1]

Every part of the *A. marmelos* tree, including the root, leaf, trunk, fruit, and seed, is utilized for various ailments. The root, a crucial component of the 'Dasmula' recipe, proves beneficial for conditions such as intermittent fever, hypochondriasis, melancholia, and palpitations of the heart. The leaves and bark find application in medicated enemas, with the leaves also being employed in managing diabetes mellitus. However, the fruit is particularly esteemed for its medicinal value. The unripe fruit, renowned for its efficacy in treating diarrhea, especially chronic cases, has earned a place in the British Pharmacopoeia. Renowned Indian pharmacologist Chopra aptly expresses the significance of the Bael fruit, stating, "No drug has been longer and better known nor more appreciated by the inhabitants of India than the Bael fruit." Charaka, a revered ancient Indian physician, has described this plant as a Rasayana, emphasizing its rejuvenating and revitalizing properties^[2]

Overview of Aeglemarmelos - the Indian Bael

Scientific Name: Aeglemarmelos

Synonyms: wood apple, stone apple, Bengal quince, Indian quince, holy fruit or golden apple in English

Taxonomy:

- Kingdom: Plantae
- Clade: Angiosperms
- Order: Sapindales
- Family: Rutaceae
- Genus: Aegle (Monotypic genus)

Plant Description:

India possesses a rich heritage of traditional knowledge, housing several revered systems of healthcare such as Ayurveda, Siddha, and Unani. The country boasts an impressive diversity of medicinal plants, estimated to be higher than any other nation globally, accounting for 7,500 out of 17,000 higher plant species.^[3]

Aeglemarmelos (L.) Correa, commonly known as Bael/Bilva and belonging to the Rutaceae family, holds a significant place in indigenous Indian medicine due to its diverse medicinal properties. Although native to northern India, it is widespread across the Indian subcontinent, including Ceylon, Burma, Thailand, and Indo-China. Hindus consider the A. marmelos tree sacred, dedicating it to deities Lord Shiva and Parvati, earning it the name "Shivaduma" or the tree of Shiva. Additionally, Bael leaves are believed to house goddess Lakshmi, making the tree a common sight near temples.

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Uses

Leaves: Leaves are used to treat asthma, mucous membrane inflammation with a free discharge, and as a mild laxative. The leaf decoction acts as an expectorant, encouraging the elimination of mucus discharge from the bronchial tubes, and as a febrifuge, aiding in the eradication of fever. Leaf juice is administered when there is dropsy, or an abnormal buildup of liquid in the cellular tissue, along with jaundice and constipation. When ophthalmia, or severe inflammation of the conjunctiva with acute bronchitis and inflammation of the other bodily parts, is present, a heated poultice of the leaves is applied.

Root: The infusion of the root and occasionally the bark of the stem is beneficial for treating intermittent fever, hypochondriasis, and heart palpitations. *fordiarrhoea* and gastrointestinal irritation, a Root is a one of the constituents of Dasamoola a standard Ayurvedic medicine for loss of appetite and puerperal disorders e.g. irritation of the uterus

Flower: A medication used as a diaphoretic, anti-dysenteric, ant diabetic, stomach and intestinal tonic, and local anaesthetic was obtained from flower distillation. It is also used as an expectorant and for epilepsy.^[5]

Fruit: After diarrhoea, fruit is consumed to aid in the healing process. It works well as a dysentery treatment and for mild astringency. Burn patients are treated by the traditional healers. Fruits are also used to treat intestinal parasites, gonorrhoea, epilepsy, gastric problems, urinary tract infections, laxative, tonic, digestive, stomachic, brain, and heart tonic, ulcer, and antiviral.

Ripe fruit: Ripe fruit helps relieve rectum discomfort and aids in digestion. The ranikhet disease virus was susceptible to the antiviral activities of the ripe fruit extract. When consumed fresh, ripe fruit pulp is aromatic, refreshing, sweet, and nourishing. Fruit pulp marmalade helps patients with chronic dysenteric conditions, such as those with intermittent diarrhoea and constipation, by relieving flatulent colic caused by gastrointestinal disorders. It is also used to prevent the formation of piles and to prevent cholera epidemics. A bitter and strong fruit extract found in fresh juice lowers blood sugar levels.

