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‘A REVIEW ON BAEL (AEGLE MARMELLOS L.) AS A DIGESTIVE NUTRACEUTICAL.’

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Abstract

Bael, *Aegle marmelos* (Linn.) Correa ex Roxb., a tree of Indian origin is known from pre-historic time. It has a great mythological significance for Hindus. Utilization of bael in day-to-day life has great nutritional, environmental as well as commercial importance. It has been in use from time immemorial in traditional systems of medicine for relieving constipation, diarrhoea, dysentery, peptic ulcer and respiratory infections. *Aegle marmelos* commonly known as bael (or bel), belonging to the family Rutaceae, is a moderate sized, slender and aromatic tree. Alkaloids, coumarins, terpenoids, fatty acids and amino acids have been isolated from its different parts. The fruits, bark, leaves, seeds, and roots of bael contain bioactive compounds such as coumarin, xanthoxol, imperatorin, aegeline, and marmeline. These compounds can provide antidiabetic, anticancerous, antifertility, antimicrobial, immunogenic, and insecticidal activities. The bael trees thrive well in dry, mixed deciduous, and dry dipterocarp forests and soils of India, Sri Lanka, ailand, Pakistan, Bangladesh, Myanmar, Vietnam, the Philippines, Cambodia, Malaysia, Java, Egypt, Surinam, Trinidad, and Florida.

Keywords: Bael Fruit, *Aegle marmelos*, Natural digestive aid, Ethnobotany, peptic ulcer relevant.

Introduction:-

According to the historical records, bael is used as a medicinal since 5000 B.C. Bael is also known as golden apple, and stone apple in India and a sacred tree in places where Hindus lives. Although having high moisture content of nearly 61%, bael fruits have high nutritional composition as it contains minerals (phosphorus, potassium, calcium, magnesium, iron, copper, zinc, chromium), fat, fiber (hemicellulose, cellulose, lignin, pectin), protein, carbohydrate, vitamins (B1, B2, B3, C), amino acids (threonine, valine, methionine, isoleucine, leucine, lysine), and fatty acids Bael mentioned in the renowned book Charaka Samhita, a comprehensive compilation of all the essential ayurvedic information, which identified bael as a necessary item in ayurvedic medicine. In Ayurveda, all the parts are used in the form of 'Panchang' to cure diseases like diarrhea, dysentery and ulcer and, dyslipidemic activity, Immunomodulatory activity, anti-proliferative activity, wound-healing activity, anti-fertility, insecticidal activity.

Literature Review

Aegle marmelos is a slow-growing, medium sized tree, up to 12-15 m tall with short trunk, thick, soft, flaking bark, and spreading, sometimes spiny branches, the lower ones drooping. The tree is tough and widely adaptable to adverse soil and climatic conditions. Intestinal microbial populations subsist on nutrients received from the partially digested diet of the host. A. marmelos is a medicinal plant whose leaves are claimed to be useful in the treatment of spermatorrhoea. Though a tree of subtropical origin, bael shows a wide adaptability and performs equally well in tropical, arid and semi-arid regions although fertile and well-drained soils are best suited for its commercial production.

Vernacular names:

English: Bengal quince, Beal fruit, Golden apple, Indian quince, Stone apple, Bel, Bilva.

Biological Classification:

Kingdom - Plantae.

Order - Sapindales.

Family – Rutaceae.

Subfamily - Aurantioideae.

Genus - Aegle.

Species - Aegle Marmelos.

Botanical name - Aegle marmelos.

Chemical constituents:

The fruits, bark, leaves, seeds, and roots of bael contain bioactive compounds such as Tannins, Gallotannic Acid, coumarin, xanthotoxol, imperatorin, aegeline, and marmeline. These compounds can provide antidiabetic, anticancerous, antifertility, antimicrobial, immunogenic, and insecticidal activities. Three organic acids (tartaric, malic acid, and oxalic acid) for the bael pulp, in the range of 40–210 mg/100 g (0.04–0.21%), whereas in our study, the amount ranged within 38.66–265.33 mg/100 g DB.

