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A REVIEW ON BAEL FRUIT ON TRETMENT OF DIABETES MELLITUS

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- **ABSTRACT:**

Bael, Aegle marmelos (Linn.) a tree is originated from India known from ancient time. It has a most mythological importance for Hindus. Utilization of bael in everyday life has very nutritional, environmental as well as precious importance. It has been in use to relieving constipation, diarrhea, dysentery, ulceration and respiratory infections from the ancient time as a medicinal Importance. medicinal properties of bael are antidiabetic, antimicrobial, anti-inflammatory, antipyretic, analgesic, cardio protective, anticancer and radio protective.

"Diabetes mellitus", is one of the general and non-communicable diseases worldwide. India faces many challenges in diabetes management, including, lack of disease avoidance in the public, health care facilities in limits, high cost, suboptimal glycaemia control and rising complication in diabetes. Insulin therapy for diabetes is important therapy which delivered through the subcutaneous injections, four times in a day. Long-term insulin therapy, compounded by the tending nature of its route of administration, which causing problems with patient compliance, overly influencing patient outcomes.

- **KEYWORDS:** Bael fruit, diabetes mellitus, mechanism of action, uses, side effect.

- **INTRODUCTION:**

WHO has contained 21000 plant species which is worn in the world for medicinal purposes in India, about 2500 plant species holding to more than 1000 genera which are used in indigenous system of medicine'. India is the second in the world for the exportation of medicinal plants. Flowering plants consists about 400 families in the world of which at least 315 are delegated by India.

Herbal medicines are greatly used and extremely popular in developing countries. Bael fruits and leaves are worn to treatment of dysentery, dyspepsia, mal-absorption, neurological diseases, edema, vomiting, and rheumatism in addition to the essential medicinal values, bael is reported as an essential in food industry and a great source for extracting pharmaceuticals and many other precious herbal compounds.

Bael is also known in India as bagal-quince, golden apple, stone apple and a sacred tree in places where Hindus lives.Golden apple is the most recognized plants used in ayurvedic medicine by the Indian and other South Asian inhabitants in ancient history.

Traditional uses of plants or plant parts are showing the direction to the use of plants for specific kind of disease or diseases. In last five decennary these plants have been extensively studied by advanced scientific techniques and reported for various medicinal properties.

- Latin Name: Aegle marmelos.
- Family: Rutaceae family
- Natural environment: Bael is intimate with the dry, open forests on hills and plains at altitudes with good rainfall.
- Season: Harvesting period is mid-April-May.
- Bael, Aegle marmelos (Linn.) Correa ex Roxb., a plant of Indian origin having immense therapeutic potential is cannot utilized. It connected with family Rutaceae, is the family of citrus fruits.

In this we have to discussed the bael plant and their fruit for uses in the diabetes mellatus. We used the google as search engine and search reviewed published data. Research all the Information and included.

fig no.1 beal fruit

❖ Diabetes mellitus:

Diabetes mellitus is a group of metabolic diseases demonstrate by chronic hyperglycemia derives from defects in insulin secretion and insulin action. Metabolic irregularities in carbohydrates, lipids, and proteins follow the importance of insulin as an anabolic hormone. Decrease in insulin achieve enough response and/or insulin resistance of target tissues, mainly skeletal muscles, adipose tissue, and to a lesser extent, liver, at the level of insulin receptors, signal transduction system, and/or effector enzymes or genes are responsible for these metabolic deformity. Diabetes mellitus (DM) is commonly known as a "sugar" and it is the most common endocrine disorder and usually occurs when there is deficiency or absence of insulin.

- **SYMPTOMS AND CAUSES OF DIABETES:**

1. Enhance thirst and urination
2. Increased appetite
3. Tiredness
4. Blurred vision
5. Numbness in the feet or hands
6. Aching that cannot heal
7. Unusual weight loss
8. Reduced sensitivity of peripheral tissues to insulin.

- **TYPES OF DIABETES:**

1. Type 1 diabetes
2. Type 2 diabetes
3. Gestational diabetes

Other types of diabetes

1. Diabetes LADA
2. Diabetes MODY
3. Double diabetes
4. Brittle diabetes
5. Diabetes insipidus
6. Neonatal diabetes mellitus

- **BENEFITS OF BAEL FRUIT IN DIABETES:**

Bael works by releasing certain chemicals like flavonoids, tannins, and coumarins that can help oppose off inflammatory conditions in the body like swelling, pain, redness, and gradual healing.

The seeds of bael fruit include 70% protein, therefore, are highly recommended to improve lean muscle mass.

- **FRUIT MORPHOLOGY:**

The fruits have a rigid, smooth-ligneous shell (i.e., pericarp), a soft rind at undeveloped stages. The crust is gray-green at early stages, turns yellowish or orange at the ripening stage and becomes very hard and orange-red when dried. The bael fruit lives in various shapes ranging from round, pyramidal, oval, or oblong. The fruits diameter is 5-20 cm.