Unripe fruit: A fine powder of unripe fruit was found to be highly efficient against

Ascarislumbricoides and Entamoebahistolytica, as well as to have a substantial effect on intestinal parasites. Unripe fruit is used as an astringent for stomachaches and dysentery in diarrhea. Unripe fruit is given in heaps and used as a restorative, tonic, diuretic, and demulcent. It is also described as cardiac. Unripe fruit decoction is an astringent that helps with chronic dysentery and diarrhea.

Fruit shell: The fruit shell can be used for skin exfoliation purpose^[6]

Overview of leaves of Aeglemarmelos

The leaves are arranged alternately, either singular or compound. They typically have one or occasionally two pairs of closely spaced opposite leaflets with short stalks. The leaf petioles are smooth, lengthy, and lack wings. These aromatic, trifoliate leaves are deciduous, appearing alternately and as singles or compounds. In compound leaves, 2–5 oval-ovate or ovate leaflets with pointed tips and lightly toothed edges are present. Each leaflet measures 4–10 cm in length and 2–5 cm in width, displaying thin characteristics with prominent midribs on the underside. The terminal leaflet features a longer petiole. Newly sprouted foliage, following a dormant or reproductive phase, exhibits a glossy texture and a pink or burgundy hue.^[4] A study on the antioxidant properties of Aeglemarmelos (AME) leaf extract, revealing elevated levels of total phenolic and flavonoid content, comparable to vitamin C's antioxidant activity. Significant correlation between TPC, TFC, and AME's antioxidant effects

was established using Pearson's correlation. This research affirmed the high antioxidant components in A. marmelosleaves.theethanolic leaf extract of Aeglemarmelos was examined for its antidepressant and antianxiety activities. The results suggested the presence of active principles responsible for these effects.A study explored the anti-inflammatory activity and phytochemical constituents of Aeglemarmelosethanolic leaf extract. The study involved screening for different phytochemicals and evaluating anti-inflammatory effects induced by Carrageenan in Wistar Albino rats. the antimicrobial and antioxidant activity of Aeglemarmelos leaf extract. Notably, acetone and hexane extracts exhibited high activity against bacterial and fungal species. The ethanolic extract showed significant radical scavenging activity.^[7]

Extraction of AEGLE MARMELOS Leaves

Shade-dried ground plant materials including root, stem, and fruit (5g each) were extracted using 250ml of various solvents: absolute ethanol, absolute methanol, aqueous ethanol (ethanol: water, 80:20 v/v), aqueous methanol (methanol: water, 80:20 v/v), hydroalcohol (ethanol: water, 50:50), and water. The extraction was conducted for 6 hours using the reflux method. The extracts were then concentrated to dryness using a rotary evaporator at 40°C under reduced pressure, and the yields of the extracts were calculated. For the estimations of total phenolics and flavonoids, 10mg of each extract was dissolved in 10ml of the respective solvents.^[8]

Active ingredient in various extract of AEGLE MARMELOS leaves

Phytochemical	Methanolic	Pet.Ether	Choloroform
Tannins	P	A	A
Flavonoids	P	A	A
Saponins	P	A	A
Phenols	P	P	P
Coumarins	P	A	A
Triterpenoids	P	A	P
Sterols	P	P	A

(P: Present A: Absent)

Test to determine photochemicals

1. Tannin Test: To assess the presence of tannins, combine 1 mL of the extract with a few drops of 10% lead acetate; the formation of a precipitate indicates the existence of tannins.
2. Flavonoid Test: Determine the presence of flavonoids by mixing 2 mL of the extract with concentrated hydrochloric acid and magnesium

ribbon; the development of a pink-red color signals the presence of flavonoids.

3. Saponin Test: For the detection of saponins, shake 1 mL of the extract with 9 mL of distilled water; the appearance of a stable froth indicates the presence of saponins.

