

A Review on Formulation and Evaluation of Herbal Churna for Anti Diabetic Activity

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Abstract: *Syzygium cumini*, also called Jamun, or black plum, is an excellent source of bioactive components such as flavonoids, polyphenols, antioxidants, iron, and vitamin C. Bael, *Aegle marmeloe* (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. Amla has also been reported to prevent/reduce hyperglycemia, cardiac complications, diabetic nephropathy, neuropathy, cataract genesis and protein wasting. However, clinical trial data with human subjects are limited and preliminary.

Keywords: Diabetes, Antidiabetic Agent, Herbals, Fruit, Amla, Jamun, Bael, Churna, Uses

I. INTRODUCTION

Diabetes, also known as diabetes mellitus, is a chronic disease that occurs when the body doesn't produce enough insulin or can't use it properly. Antidiabetic agents are used to treat or prevent diabetes, a disease that occurs when the body can't control blood sugar levels. The function of antidiabetic agent helps to control blood glucose levels. The major type of diabetic mellitus is Type 1 diabetic and Type 2 diabetic. The mortality rate for diabetes in India in 2019 was 27.35 deaths per 100,000 people. This was an increase from 1990, when the mortality rate was 22.30 deaths per 100,000 people. The Amla, Jamun and Bael shows antidiabetic activities. Amla improves glucose utilization, stimulates insulin secretion, and prevents apoptosis of pancreatic cells. It also has antioxidant and free radical scavenging properties. Jamun holds anti-hypercholesterolemic properties and helps in regulating the blood lipid profile due to presence of bioactive components. Bael exerts its antidiabetic action by increasing glycated hemoglobin, insulin, and β -cell function, and reducing HOMA-IR (Homeostatic Model Assessment of Insulin Resistance). Diabetes is a metabolic disorder characterized by high blood sugar levels and difficulty processing glucose. The main cause of this disorder is the malfunctioning of the pancreas, which can be due to insufficient insulin production, impaired insulin function, or both. There are four types of diabetes based on their causes and symptoms: insulin-dependent diabetes mellitus (IDDM, Type I), non-insulin dependent diabetes mellitus (NIDDM, Type II), gestational diabetes, and other specific types. Type I diabetes (IDDM) is an autoimmune disease that occurs when the body's T lymphocytes destroy the β -cells of the islets of Langerhans, leading to local inflammation and reduced insulin secretion, requiring insulin replacement therapy. It is more prevalent in children than in adults. Type II diabetes develops due to peripheral insulin resistance and inadequate insulin secretion by the pancreas. It is more common than type I diabetes. People with type II diabetes experience intermediate stages of impaired fasting glucose and impaired glucose tolerance, which is also known as prediabetes. The development of type II diabetes is largely attributed to obesity, with 90% of diabetic patients falling into this category. Diabetes ranks as the sixteenth most common cause of death on a global scale.⁶ Symptoms of diabetes include blurred vision, fatigue, increased thirst, frequent urination, and weight loss in affected individuals.^{7,8} Modern medicine offers various treatment options for both type I and II diabetes. Diabetes can lead to a range of other health issues such as cardiomyopathies, nephrotoxicity, neuropathy, cerebrovascular disorders, and impaired wound healing.⁹ The global financial burden of diabetes treatment is substantial, prompting diabetic patients to seek alternative

treatment options. Ayurveda, an ancient medicinal system, has also detailed its approach to diabetes treatment, with a focus on the use of Jamun, *Syzygies cumini*

II. BENEFITS OF ANTIDIABETIC CHURNA USING AAMLA, JAMUN AND BAEL

Before you finalize the product, it is important to know the benefits The tablet has following benefits:

1.Regulates blood sugar

Amla can help regulate blood sugar levels and reduce the risk of spikes and crashes. It can do this by: Improving insulin sensitivity, regulating carbohydrate metabolism, Slowing sugar absorption. Prevents pancreatitis. Amla can help prevent pancreatitis, which can cause high blood sugar levels. Lowers cholesterol

Amla can help lower cholesterol levels, which can reduce the risk of heart disease.

2. Purifies blood:

Jamun's high antioxidant content may help purify blood, lower LDL levels, and regulate pressure. Improves immunity: Jamun may help improve immunity. Jamun is also low in calories and contains many nutrients, including potassium, iron, proteins, vitamin C, carbohydrates, magnesium, flavonoids, phosphorus, and calcium.

3.Reduces blood glucose level

Bael helps in reducing the blood glucose level. Bael also increases the secretion of insulin. Due to its antioxidant property, Bael also reduces the risk of diabetes related complications. Bael has a high content of pectin and dietary fiber, which regulates bowel movement and helps maintain a healthy digestive system.

