USES OF AEGLE MARMELOS (INDIAN BAEL) TO TREAT, MITIGATE AND PREVENT VARIOUS DISEASES…

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Abstract- **It is worth noting that every part of the bael tree, such as the stem, bark, root, leaves, and fruit, has medicinal properties. The bael fruit, in particular, is believed to have multiple health benefits, including anti-diarrheal, antibacterial, anti-ulcerative colitis, and antiviral properties. It is also thought to have radio-protective effects, peroxidation, inhibition of lipid, gastro protective, and cardio protective effects. The A. marvellous species and its bioactive components can help prevent various chronic and degenerative diseases. This review highlights the medicinal uses of Indian bael and the challenges encountered during the formulation of various dosage forms to treat different ailments.**

Keywords: **INDIAN BAEL FRUIT, BIOLOGICAL SOURCE, MEDICINAL PROPERTIES.**

INTRODUCTION:

India is home to a wide range of flora and fauna, found in temperate, frigid, subtropical, and tropical temperatures and areas. “Rig-Veda” one of the oldest repositories of human knowledge mentions the use of 67 medicinal plants. Bael is native to the northern part of India but is widely distributed throughout the Indian peninsula, Ceylon, Myanmar, Thailand, and the People's Republic of China.

The bael fruit is also depicted in paintings of the Ajanta caves. Bael
fruit grows wild in the low hills in Himachal Pradesh at altitudes of 1000 meters or more. Bael fruits are abundant in the wild in Uttar Pradesh, Orissa, West Bengal, and Madhya Pradesh, but the fruit of the wild trees is much smaller than that of the cultivated varieties grown in the plains.

The medicinal properties of this tree are well-known. The entire tree, including the stems, bark, roots, leaves, and fruit at every stage of maturity, has been described in ancient medical treatises in Sanskrit as having medicinal benefits. When the fruit begins to ripen, it is of great medical value, as it smells, tastes, cools, and acts as a laxative. When the fruit is half-ripe, it is stomach-tasting, antiseptic, and digestive, and the ripe fruit is considered the best laxative of all. [1]

Vernacular names in different language:

Language	**Names**
Sanskrit	**Bilva, sriphal, shivadruma, Shivapala**
Hindi	**Bel, bael, sripal**
Telugu	**Maredu**
Bengali	**Bel**
Gujrati	**Bil**
Kannada	**Bilpatra, kumbala, malura**
Tamil	**Kuvalum [2]**

Biological source: Bael consists of the unripe or half ripped fruits or their slices or irregular pieces of Aegle marmelos Corr.

1. Family: Rutaceae
2. Sub family: Aurantioideae
3. Kingdom: Plantae
4. Order: Sapindales
5. Genus: Aegle
6. Species: A. marmelos [3]

MEDICINAL PROPERTIES

1. Antitumor:

Bael extract works against cancer by boosting the body's immune system [4]. Bael extract may be able to delay the genotoxic effects of doxorubicin treatment on mouse bone marrow. Therapy is administered, on a continuous period of five days before the administration of doxorubicin, resulting in a decrease in the rise in normochromic erythrocyte and micro nucleated polychromatic frequency that is caused by doxorubicin therapy [5]. The anti-neoplastic properties of Bael extract have been demonstrated by D-limonene, eugenol, and citral. [6]

2. Dysentery and diarrhoea

Bael fruit, particularly unripe or half-ripe fruit, can be used to treat chronic diarrhoea. The ideal powder for this purpose is dried bael fruit. Unripe fruits can be roasted, and then combined with jaggery to be consumed.[7]. The secret to treating persistent diarrhoea and dysentery is the astringency of unripe fruit.

3. Diabetes

Since the human body is known to produce insufficient insulin when it comes to diabetes, external insulin must be obtained. In a similar vein, bael can substitute insulin by improving the body's ability to absorb glucose externally [8]

4. Antibacterial Properties

Antibacterial, anticancer, antiviral, anti-inflammatory, and antifungal properties are only a few of the many pathogenic organisms against which Bael is said to exhibit exceptional defence [8] When tested against coxsackie viruses B1–B6, marmelide isolated from Bael demonstrated antibacterial activity in an assay reported by the plaque inhibition assay at 96 hours. It has been demonstrated that the extract possesses antiviral activity without causing any harm to host cells. The antimicrobial medication ribavirin has been discovered to have less potential activity than marmelide. Marmelide and extract's virucidal activity comes after inhibition at the initial stages of replicative cycles, such as adsorption and penetration [9]