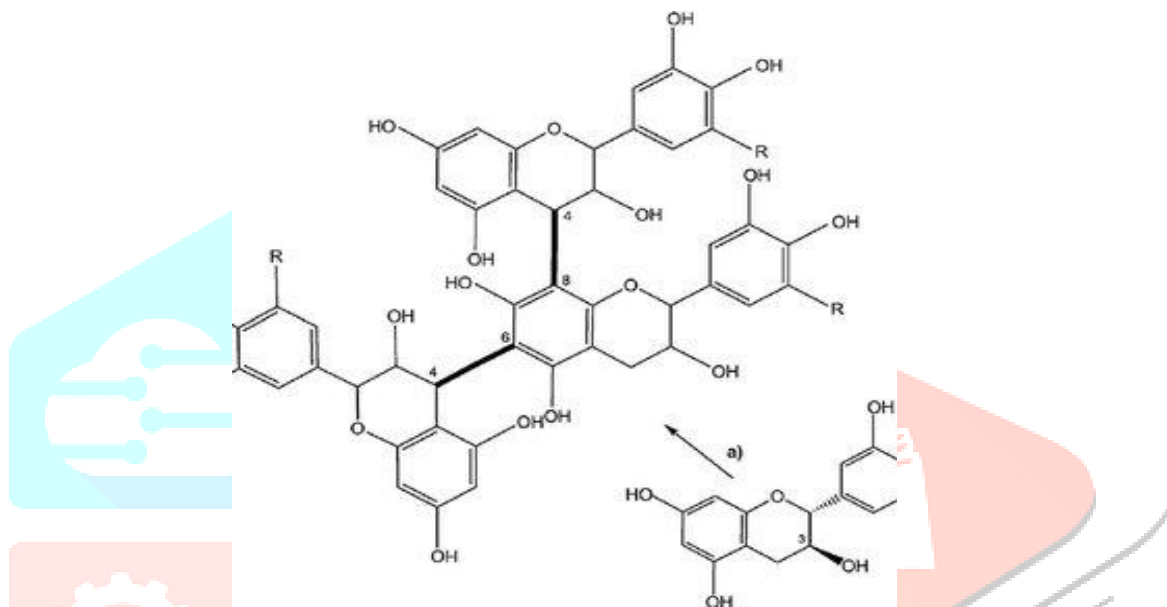
Medicinal Significances of Bael.

The fruits are valued much in Ayurvedic medicines. Over the past few years, researchers are increasingly identifying and validating the plant derived substances for the treatment of various human diseases. Different parts of the plant have been used in the ethno-medicine as astringent, antidiarrhoeal, antidycentric, antipyretic, antiulcer, antidiabetes, antibacterial, antiviral, antifungal, anticancer, analgesic, radioprotective, antiviral, antimicrobial and anti-helmintic.

Bael as Antiulcerative and a Digestive aid.

Chronic diarrhoea can be treated with the use of bael fruit especially half-ripe or unripe fruit. Dried bael fruit powder is the best one for this purpose. Over 35 strains of bacteria that cause diarrhoea, *Vibrio cholera*, *Escherichia coli*, and *Shigella* sp are effectively inhibited by ethanolic extract of fruit . The unripe fruit pulp has potential activity against enterotoxins. It can also prevent colony formation from gut epithelium Chemical Constituent callef Gallotannic acid of bael is responsible for this activity.

Gallotannic Acid



About Gallotannic acid

Gallotannin or tannic acid is a type of hydrolyzable tannin found in vegetable diets which possess gallic acid as the basic unit of the polyester. Studies have shown that TA displays a wide range of pharmacological activities, such as anti-inflammatory, neuroprotective, antitumor, cardioprotective, and anti-pathogenic effects. TA is a more potent inhibitor of gastric H^+,K^+ -ATPase than ellagic acid, and markedly inhibits acid secretion and ulcerogenesis.