Advantages of antidiabetic churn

- amla in regular diet can be highly beneficial for people with diabetes.
- Promotes a healthy digestive system and natural bowel movement.
- Supports Healthy Liver Functions.
- Supports Better Eyesight and Skin Health.
- Supports Stamina and Energy Levels.

PLANT PROFILE: JAMUN



Fig No 1: Jamun Fruit



Fig No 2: Syzygium cumini tree

SCIENTIFIC NAME - Syzygium cumini.

SYNONYMS - jambolan, black plum, jamun, java plum, Indian blackberry, Portuguese plum, Malabar plum, purple plum, Jamaica and damson plum.

BIOLOGICAL SOURCE - The biological source of jamun is the Syzygium cumini tree.

KINGDOM – Plantae

ORDER - Java plum

FAMILY – Myrtaceae

GENUS - Syzygium

CHEMICAL CONSTITUENTS - Jamun mainly contains polyphenols, flavonoids, phenolic, anti-inflammatory, anthocyanins, gallic acids, tannins, phenols, alkaloids, ellagic acid, glycoside, isoquercetin, kaempferol, myricetin, tannins, flavanols, flavone, and vitamins

GEOGRAPHICAL SOURCE - The jamun tree (Syzygium cumini) is native to India and Southeast Asia, and is also found in Thailand, the Philippines, and Madagascar.

USES - Digestion: Jamun can help with digestive issues, such as diarrhea and gas. It's rich in vitamins A and C, which can help cleanse the body.

Immune system: Jamun's vitamin C content can help boost the immune system by stimulating white blood cell production.

Blood pressure: Jamun's potassium content can help regulate blood pressure.

Oral health: Jamun's astringent properties can help strengthen teeth and gums and prevent gum bleeding and inflammation.

Cancer: Jamun contains polyphenols, which include anthocyanin, a chemical that can help fight cancer cells.

Diabetes: Jamun can help manage blood sugar levels.

Respiratory health: Jamun can help promote respiratory health. Skin health: Jamun can help improve skin health.

JAMUN AS AN ANTIDIABETIC AGENT -

The Ayurvedic pharmacopeia suggests that Jamun's seed powder is effective in managing high blood sugar levels. Although Jamun has been utilized for over 130 years in the West for controlling blood sugar levels, clinical studies have produced mixed results. Some patients responded well to Jamun therapy, showing improved blood sugar control, while others did not experience any changes post-treatment.¹⁴ Various researchers have explored the hypoglycemic effects of different parts of Jamun in preclinical models for diabetes management, with diverse outcomes. While some studies found no hypoglycemic effects of Jamun in alloxan-induced diabetic rats, the majority of preclinical reports indicated that Jamun's different parts reduced blood sugar levels in rodent models of diabetes and

clinical settings. The preclinical studies have shown that various parts of the Jamun plant can lower blood sugar levels in both diabetic rodent models and clinical settings. For instance, the use of seed powder extracted in water has demonstrated a reduction in blood sugar levels in diabetic rabbits. In diabetic rats, the administration of aqueous seed extract of Jamun at a dose of 1 g/kg body weight has been proven to have a hypoglycemic effect on blood sugar. Additionally, several other studies have indicated that aqueous seed extract can reduce blood sugar levels in diabetic rats. Furthermore, the lyophilized powder of aqueous seed extract has been found to decrease blood glucose levels in diabetic mice and rats. Similarly, an aqueous Jamun seed extract containing gummy fibers has been highly effective in managing diabetes in rats with alloxan-induced diabetes.

AMLA:



Fig No 3: Amla Fruit



Fig No 4: Indian gooseberry tree

SCIENTIFIC NAME - *Emblica officinalis* Gaertn

SYNONYMS - emblic, emblic myrobalan, myrobalan, Indian gooseberry, Malacca tree, or amla.

BIOLOGICAL SOURCE - The biological source of amla is the *Phyllanthus emblica* tree, which is also known as the Indian gooseberry tree.

KINGDOM - Plantae

ORDER - Indian gooseberry
FAMILY - Phyllanthaceae
GENUS - Phyllanthus emblica.

CHEMICAL CONSTITUENTS - Amla is a super fruit with many nutritional benefits. It's used in Ayurvedic preparations and is believed to have therapeutic properties for treating a variety of diseases.

Ascorbic acid: Also known as vitamin C, amla fruits are high in this nutrient

Tannins: Amla contains many types of tannins, including ellagitannins, hydrolysable tannins, and phlorotannin

Flavonoids: Amla contains flavonoids such as quercetin and kaempferol Alkaloids: Amla contains alkaloids such as phyllantine and phyllantidine

Fatty acids: Amla contains linolenic, linoleic, oleic, stearic, palmitic, and myristic acids Sugars: Amla contains D-glucose, D-fructose, D-myo-inositol, and other sugars

Other polyphenols: Amla contains other polyphenols, such as gallic acid and ellagic acid

GEOGRAPHICAL SOURCE:

Amla (*Phyllanthus emblica*) is native to India but is also found in other countries in Southeast Asia, South Asia, and East Asia: India Amla trees are found in the coastal and tropical regions of India, as well as on hill slopes. They are also cultivated in the Kashmir valley.