4. Phenol Test: Evaluate the presence of phenols by combining 1 mL of the extract with 5 mL of

distilled water and a few drops of neutral ferric chloride; the emergence of a dark green color signifies the presence of phenol.

5. Coumarin Test: To identify coumarins, mix 1 mL of the extract with 1 mL of ethanol KOH solution; the formation of a precipitate indicates the presence of coumarins.

6. Sterol Test: Determine the presence of sterols by combining 25 mg of the extract with 1 mL of chloroform, along with a few drops of acetic anhydride and 2 drops of concentrated sulfuric acid; the development of a green solution indicates the presence of sterols.

7. Triterpenoid Test (Liebermann-Burchard): To assess triterpenoid presence, mix 2 mL of the extract with 1 mL of chloroform, along with a few drops of acetic anhydride and concentrated sulfuric acid added along the side of the test tube; the appearance of a red-brown color indicates the presence of triterpenoids.^[9]

Evaluation of Antimicrobial Activity of AegleMarmelos

The antimicrobial activity of Aeglemarmelos was tested against bacterial strains using ethanol and aqueous extracts through the agar well diffusion method. Nutrient agar plates were prepared, and 50µl of each bacterial inoculum (*S. epidermis*, *S. aureus*, *E. coli*, *P. aeruginosa*, and *C. albicans*) were spread uniformly on the agar plates using a glass spreader. After five minutes, three wells approximately 5mm in diameter were made with a borer, and the plant extracts were added to the wells. The plates were then incubated at 37°C for 24 hours. Petri plates containing 20ml of agar medium were seeded with a 24-hour culture of the bacterial strains. In each plate, a 6mm diameter hole was made using a sterile borer. Discs (6mm in diameter) were impregnated with plant extracts at concentrations ranging from 100 to 200µg/ml and placed on the inoculated agar. The inoculum size was adjusted to deliver approximately 10⁸ colony-forming units (CFU)/ml. Incubation for bacteria was performed at 37°C for 24 hours, and for fungi at 37°C for 72 hours. Antibacterial activity was assessed by measuring the diameter of the inhibition zone around the wells. Ciprofloxacin served as a positive control. All assays were conducted in triplicate. Nutrient agar was used as the growth medium for microbes; 38g of agar was dissolved in 1000ml of distilled water in a conical flask, which was then cotton-plugged and sterilized in an autoclave at 121°C for about 15 minutes. Twenty milliliters of the agar solution were dispensed into sterilized Petri dishes near a gas

flame to prevent contamination, then the plates were covered and allowed to solidify.^[10]

The antibacterial activity of Aeglemarmelos was evaluated using petroleum ether, acetone, methanol, and water extracts in increasing polarity via disc diffusion technique, MIC, and MBC. Petroleum ether and acetone showed low inhibition rates against *S. marcescens*, while methanol extract demonstrated a zone of inhibition greater than ten millimeters against *E. coli*. Previous studies have reported *A. marmelos* leaves being effective against *E. coli*, *Staphylococcus aureus*, and *Klebsiellapneumoniae*, but in this investigation, only *E. coli* showed susceptibility to methanol extracts. Methanol extracts displayed strong antibacterial activity, consistent with earlier findings. Aeglemarmelos also exhibited activity against shigellosis and antidiarrhoeal potential. Acetone extracts were ineffective against *Staphylococcus aureus*, and water extracts showed no antibacterial activity. The MIC and MBC for active methanol extract were 200 mg/ml for *Serratiamarcescens* and *Escherichia coli*, while all extracts showed values greater than 400 mg/ml. Phytochemical evaluation revealed the presence of flavonoids, phenols, and alkaloids in methanol extracts, with phenols and alkaloids also present in acetone extracts. High flavonoid, alkaloid, and phenol content likely contributes to the antibacterial activity. These findings support the traditional use of Aeglemarmelos in treating diarrhoea and dehydration and highlight its potential as a source of bioactive substances for human and animal disease therapy.^[11]

II. FUTURE SCOPE

Wood apple is a fruit which finds its traces in mythology, however it can also prove useful in the modern world. Traditional Ayurvedic medicine recognizes wood apple as a natural remedy for various ailments. It is believed to aid digestion, boost immunity, and alleviate respiratory issues. Additionally, the fruit can be used topically to treat skin problems such as acne and inflammation.