Material and Method

Dried bael fruit powder, Jaggery, funnel Powder, liquorice Powder, honey, coriander Powder .

Method of preparation:

Method of preparation of nutraceutical product-

- 1) Bael, funnel, liquorice, honey, coriander are dried powder mixed together
- 2) Then mixed with jaggary solution or sugar solution properly
- 3) This will help masking the powder drug particles
- 4) After that the above drug particle are dried in hot air oven properly and sieved for size reduction and resulting in granulation

5) This finished product is then ready to be packed into appropriate container

Formulation table;-

Sr. no	Ingredient	Category	Qty. given
1	Dried bael fruit powder,	Active ingredient	12 gm.
2	Jaggery	Preservative	20gm
3	Funnel Powder	Carminative	23gm
4	Liquorice Powder	Sweetener	18gm
5	Honey	Sweetener Binder	22gm
6	Coriander Powder	Astringent	5gm

Evaluation parameter

(g) Quality Control Tests:

Flow properties: Flow properties such as angle of repose, bulk density, tap density and porosity of powder mixture, granulations and combination product should be determined.

(3) pH: The pH of suspensions can be measured using pH paper or pH meter.

(4) Sedimentation:

(a) Redispersability: The redispersability is determined from number of strokes required to redisperse the formed sediment at the end of 7 days of storage of the formulations (acceptable when requires NMT 100 strokes).

(b) Sedimentation volume: Sedimentation volume (F) of a suspensions determined as ratio of the equilibrium volume of the sediment (V) to the total volume (Vu) of the suspension. The value of F should lie in 0 to 1 range. This value provides a qualitative knowledge about the physical stability of the suspension.

(5) Drug content: The required weight of powder is extracted with 100 mL solvent and the obtained solution is filtered through nylon filter membrane. Accurately 0.1 mL of this solution is further diluted to 10mL with solvent and absorbance of the solution is measured on UV-spectrophotometer. The drug concentration is extrapolated from the calibration curve in solvent.

(6) In-vitro drug release:

The in-vitro drug release is estimated using USP dissolution test apparatus Type II at 100 rpm.

The dissolution medium consisted of 900 mL distilled water maintained at $37\pm 0.5^{\circ}\text{C}$. The drug release at different time intervals is measured using UV spectrophotometer.

(7) Particle size: The average particle size of reconstituted suspension is examined using standard microscope. Average and standard deviations of 100 particles are estimated.

(8) Zeta potential: The reconstituted suspension is diluted with distilled water and zeta potential is measured in triplicates using zeta meter.

(9) Stability: The dry powder is packaged in air tight amber coloured glass bottles and stored for 36 days at 45 °C and then reconstituted with distilled water to make up the volume to 60 mL with gentle shaking. This reconstituted suspension is again stored at 4, 25 and 45 °C for 15 days. These samples stored at various temperatures are evaluated on 7th and 15th day of reconstitution for redispersability, sedimentation volume, drug content, in vitro drug release, particle size and zeta potential.

Conclusion

This review presents it as quite clear that *Aegle marmelos* has a variety of phytoconstituents, which indicates its potential applications for a range of medical conditions. The plant or any of its parts can be used to treat a variety of illnesses in people, including diabetes, liver damage, fungal infections, and pain relief, pyrexia, inflammation, and microbiological infection. Nevertheless, a great deal of work needs to be done on the *Aegle marmelos* to look at its mechanism of action in relation to other therapeutic activities.

The Indian subcontinent's residents have been using the native plant *Aegle marmelos* for more than 5000 years. The Indian traditional medical system, Ayurveda, and numerous folk medicines use leaves, bark, roots, fruits, and seeds extensively to treat a wide range of illnesses. The pulp from bael fruits is used to make sweet treats like murabba, puddings, and juice. Bael fruits are utilised in food. Bael fruits are also utilised in many traditional treatments as a laxative, to cure respiratory ailments, and to treat peptic ulcers, chronic diarrhoea, and dysentery.

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