Other countries Amla trees are also found in Sri Lanka, Uzbekistan, Pakistan, Bangladesh, Nepal, Burma, Indonesia, Bhutan, China, and the Mascarene Islands.

USES –

Hair care: Amla is a common ingredient in shampoos and conditioners because of its iron and antioxidant content. Amla oil can be used to promote hair growth, and amla powder can be mixed with henna to prevent premature graying.

Digestion: Amla's fiber content helps with digestion and prevents constipation.

Blood sugar regulation: Amla may help regulate blood sugar levels, which can be beneficial for people with diabetes.

Eye health: Amla is rich in vitamin A, which can help improve eye health. It also contains carotene, which can help enhance vision.

Immunity: Amla has antibacterial and anti-inflammatory properties that can help improve the body's immunity system.

Heart health: Amla extract may reduce risk factors for heart disease, such as cholesterol, triglyceride, and blood pressure levels.

Kidney health: Amla extract may help protect against kidney damage and preserve kidney function.

Brain health: The antioxidants in amla may help improve memory and cognitive function.

Stress relief: Amla can help induce sleep and relieve headaches. Anemia: Amla is a rich source of iron, which can help treat anemia

AMLA AS AN ANTIDIABETIC AGENT:

Emblica officinalis, also called Indian gooseberry in English and amla or amalaki in most Indian languages, holds significant importance in traditional Indian medicine systems such as Ayurveda, Siddha, and Unani, as well as in homeopathy, Sri Lankan, Tibetan, and Chinese medicine. It offers a wide range of medicinal benefits and is traditionally used to treat various chronic conditions including cerebral and intestinal ailments, diabetes mellitus, coronary heart diseases, and cancers. It is recognized as a potent rejuvenator and immunomodulator, providing positive effects on digestion, cough, asthma, heart health, hair growth, eye health, and overall physical and mental well-being. Numerous studies have documented its use in managing diabetes, dyslipidemia, obesity, cancer, liver disorders, arthritis, gingivitis, and wound healing.

Bael



Fig No 5: Indian bael



Fig No 6: Aegle marmelos

SCIENTIFIC NAME – Aegle marmelos

SYNONYME - bili, bilva, belo, maredu, vilwam, sriphal, golden apple, Indian quince, and Bengal quince, Stone apple, wood apple, Japanese bitter orange, holy fruit, elephant apple Koovalam, vilmam, Kuvalum, Kumbala

BIOLOGICAL SOURCE - The biological source of Indian bael is the tree Aegle marmelos, which is native to the Indian subcontinent and Southeast Asia

KINGDOM - Plantae kingdom

ORDER - Indian bael

FAMILY - Rutaceae

GENUS - Aegle marmelos Correa

CHEMICAL CONSTITUENTS - coumarin, xanthotoxol, imperatorin, aegeline, carotenoids, pectins, flavonoids, and terpenoids.

Citral: A key component of bael that can induce apoptosis in cancer cell lines

Tannin: A chemical found in high amounts in bael that gives it antibacterial and anti-viral properties

Phenolic compounds: Contain antioxidants that can help with gastric ulcers and acidity
Limonene: A major constituent that produces the characteristic bael fruit flavor
Marmelosin: The active factor in bael that can help with stomach ailments

coumarin, xanthotoxol, imperatorin, aegeline, carotenoids, pectins, flavonoids, and terpenoids.

Citral: A key component of bael that can induce apoptosis in cancer cell lines.

GEOGRAPHICAL SOURCE - Bael is an indigenous tree of India and found growing in neighboring countries namely Nepal, Sri Lanka, Malesia Pakistan, Bangladesh, Myanmar, Thailand and most of the southeast Asian countries.

USES - Bael fruits are of dietary use and the fruit pulp is used to prepare delicacies like murabba, puddings and juice. Bael fruits are also used in the treatment of chronic diarrhea, dysentery, and peptic ulcers, as a laxative and to recuperate from respiratory affections in various folk medicines. Bael contains chemicals called tannins, flavonoids, and coumarins. These chemicals help to reduce swelling (inflammation). This might help treat asthma, diarrhea, and other conditions. Also, some of these chemicals help to reduce blood sugar.