The seeds embed in a pulp-adhesive transparent mucilage and, which solidified like a glassy crystal when dried.

fig no.2 fruit morphology of beal fruit

- **ORIGIN AND DISTRIBUTION:**

Bael is indigenous to India and known since ancient period of time. The fruit is mentioned in the ancient Indian literature i.e., Vedas, Ramayana, Upvan Vinod and Brihat Samhita. It is also found growing in nearest countries
like Nepal, Sri Lanka, Pakistan, Bangladesh, Myanmar, Thailand and most of the South-East Asian countries. It is grown in some Egyptian garden as well as in Surinam and Thailand. In India it is cultivated throughout the country and main bael growing states are Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh, West Bengal, Odisha, Chhattisgarh and Rajasthan. Systematic planting of bael is very limited, however, it is grown in temples, gardens roadside, backyards of houses, parks, etc.

- **PRODUCTION, PROTECTION AND PROCESSING OF BAEL:**

❖ Area and production

The organized orchards of bael are rare. Hence, the exact data on area and production is not available. In the recent years, initiatives have been made by some institutions for collection, evaluation and conservation of germplasm at their experimental farms. Generally, the bael plantations were made as boundary plants or temple side or in home garden. Some seedling plantations were also available in natural forest and road side areas. The total production per year is estimated to be about one thousand tons in India (Saroj and Awasthi, 2004)

❖ Flowering and fruiting :

After 4-5 years of planting the budded bael trees are start flowering,also the seedling trees start flowering after 7-8 yearsbof planting. starts with the commencement of new growth in the month of May-June. Fruit growing takes place by the end of May and continues upto July. Fruiting occurs on one year old shoots. The complete fruit development (ready for harvest) takes about 10-11 months. Hence, by next April-May, fruits
are ready for harvest. However, the fruit maturity varies according to the genotype and agro-climatic conditions.

- **PHARMACOLOGICAL IMPORTANCE:**

❖ Antidiabetic activity:

Bael extracts are shown to have significantly higher antidiabetic activities when tested using animal models. The fruit extracts of bael have estimate the diffensive effects on pancreatic tissues of diabetic rats. Further observation of hyperglycemic activity and ant hypoglycemic activity of the bael aqueous extracts were made using rat models, bael leaf extracts can decrease Mi receptor gene expression and inhibit aldose reductase activity, anti-cataract activity, and free radical.

- **CHEMICAL COMPOSITION**

Different type of chemical constituents like alkaloids, coumarins and steroids have been detached and identified from different parts of tree, like leaves, fruits, wood, root and bark.

❖ Coumarins:

Marmelosin, marmesin imperator in, marmin, alloimperatorin, methyl ether, xanthotoxol, scoparone, scopoletin, umbelliferon, psoralen and 7-geranyloxycoumarin (7-(2,6-dihydroxy- 7-methoxy-7-methyl-3-octaenyloxy) coumarin] has also been reported marmelide"". Marmenol,

❖ Alkaloids:

Aegelin, aegelenine, marmeline, dictamine, fragrine (C, H, O, N), 0-methylhalfordinine, isopentenylhalfordinol", N-2-14-(3',3'- dimethylallyloxy) phenyl) ethyl cinnamide, N-2-hydroxy-2-[4-(3'3'-dimethylallyloxy) phenyl) ethyl cinnamide, N-4 methoxystyryl cinnamide, N-2-hydrox -2- (4-hydroxyphenyl)ethyl cinnamide 0- (3,3-dimethylallyl) halofordinol, N-2-ethoxy-2-(4-methoxy phenyl) ethyl cinnamide, N-2-methoxy-2-[4-(3',3'- dimethylallyloxy)phenyl] ethylcinnamide, N-2-methoxy-2-(4-methoxyphenyl)-ethylcynamide.

❖ Polysaccharides:

Galactose, arabinose, uronic acid and L-rhamanose are obtained on hydrolysis"

❖ Seed Oil:

Composed of palmitic, stearic. Oleic, linoleic and linoleic acid"

❖ Tannins:

The maximum tannin content in bael fruit was recorded in the month of January. There is as much as contain as 9% tannin in the pulp of wild fruits, less in cultivated type.

❖ Carotenoids:

Carotenoids are effective for imparting pale colour to fruit.

- **MECHANISM OF ACTION:**

bael is an essential remedy for diabetes. Bael stimulates the pancreas and helps them to produce insulin that controls sugar levels in the blood and produces the Antidiabetic activity.

- **BAEL DOSAGE:**

Bael may vary from person to person for the successful dosage depending upon the age, body strength, effects digestion, severity, and condition of the patient. It is firmly recommended to advise homeopathic doctor or practitioner as he or she would find the patient's indications, medical conditions history and prescribe an great dose for a specific period.

Bael Churna - 4-2 teaspoon twice a day.

Bael Juice/ Decoction - 2-1 cup twice a day with water after meals. Bael Capsule/ Tablet/ Gutika is administered 1-2 capsules twice a day.

Bael Candy is taken 4-5 candies or as per requirement.

