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SYZYGIUM CUMINI'S (JAMUN) PHARMACOLOGICAL CHARACTERISTICS AND THERAPEUTIC POTENTIAL

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ABSTRACT

Commonly referred to as Java Plum, Blackberry, Black Plum, or Jambul, JAMUN (Syzygium cumini) is a huge, glabrous, evergreen tree that grows in Australia, Malaya, Sri Lanka, and India. The trees bear rectangular or ellipsoid berries every year. When fully ripe, they turn purple black, yet when raw, they are green. The ripe fruits taste rather tart and sweet. According to studies, the berries are rich in minerals, carbohydrates, and pharmacologically active phytochemicals such anthocyanins, terpenes, and flavonoids. Among the several compounds included in the plant are anthocyanins, glucoside, ellagic acid, isoquercetin, kaemferol, and myrecetin. The seeds are said to contain the glycoside jambolin or antimellin and the alkaloid jambosine, which prevent starch from being converted to sugar diasterately. The database's extensive collection of literatures shown that extracts from various jamun sections exhibited notable pharmacological effects. A plant noted for its ethnomedical applications is jamun. Numerous pharmacological properties, including antibacterial, antifungal, antiviral, antigenotoxic, anti-inflammatory, anti-ulcerogenic, cardioprotective, anti-allergic, anticancer, chemopreventive, radioprotective, free radical scavenging, antioxidant, hepatoprotective, anti-diarrheal, hypoglycemic, and antidiabetic effects, have been demonstrated by scientific studies to be present in the different extracts of jamun. Bark, seed, and leaf extracts are too helpful in the management of diabetes. The primary focus of this review is the medicinal value of jamun plants and how they can be used to treat a range of illnesses.

KEYWORDS: *JAMUN (Syzygium cumini) cardioprotective, cervical cell lines.*

INTRODUCTION

Since ancient times, people have utilized plants as medicine to treat a wide range of illnesses, making them extremely beneficial. The gift of nature that calms the mind and heals the body has long been sought after by man. In India, jamun is regarded as a native and significant minor crop. This tropical evergreen tree is indigenous to Bangladesh, India, Nepal, Pakistan, Sri Lanka, the Philippines, and Indonesia. This fruit crop is resilient. Its towering, evergreen tree becomes partially deciduous during droughts. India is where jamun originated. It can be found growing wild all around the nation. With a height of 2530 meters and a stem girth of 3–4 meters, Jamun is a huge evergreen tree.This tree has a lovely shape and is cultivated along the roadsides of Bunds Road for its mouthwatering fruits, shade, and windbreak. A crop that is cross-pollinated is jamun. Fruits are produced by this tree for as long as 60 to 70 years[1]. There have been reports of the medicinal benefits of several plant parts, including the leaves, seeds, and bark. It is particularly helpful in the treatment of diabetic mellitus, ulcer, antioxidant, antibacterial, anti fungal, nitric oxide scavenging, free radical scavenging, antimicrobial, anti HIV and radioprotective measures. In ancient times, ayurveda made use of seeds, barks, flowers, and leaves[2]. The plant's bark has antibacterial, digestive, anthelminthic, febrifuge, sweet, carminative, diuretic, astringent, and stomachic properties. Diabetes, ringworm infection, spleenopathy, pharyngitis, and urethrorrhea are all treated with the fruits and seeds. The leaves have been widely used to prevent blood discharges in the feces, cure diabetes, leucorrhea, and constipation. The plant's bark has antibacterial, digestive, anthelminthic, febrifuge, sweet, astringent, carminative, diuretic, and constipating properties. Diabetes, ringworm infection, spleenopathy, pharyngitis, and urethrorrhea are all treated with the fruits and seeds. The leaves have been widely used to prevent blood discharges in the feces, cure diabetes, leucorrhea, and constipation[3].

Morphological Characteristics of Syzygium Cumini (Jamun)

Jamun is a huge, highly foliaceous, evergreen tree with thick, greyish-brown bark that exfoliates in woody scales. The wood produces brown dyes and a form of gum called Kino. It is white, close-grained, and long-lasting. The leathery, oblong-ovate to elliptic or obovateelliptic leaves are 6 to 12 centimeters long, smooth, glossy, and have many nerves that unite within the edge. The tip is broad and less acuminate. The panicles, which are 4 to 6 cm long and frequently axillary or terminal, are borne mostly from the branchlets beneath the leaves. Round or rectangular in shape, the fragrant, greenish-white flowers are found in dichotomous paniculate cymes and can be found in clusters of only a few or 10 to 40.The calyx is serrated, funnel-shaped, and roughly 4 millimeters long. The petals fall as a single, tiny disk because they are cohesive. The stamens are roughly as long as the calyx and are quite numerous. Numerous varieties with varying fruit sizes and colors have been created, including some enhanced races with seedless fruits and flesh that is purple to violet

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or white in color. Typically rectangular, 1.5 to 3.5 cm long, dark-purple or almost black, delicious, juicy, and tasty, the berries have a single big seed[4].

