

Jambu (*Syzygium cumini*): A Review from Classical and Modern Perspectives

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Abstract

Jambu (*Syzygium cumini*), sometimes referred to as Jamun or Indian blackberry, is a significant medicinal plant that has been extensively documented in both contemporary scientific research and Ayurvedic literature. It is a member of the Myrtaceae family and has long been used to treat a number of illnesses, most notably Prameha (diabetes mellitus). Jambu's Kapha-Pitta shamaka and Pramehaghna qualities are attributed to its Kashaya and Madhura rasa, Laghu and Ruksha guna, Sheeta virya, and Katu vipaka, according to classical Ayurvedic literature like Charaka Samhita, Sushruta Samhita, and Bhavaprakasha Nighantu. Fruit, seeds, bark, and leaves are among the several plant parts that are utilized medicinally. Jambu's antidiabetic, antioxidant, antibacterial, anti-inflammatory, and cardioprotective properties are attributed to a number of bioactive components, including jamboline, jambosine, flavonoids, tannins, anthocyanins, and ellagic acid, according to contemporary pharmacological research. By enhancing insulin activity and controlling glucose metabolism, scientific research has confirmed the hypoglycemic effect of jambu seeds. The fruit's nutritional and medicinal benefits is further enhanced by its abundance of vitamins, minerals, and polyphenolic substances. The substantial therapeutic potential of Jambu in the treatment of metabolic disorders and other illnesses is highlighted by the merging of traditional Ayurvedic knowledge with contemporary scientific data. This review aims to present the classical description and modern scientific findings related to Jambu, emphasizing its therapeutic importance and future research prospects.

Keywords: Jambu, *Syzygium cumini*, Jamun, Ayurveda, Prameha, Antidiabetic, Medicinal plant.

Introduction

A popular medicinal plant found across India and other tropical areas is jambu (*Syzygium cumini*). It is frequently referred to as Java plum, Indian blackberry, or jamun. Due to its medicinal qualities, Jambu has a significant role in Ayurveda and is referenced in a number of traditional books. Traditionally, the herb has been used to cure skin illnesses, digestive issues, bladder infections, and metabolic abnormalities. Under Phalavarga, Ayurvedic experts explained Jambu and emphasized its function in preserving metabolic equilibrium and strengthening the digestive system. Nowadays, there is a resurgence of interest in medicinal herbs like Jambu due to the rising incidence of diabetes and lifestyle problems. Scientific research has confirmed many traditional claims and demonstrated the pharmacological activities of various plant parts. ¹Therefore, understanding both classical Ayurvedic knowledge and modern scientific findings is important for the effective therapeutic utilization of Jambu.

Classical View of Jambu

Jambu's characteristics and medicinal use are mentioned in a number of Nighantus and Samhitas found in Ayurvedic literature. Classical sources state that Jambu has Sheeta virya, Katu vipaka, Laghu and Ruksha guna, and Kashaya and Madhura rasa. These qualities aid in balancing Pitta and Kapha doshas. Jambu is especially recommended for metabolic illnesses such as Raktapitta, Atisara, and Prameha. The Jambu beeja seeds are said to be very successful in reducing excessive urine and sugar imbalance. The plant's bark possesses Stambhana and Grahi qualities, which make it beneficial for dysentery and diarrhea.² The fruit, known as Raktaprasadana and Deepana-Pachana, is said to enhance digestive fire and blood purity. Because of the traditional belief that Jambu seed powder has antidiabetic properties, traditional Ayurvedic doctors frequently utilized it to treat Prameha.

SYNONYMS & VERNACULAR NAMES³

Latin : *Syzygium cumini* (Linn) Skeels

Botanical Synonym: *Eugenia cumini* & *Eugenia jambolana*

English : Java Plum (Sometimes Malabar Plum), Indian blackberry

Hindi Name: Jamun, Jambul

Other names: Jamblang, Jambolan, Duhat, Jambolan Plum, Kavika, Mesegerak

Ayurvedic name: Jambu, Mahaphala

BOTANICAL CLASSIFICATION⁴

Kingdom - plantae

Sub-Kingdom- Viridiplantae

Infra Kingdom - Streptophyta (Land Plants)

Super Division - Embryophyta

Division- Tracheophyta (Tracheophytes or Vascular Plants)

Sub Division - Spermatophyta (Spermatophytes or Seed Plants)

Class- Magnoliopsida

Super order - Rosanae

Order - Myrtales

Family - Myrtaceae

Genus- *Syzygium*

Species - *Syzygium cumini*

Botanical Description:

The massive evergreen *Syzygium cumini* tree may reach a height of thirty meters. The bark has a rough texture and is grayish brown in color. The leaves have a shiny surface, are opposite, leathery, and fragrant. Clusters of tiny, greenish-white blooms are seen. When ripe, the fruit, which has an oval or oblong shape, turns from green to dark purple or black. The pulp tastes somewhat astringent and is sweet and juicy. The solitary seeds have potent therapeutic qualities. The plant is found in many tropical and subtropical areas, particularly in the Indian subcontinent.⁵

Distribution: Common in the Upper Gangetic Plain, Bihar, and Orissa, particularly in damp areas; planted in West Bengal, the Deccan and Konkan regions, and all of South India's forest districts, both in the plains and in the hills up to 1800 m; typically found along riverbanks and seashore ghats. The jamun plant was

originally planted on the Indian subcontinent, but it is now spread throughout much of south Asia, including Bangladesh, India, Nepal, Pakistan, Burma, Indonesia, and Sri Lanka. The jamun tree is revered by Buddhists in southern Asia and is frequently planted next to Hindu temples since it is associated with Lord Krishna.

CHARACTERISTIC CHARACTERS IN AYURVEDA⁶

Rasa – Kasaya, Madhur, Amla

Guna – Laghu, Ruksha

Virya – Sheeta

Vipaka – Katu

Prabhava – Cardiac Tonic

Dosha karma – Pacifies Kapha dosha & Pitta dosha but increases vata dosha.

Karma- Stambhana, Twagdosahara, Dahaprashamana, Deepana, Pachana, Yakriduttejaka, Chhardinigrhana, Raktastambhana, Mootrasangrahaneeya.[19]

Phytochemical Composition

The active chemical components or secondary metabolites found in plant parts are how medicinal plants carry out their pharmacological effects and therapeutic applications. The majority of traditional medical systems, including Ayurveda, Siddha, Unani, folklore medicine, and home remedies, employ plant parts as a crude combination without separating the pharmacologically active ingredient for therapy. Numerous investigators have documented the presence of active phytochemicals in different regions of Jambu.⁷

Jambu has a variety of bioactive chemicals that are responsible for its medicinal properties, according to recent phytochemical research. Alkaloids found in the seeds, such as jamboline and jambosine, are thought to be involved in controlling blood sugar levels. Flavonoids, tannins, ellagic acid, anthocyanins, glycosides, and essential oils are other phytochemicals found in the plant. Vitamin C, iron, calcium, potassium, and dietary fiber are all abundant in the fruit pulp. The fruit's rich purple hue is caused by anthocyanins, which are potent antioxidants. The different pharmacological effects shown in clinical and experimental research are influenced by these phytochemicals.⁸

A thorough analysis of the phenolic content of the edible portions of the jambolana fruit (*SC (L.) skeels*) and phytochemical characterisation were published. According to the study, the fruit's edible portions may contain the following active ingredients. Anthocyanins, gallotannins, and ellagitannins were identified as the predominant phenolic components among the 74 distinct phenolics present in the edible sections of jambolan, primarily in the skin. Jambolan and jambolan flavonols produced from the myricetin, laricitrin, and syringetin classes also had high concentrations of flavanols. The fruit did not contain hydroxycinnamates, and the condensed tannins were only trace amounts of phenolic substances.⁹

Bioactivity- Bifunctional vitalboside was isolated and identified by the fractionation and purification of methanolic extracts of SC seeds. An A. Solvent-solvent fractionation was used to the methanol extract of powdered SC seed by dissolving 60% methanol and partitioning it with hexane and chloroform. After being exposed to silica gel column chromatography, the chloroform soluble fraction demonstrated enhanced bioactivity. Vitalboside-A demonstrated anti-diabetic and anti-adipogenic activities by glucose

uptake in L6 (rat myoblast), 3T3-L1 (mouse preadipocytes) adipocytes, and Nile red assay. The F12 fraction from the column elution demonstrated the best functional activity, and the concentrated F12 fraction was further analyzed by NMR, LC-MS, and FTIR to enable the chemical structure for the vitalboside-A. It inhibited the protein tyrosine phosphatase 1B through the allosteric mechanism, which was later confirmed by docking studies.¹⁰

Useful Parts-¹¹

- Kernel
- Fruit pulp
- Leaves
- Stem Bark

Main action – Astringent & Digestive Stimulant

Side effect – ANAHA (Abdominal distension along with intestinal gas and constipation)

Prevention – Kali Mirch (black pepper) and Kala namak or Sendha namak should be added in juice to prevent its side effect.