- **TREATMENT FOR DIABETES:**

Treatment of patients with type 1 diabetes- The patients with type 1 diabetes has lost the ability to produce insulin and is therefore dependent upon extremely administered insulin

1. A genetic susceptibility to developing type 1 diabetes

A. Conventional therapy- 2 daily injections of mixed insulin, mixed insulin contains rapid-or-short acting and intermediate acting taken before breakfast and the meal.
B. Conventional therapy with a split night-time dose-1 injection of mixed insulin (repid-or-short-acting and intermediate-acting) before breakfast, 1 injection of Diagnostic tests for diabetes mellitus Three blood tests are available to diagnose prediabetes and diabetes rapid-or-short-acting insulin before the evening meal and 1 injection of intermediate-acting insulin before the bedtime snack.
C. Multiple daily injections (MDI) of rapid-or short- acting insulin before every meal with intermediate -or long-acting insulin once or twice a day.
D. Intensive therapy with a continuous subcutaneous insulin infusion (CSII or insulin pump) A bolus dose of insulin is given before meals and snacks based on the amount of carbohydrate eat and the calculate the level of blood glucose.

2. Treatment of patients with type 2 diabetes- In this treatment depends on a number of factors.

1. Body weight.

2. Current eating habits.

3. Current level of physical activity.

4. Severity of symptoms.

5. Blood glucose levels.

6. Time period of diabetes.

- **ADVERSE EFFECTS OF BAEL:**

The fruit is useful to lower diabetes treatment, over consumption of bael along with other diabetes supplements may cause your blood sugar level to drop too low.
As the fruit is high contain on tannins, over consumption of it over a prolonged time period without physician consultation may cause your body to exhibit carcinogenic properties.
Extract or powder of the leaves of beal are believed to be more harmful for pregnant women. So, consult a physician if you are pregnant or breast feeding.

- **NUTRITIONAL VALUE:**

In Physico-chemical studies have observe that the bael fruit is rich in mineral and vitamin contents. Bael pulp is steeped in water, strained, preserved with 350 ppm SO, blended with 30% sugar, then dehydrated for 15 hours at 120°F (48.89°C) and pulverized. The powder is contain with 66mg/100g Ascorbic acid and can be stored it for maximum 3 months for making cold drinks (Squashes).

Nutritive value of bael fruit

Constituent Value (per 100 g pulp)

Moisture 61.5 g

Protein 01.80 g

Fat 0.30 g

Fiber 2.90 g

Minerals 1.70 g

Carbohydrates 31.80 g

Mucilage 12.7-19.0%

Carotene 55.0 mg

Thiamine 0.13 mg

Riboflavin 1.19 mg

Niacin 1.1 mg

Vitamin ‘A’ 186 IU

Vitamin ‘C’ 8-18 mg

- **PLANT PROFILE:**

○ Scientific Classification:

· Kingdom- Plantae.

· Order- Sapindales.

· Family- Rutaceae.

· Subfamily- Aurantioideae.

· Genus- Aegle.

· Species- Aegle Marmelos.

· Botanical name- Aegle marmelos.

○ Vernacular names

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

· Hindi: Bel, Bili, Sirphal, and Bela,

· Sanskrit: Adhararutha, Asholam, Atimangaliya, Bilva.

· Bengal: Bael, Bel,

· Gujarat: Billi,

· Kannada: Bela, Bilva

· Malayalam: Koovalam, Vilwam.

· Orissa: Belo.

- **USES**:

1.The ripe fruit is used as a restorative, laxative and thus used as a good tonic for heart and brain health. Homeopathic drugs, Aegle marmelus and Aegle folia are prepared from bael fruit and leaves, respectively.
2.By incorporating bael fruits in the diet of growing infants and children under 3 age, their teething problem could be resolved.
3.The unripe and roasted dried fruit pulps are considered as astringent, digestive, demulcent, stomachic, and antipyretic properties, because of which they are usually prescribed for curing diarrhea and dysentery.
4.Bael fruits have immense potential for processing and several products such as squash, jam, candy and syrups can be prepared from it for foreign markets.
5. The root extract of bael has anti-inflammatory and wound healing properties while, the bark of the tree is used to treat diabetes in Indonesia.

- **CONCLUSION:**

Bael is a cultural fruit as well as medicinal fruit. Candy, panjiri, toffee, jam, etc. products are prepared by the fruit. Bael farming can be done in all types of silos. Diseases are treated by chemical substances extracted from bael leaves, fruits and seeds. The most common ingredients which are present in plants are alkaloids, terpenoids, steroids, phenols glycosides and tannins. it may be worn for the remedy of different problems in person like as, diabetes, liver toxicity, fungal infection, microbial infection, inflammation, pyrexia etc. The farmer can get more income at a lower cost by cultivating it. Looking upon large prospects and potential of bael for different purposes, it is worthwhile to cultivate this plant on wide scale especially on unproductive and wasteland. Furthermore, systematic and scientific research is essential to explore the largest potential of this under-utilized plant. Authors are of the opinion that we Indians equipped with modern scientific techniques and enriched with strong traditional knowledge are best suited and well placed harness to maximum potential of this Plant of Panacea for human and environmental well-being.

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