BEAL AS AN ANTIDIABETIC AGENT

The Bael has been utilized as a medicinal remedy in Ayurveda in India and several Southeast Asian nations since ancient times. It has a medicinal history of 5000 years and is mentioned in Ramayan, Charak Samhita, Upvana Vinod, and Yajur Veda. According to Charaka (1500 BC), Indians have long valued the medicinal properties of Bael. Traditionally, Bael has been used for regulating fertility, treating intestinal disorders, intermittent fever, and postpartum care. Additionally, it has been employed as a fish poison. Bael is also employed in the treatment of asthma, acute bronchitis, abdominal discomfort, burning sensation, brain fever, jaundice, constipation, stomachache, febrile delirium, high blood pressure, indigestion, inflammations, snakebite, leprosy, myalgia, mental illnesses, nausea, smallpox sores, swelling, thirst, thyroid disorders, tumors, ulcers, upper respiratory tract infections, anemia, fractures, wound healing, and joint swelling.

The use of unripe Bael fruit pulp in boiled rice water twice daily can alleviate vomiting in pregnant women. Urinogenital disorders can be remedied by administering unripe Bael fruit mixed with milk and sugar. Half-roasted unripe Bael fruit pulp mixed with sugar can treat abscesses and dysentery in humans. Unripe Bael fruits function as astringent digestives, demulcents, and stomachic and aid in relieving piles. In Southern Chhattisgarh, traditional healers apply a mixture of one-part dried fruit powder and two parts mustard oil to treat burn wounds. Ripe fruits are used to address chronic dysentery, diarrhea, constipation, gonorrhoea, and ulcerated intestinal mucosa. They are also employed as a tonic for the heart and brain, acting as laxatives and antivirals, and treating epilepsy and parasitic infections. Root decoction is utilized to address melancholia, intermittent fever, and heart palpitation. Bael roots are a crucial component of 'dashmool,' an Ayurvedic medicine. The syrup made from Bael fruits aids in the treatment of frequent urination, and consumption of Bael fruit juice eliminates toxins from the body.

METHOD OF PREPARATION OF CHURNA:

Churna is a fine powder of one or more drugs. Drugs according to the composition of the churna are collected, dried, powdered individually and passed through sieve number 85 to prepare a fine powder. They are mixed in the specified proportion and stored in a well closed container.

EVALUTION PAEAMETER OF CHURNA:

Determination of pH

The pH of 1% solution of formulated churna was determined using pH meter (Elico pH meter).

Determination of Moisture content

The moisture content of churna was found using halogen moisture determining apparatus (Mettler Toledo).

Determination of Ash Values

I. Total Ash Value - 2gms of churna was weighed accurately in a previously ignited and tarred silica crucible. The material was then ignited by gradually increasing the heat to 500-600°C until it appeared white indicating absence of carbon. It is then cooled in a desiccator and total ash in mg per gm of air-dried material is calculated.

II. Acid Insoluble Ash Value

To the crucible containing total ash, 25ml of HCl was added and boiled gently for 5minutes, then about 5ml of hot water was added and transferred into crucible. The insoluble matter was collected on ashless filter paper. This was then washed with hot water until filtrate is neutral and the filter paper along with the insoluble matter was transferred into crucible and ignited to constant weight. The residue was then allowed to cool and then weighed.

Determination of Extractive Values [13]

I. Water Soluble Extractive Value

5gms of churna was accurately weighed and placed inside a glass stoppered conical flask. It is then macerated with 100ml of chloroform water for 18 hours. It was then filtered and about 25ml of filtrate was transferred into a China dish and was evaporated to dryness on a water bath. It was then dried to 105°C for 6 hours, cooled and finally weighed.

II. Alcohol Soluble Extractive Values

Ethanol was used as solvent in place of chloroform water and the remaining procedure was the same as that of water-soluble extractive value.

Determination Of Crude Fiber Content ¹⁴

2gms of accurately weighed churna was placed in a round bottom flask and then 100ml of 0.128 M sulphuric acid was added and refluxed for 1 hour then filtered through ashless filter paper and the residue was washed with water until filtrate becomes neutral. The residue was then weighed

- (a) Ignited to ash and finally the weight of ash was determined.
- (b) The difference between a and b represented the crude fiber content and was calculated on dry weight basis.

DETERMINATION OF MICROBIAL CONTENT

1gm of churna was dissolved in lactose broth and volume adjusted to 100ml with the same medium. About 10ml of sample was transferred into 100ml of Macconkey broth and incubated for 18-24 hours at 43-45° C. A subculture was prepared on a plate with Macconkey agar and incubated at 43-45° C for 18-24 hours. The growth of red, generally non-mucoid colonies of gram-negative rods appearing as reddish zones indicates the presence of E. coli if not then it indicates the absence of E. coli.

III. CONCLUSION

The standard is confirmed by the assessed physical parameters. of the prepared churna. The examination of enzymes in a laboratory setting. the fact is revealed through the activity performed using the methods mentioned above that the churna that has been formulated can aid in digestion starch, lipids, and proteins that resemble those found in products on the market GASTRA formula formulation.

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