Parts Are Used
(Leaves, Stem bark, Flowers, Fruit, Seeds)
Phytochemical constituents

Leaves



Diagram 1

After being extracted in methanol and water, the leaves of the jamun plant were examined for the presence of several phytochemicals. A variety of alkaloids, flavonoids, glycosides, steroids, phenols, tannins, saponins, and cardiac glycosides have been discovered in both aqueous and methanol extracts[5], Myricitin, myricetin 3-O-4-acetyl-L-rhamnopyranoside, quercetin, and myricetin[6].

Stem Bark



Diagram 2

The stem bark is abundant in betulinic acid, friedelin, β-sitosterol, eugenin, and fatty acid ester of myricetin, gallic acid, ellagic acid, quercetin, and kaempferol[7], bergenins, flavonoids and tannins[8].

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Flower



Diagram 3

Kaempferol, myricetin, isoquercetin (quercetin-3-glucoside), myricetin-3-L-arabinoside, quercetin-3-D-galactoside, dihydromyricetin, oleanolic acid, acetyl oleanolic acid, eugenol-triterpenoid A, and eugenol-triterpenoid B are abundant in the flowers[9].

Fruit



Diagram 4

Fruits contain malic acid as the major acid, a small quantity of oxalic acid is also reported to be present, Gallic acid and tannins account for astringency of the fruit. The fruit's purple hue results from the presence of cyaniding diglycosides. Fruits contain glucose, fructose, mannose, galactose, non-reducing sugar (9.26%), and sugar (8.09%). According to reports, there are the following mineral elements (mg/100g of edible pulp): Ca, Mg, Fe, Na, K, and Cu. Vitamin A (80 IU), thiamine (0.03 mg), riboflavin (0.01 mg), nicotinic acid (0.2 mg), vitamin C (18 mg), choline (7 mg), and folic acid (3 µg) are the vitamins found in 100g of edible pulp[10].

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Seed



Diagram 5

Hydrolyzable tannins, phenolic acids, flavonoids, other phenolics, terpenoids, phloroglucinol derivatives, and saponins[11]. Amino acids, alkaloids, flavonoids, phytosterols, phenols, saponins, and tannins [12]. Carbohydrates, vitamin, proteins[13].

Therapeutic use of Jamun

The entire jamun plant, including the seeds, fruit pulp, leaves, flowers, and bark, is well known for its therapeutic properties. Jamun is used in many traditional medical systems, including homeopathic, Siddha, Ayurvedic, and Unani. Charkha and Sushruta suggested jamun as a remedy for a variety of ailments, including diarrhea, obesity, vaginal discharge, menstrual disorders, hemorrhage, etc., marking the beginning of the plant's medicinal use[14]. Anti-diabetic, antioxidative, anti-hyperlipidemic, anti-ulcer, anti-allergic, anti-inflammatory, anti-arthritic, antibacterial, and radioprotective properties are just a few of the recognized pharmacological properties of S. cumini.These effects have been connected to the presence of several flavonoids and phenolics in the S. cumini tree.Ayurveda and other traditional Indian medical systems have referenced the therapeutic properties of S. cumini seeds, leaves, stem bark, and complete fruit [15].

Anti-Diabetic

Many medical systems recommend jamun seeds as a way to manage diabetes. Numerous pharmacological research have also confirmed jamun seed's anti-diabetic properties. According to research by Helmstadter and Kumar et al., giving jamun seed to mice with diabetes caused a significant drop in blood glucose levels[16,17]. Various scientists have investigated the extracts' efficacy using various solvents on various animal models[18].

Anti-Oxidant

Increased lipid peroxidation is thought to be linked to oxidative stress, which is a significant factor in the development of diabetic complications[19]. Reactive oxygen species production rises and antioxidant defense capacity falls, causing oxidative stress in cells and tissues[20]. Several solvents, including nhexane, chloroform, ethyl acetate, butanol, and water, were used to separate the methanolic extract of SC's leaves, bark, and seeds. These fractions' capacity to scavenge free radicals and behave as antioxidants was examined.The polar fractions, such as the water and ethyl acetate fractions, produced the best results out of all of them[21]. When evaluated using a variety of in vitro techniques, including the ferric reducing antioxidant power (FRAP) assay, 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging assay, nitric oxide radical scavenging, ABTS assay, total reducing antioxidant potential, total antioxidant activity, reducing power, and hydroxyl radical scavenging activity, the SC leaf and seed extract demonstrated a notable level of antioxidant activity[22].