Recent scientific studies have delved into the pharmacological properties of wood apple, unveiling promising results. Researchers have identified antimicrobial, antioxidant, and anticancer properties in various parts of the fruit, including the pulp, seeds, and bark. Recent scientific studies have delved into the pharmacological properties of wood apple, unveiling promising results. Researchers have identified antimicrobial, antioxidant, and

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With its diverse range of bioactive compounds, wood apple holds potential for the development of novel therapeutic interventions. Researchers are exploring its use in the management of diabetes, cardiovascular disorders, and neurodegenerative diseases.

The development of wood apple-derived medicines could offer natural, cost-effective alternatives to conventional treatments. However, challenges such as standardization, formulation, and clinical trials must be addressed to make these potential benefits a reality.

III. CONCLUSION

A brief about various herbal formulation were studied along with its application. Dosage form owing to herbal formulation was evaluated. The Anti dermatophytic activity of wood apple was studied in detail along with its other application. A method to extract its phytoconstituent was studied. Methods to determine its antimicrobial activity was also explored. Various methods to synthesize its formulation was also determined.

REFERENCES:

- [1]. Baruch site, Herbal and Pharmaceutical Medicine [Internet]2016 Available at <https://blogs.baruch.cuny.edu/herbalandpharmaceuticalmedices/?Cat=1>
- [2]. Brijesh S, Daswani P, Tetali P, Antia N, Birdi T. Studies on the antidiarrhoeal activity of Aeglemarmelos unripe fruit: validating its traditional usage. BMC Complement Altern Med. 2009;9(1):47
- [3]. Janarthanan UK, Varadharajan V, Krishnamurthy V. Physicochemical evaluation, Phytochemical screening and chromatographic fingerprint profile of Aeglemarmelos (L.) leaf extracts. World journal of pharmaceutical research. 2012 Jun 12;1(3):813-37.
- [4]. Manandhar B, Paudel KR, Sharma B, Karki R. Phytochemical profile and pharmacological activity of Aeglemarmelos Linn. Journal of integrative medicine. 2018 May 1;16(3):153-63.
- [5]. Choudhary Y, Saxena A, Kumar Y, Kumar S, Pratap V. Phytochemistry, pharmacological and traditional uses of Aeglemarmelos. Pharmaceutical and Biosciences Journal. 2017 Oct 20:27-33.
- [6]. S.Dhanankar, S.Ruhil, M.Balhara, S.Dhanakar, Aeglemarmelos (Linn.) Correa: A potential source of Phytomedicine Journal medicinal plant research Vol5(9)pg no1497 2011
- [7]. Sulaiman CT, Shahida V, Balachandran I. Effect of extraction solvent on the phytoconstituents of Aeglemarmelos (L.) Correa. Journal of Natural Remedies. 2015 Dec 30;15(1):58-64.
- [8]. Mujeeb F, Bajpai P, Pathak N. Phytochemical evaluation, antimicrobial activity, and determination of bioactive components from leaves of Aeglemarmelos. BioMed research international. 2014;2014(1):497606.
- [9]. C.K Pathirana, T.Madhujith and J.EeswaraBael (Aeglemarmelos L. Corrêa), a Medicinal Tree with Immense Economic Potentials Hindawi journal 2020
- [10]. Gupta A, Thomas T, Khan S. Physicochemical, phytochemical screening and antimicrobial activity of Aeglemarmelos. Pharmaceutical and Biosciences Journal. 2018 May 30:17-24.
- [11]. Ulahannan RK, Thomas T, Sadasivan C. Antibacterial action of leaves of Aeglemarmelos. Int. J.(Sci.). 2008;2:134-8.