5. Activity against hyperlipidaemia

It has been observed that bael extract can lower the cholesterol level. Bael extract has demonstrated the Anti- hyperlipidemic effect [10] Bael contains umbelliferone, which has antihyperlipidaemia properties. Bael leaf extract contains coumarins and saponins that lower cholesterol levels [11]. Bael fruit powder has been shown to lower both ester and free cholesterol

levels. [12]. When 250 mg/kg of aqueous Bael seed extract is administered to fasting blood glucose (FBG) diabetic rats, their blood glucose level is reduced by 60.85% [13]

6. Anti-asthmatic activity

Leaf decoction of Bael is effective in reducing phlegm in cold and asthma. Studying with guinea pig ileum, the tracheal chain it shows an antagonistic effect on contraction evolved by histamine {14, 15}.

The presence of Angeline in Bael leaf helps to prohibit the release of histamine from mast cells [16]

7. Nephro protective properties

Bael leaf extract has been shown to have nephroprotective properties in Wistar rats. A higher blood urea nitrogen level and serum creatinine are indicators of gentamicin nephrotoxicity.

Gentamicin can both raise and lower MDA levels, glutathione, and catalase levels. Blood urea nitrogen and elevated serum creatinine levels can both be successfully decreased using bael extract. This demonstrates the nephroprotective effect [17]

8. **Anti-ulcer properties**

Numerous researches have demonstrated Bael's anti-ulcer properties. Oral administration of Bael methanolic extract has been used to treat gastric ulcers caused by lipopolysaccharide in rates.[18]

9. Immunity enhancer

Bael juice, which boosts immunity, is high in antioxidants and vitamin C. During the monsoon season, drinking bael juice daily can help avoid infection due to its anti-bacterial properties.

Limitations

Although there is no denying the Bael fruit's (Aegle marmelos) tremendous potential for use in medicine, there are several obstacles and restrictions that must be overcome to realize this potential.

1. **Seasonal Availability and Cultivation Challenges**:

The seasonal availability of Bael fruit is a significant cultivation difficulty. Its short fruiting season may make it difficult to reliably get raw materials for the manufacturing of pharmaceuticals. Furthermore, there are difficulties in growing Bael trees because they need certain agroclimatic circumstances and knowledge, which might not be easily accessible in all areas.

2. **Standardization of Extracts**:

There are a lot of obstacles to overcome before Bael fruit extracts are homogeneous and standardized. Strict quality control methods are required due to the variability in the chemical content of fruits from different locales, tree kinds, and maturation stages. Creating standardized procedures for extraction and setting quality standards are crucial yet difficult responsibilities.

3. **Considerations for Dosage and Toxicity**:

It is a complex undertaking to determine the right dosage of Bael fruit extracts for medicinal usage. The severity of the ailment, the patient's demographics, and the particular bioactive chemicals being targeted must all be taken into consideration when determining the appropriate dosage. Additionally, Ensuring patient safety necessitates evaluating possible toxicity or side effects, particularly in cases of continuous use or high dosages.

4. **Regulatory Obstacles**: Integrating Bael fruit-based medications into mainstream healthcare presents substantial obstacles due to navigating regulatory frameworks and compliance norms. Complying with strict regulations, which involve safety and efficacy evaluations, can demand a lot of time and resources. It takes careful balancing to bring ancient knowledge and current regulatory demands into harmony.

5. **Prospective Courses**: There could be some fascinating advancements in the future in the process of using Bael fruit (Aegle marmelos) as a useful resource in pharmaceutical research. This section describes potential directions that present chances for additional research and application of this herbal cure in contemporary medicine. [19]

Conclusion:

Based on its traditional uses as medicine and promise from preclinical studies, bael fruit which is also of dietary use has many beneficial effects.

The edible pulp 100g of bael fruit contains 61.06g water, 3.64g protein, 0.43g fat, 2.85g ash, 603mg potassium, 78mg calcium, and 51.60mg phosphorus with a total sugar content of 14.35%.

The ascorbic acid content of 22.5mg/100g fruit pulp makes it a good choice to be used as a source of vitamin C.

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