Anti-Hyperlipidimic

Abnormal lipid profiles are among the most prevalent consequences of diabetes mellitus. Alcoholic E. jambolana seed extract (0.1 g/kg body weight) was shown to have an anti-hyperlipidemic action in the liver, kidney, and plasma of streptozotocin-induced diabetic rats. Glibenclamide (0.6 x 10-3 g/kg) and E. jambolana seed extract were used to treat diabetic rats, bringing their elevated plasma lipid levels back to almost normal. Oral administration of E.jambolana seed extract lowered the levels of blood LDL and VLDL cholesterol and elevated HDL cholesterol in diabetic rats by regulating the hydrolysis of lipoproteins and their selective absorption and processing in

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liver and kidney[23]. Fat depots include insulin-sensitive lipases, which remain active or uncontrolled in the absence of insulin and result in lipolysis and the mobilisation of fatty acids from fat depots to plasma, which raises blood cholesterol levels[24].

Anti-Ulcer

A peptic ulcer occurs when the stomach and/or duodenum's mucosal integrity is disrupted, resulting in a local defect or excavation brought on by active inflammation. Impaired mucosal resistance (mucus, bicarbonate secretion, prostaglandins, blood flow, and the process of restitution and regeneration after cellular injury) and offensive factors (acid-pepsin secretion, H. pylori, bile, increased free radicals, and decreased antioxidants) are out of balance. There have been reports of negative side effects linked to the medications used to treat peptic ulcers[25]. Due to its impact on both defensive and offensive mucosal variables, diabetes has been shown to increase the risk of developing peptic ulcers. There have been reports of ulcer-preventive benefits from E. jambolana seeds[26].

Anti-Allergy

In Swiss mice weighing 20–25 g, S. cumini leaf extract at a dose of 0.1 g/kg prevented only 23% of allergic paw oedema, but 50% of paw oedema generated by compound 48/80, a potent mast cell degranulator. Treatment with S. cumini (SC) reduced the amount of oedema caused by histamine and 5-hydroxytryptamine (5-HT) by 58% and 52%, respectively. Paw oedema caused by platelet aggregating factor showed no change. These findings imply that the SC extract may be far more successful in preventing reactions whose mechanism relies on 5-HT and histamine production. Additionally, SC extract directly affected mast cell degranulation, preventing the histamine release that the mast cell degranulator C48/80 produced in vitro[27].

Anti-Bacterial

The study used extracts from several fruit pulp maturity indices (young, premature, mature, preripened, and ripened) and solvent systems (ethyl acetate, acetone, methanol, aqueous, and diethyl ether). Compared to Gramme negative bacteria, the extracts claimed greater efficacy against Gramme positive bacteria. Among the different maturity stages and solvents, the diethyl ether extract from preripened pulp showed the greatest promise as an antibacterial agent[28].

CONCLUSION

Although S. cumini, also referred to as "jamun," has a number of pharmacological properties, its anti-diabetic properties might be the most significant. The entire jamun, including the peel, pulp, and seed, is a rich source of phytochemicals, containing bioactives that are both phenolic and non-phenolic. The most extensively researched of them is the ameliorating activity against Type 1 and Type 2 diabetes. Pharmacological studies link the phytochemicals to a variety of therapeutic actions, including antioxidative, anti-cancer, antidiabetic, antibacterial, and radioprotective activities. To determine the primary functional component in charge of these functions, more research is necessary. Jamun is a seasonal, perishable, and underappreciated fruit with an appealing appearance, an astringent flavour, and a notable mineral and vitamin content. Traditional healers frequently utilise jamun to treat a variety of illnesses, particularly diabetes and its consequences. The majority of pharmacological research on diabetes was done on seeds, but further research is needed to fully understand the pharmacological potential of the other plant parts. Likewise, there aren't many studies on the pharmacological effects of jamun's phytochemical ingredients. With these facts in mind, the authors hope that this study will emphasise the significance of jamun in a variety of treatments and suggest that more clinical and phytochemical research be conducted on this traditional medicinal plant in order to develop safer medications. In addition to its primary purpose of providing nutrients, jamun has a great deal of promise for use as a raw material for post-harvest processing and the creation of functional foods with the ability to prevent disease. This review provides thorough details on the medicinal, nutritional, and processing aspects of jamun.

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