Interactions – Milk & Tea should not be taken before and after eating jamun.¹²

THERAPEUTIC INDICATIONS

- Poor appetite
- Indigestion
- Chronic colitis
- Rectal Bleeding (Bleeding Diarrhoea)
- Cancer
- Liver disorders
- Pharyngitis
- Urethrorrhea
- Splenopathy¹³

Dosage and administration

- **Juice** – 10 – 20 mL
- **Powder** – 3-6 g

Modern Pharmacological Activitie

Numerous pharmacological properties of Jambu have been shown by contemporary scientific study. Due to its capacity to increase insulin production, improve glucose absorption, and block enzymes that break down carbohydrates, Jambu seeds have been shown to have antidiabetic properties. The presence of polyphenols and anthocyanins, which shield cells from oxidative stress, has also been linked to antioxidant activity. Extracts from Jambu leaves and bark have been found in antimicrobial investigations to have inhibitory effects against a variety of bacterial and fungal infections. Experimental investigations have also shown hepatoprotective and anti-inflammatory properties. Jambu fruit is also good for preserving general health since it possesses gastroprotective and cardioprotective properties.¹⁴

PHARMACOLOGICAL ACTIVITY-

Jambu's antidiabetic efficacy has been assessed in over 100 studies utilizing both in vitro and in vivo models. Regarding in vivo models, the majority of research is done on diabetes generated by streptozotocin or alloxan, which primarily resembles type-1 diabetes. Studies on high-fat diets and streptozotocin-induced diabetes, which closely matches type-2 diabetes, are few. Rats, rabbits, and mice are used in experiments. The primary purpose of the in vitro models is to illustrate the location or targets of anti-diabetic activity, such as α -glucosidase, α -amylase, peroxisome proliferators-activated receptor, glucose absorption by muscle or adipocyte cells, insulin secretion by insulinoma cells, etc.¹⁵

Uses in Ayurveda¹⁶

Prameha: Due to kashaya rasa and kledaghnata of jambu, it is useful in Bahu mutrata and Aavilmutrata. It also reduces level of Raktagata and mutragata Sarkara

Chhardi: Due to kashaya rasa, shamana of Kleda (Amasaya gata), kapha & pitta is occurring which is chhardi nigrhana. Jambu patra kwath with honey is given in chhardi.

Atisara-Pravahika: Jambu phala majja churna is used in Atisara and Pravahika, due to Stambhana guna.

Raktavikar-Raktapitta-Rakta pradar: Patra swarasas used for Raktapitta and Beej churna is used for Rakta pradara and Raktatisara.

Vrana ropana: Phalamajja churna is used for mukha dushika.

Mukha paka: Jambu patra kwatha is given for Gandusha and kavala in Mukhapaka.

Integration of Classical and Modern Knowledge

Jambu's traditional Ayurvedic description closely matches current scientific discoveries. The plant's scientifically demonstrated antidiabetic properties are consistent with the traditional usage of Jambu seeds for Prameha. Similar to this, the presence of tannins with astringent and antibacterial qualities supports the Kashaya rasa and Stambhana karma stated in classical writings. The Ayurvedic idea of Raktaprasadana can potentially be connected to the antioxidant benefits shown in contemporary studies. These connections emphasize how crucial it is to combine traditional Ayurvedic knowledge with contemporary pharmacological research in order to better comprehend and apply therapeutic herbs.

The major minerals present in jamun pulp as well as seeds include:

- Sodium
- Potassium
- Magnesium

Nutrition in jamun

The place and environment in which jamun fruit is grown are the primary determinants of its makeup. The makeup of minerals, as opposed to vitamins, is greatly influenced by climate.

Discussion-

Jamun plant parts have long been used in Ayurveda and other traditional medicinal systems to treat diabetes mellitus and its consequences. Nevertheless, relatively few research are conducted to provide scientific proof of Jamun's medicinal potential for humans. The lack of sufficient information on extract safety, extract selection, and dose to be tested may be the cause of this. The following clinical trial trials, which have recently been published in the literature, were conducted utilizing the crude powder made from Jambu plant parts.

Conclusion-

Syzygium cumini, or jambu, is a highly prized medicinal herb with substantial therapeutic potential. Its qualities and medicinal applications are well described in classical Ayurvedic literature, especially in the treatment of digestive diseases and Prameha. By finding many bioactive chemicals that are responsible for its pharmacological actions, modern scientific study has confirmed these traditional assertions. The use of Jambu as a successful natural treatment for metabolic disorders and other medical diseases is supported by the blending of traditional knowledge and contemporary scientific data. To fully investigate its medicinal potential and create standardized herbal formulations, more pharmacological and clinical research is required.

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