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Phytochemistry And Pharmacological Review Of *Syzygium Cumini*

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Abstract:

Syzygium cumini, also known as jambolan, is a highly valued medicinal plant widely used in the treatment of various illnesses, especially diabetes. This review aims to provide a comprehensive overview of the botany, phytochemical components, traditional uses, and pharmacological effects of Syzygium cumini. A thorough search of electronic databases using terms like Eugenia jambolana, jambolan, common plum, and java plum was conducted. This plant has been recognized for its anti-diabetic properties for many decades and has gained popularity as a natural remedy. Studies have shown that *Syzygium cumini* is rich in anthocyanins, glucosides, ellagic acid, isoquercetin, kaempferol, and myricetin. The seeds are said to contain alkaloids like jambosine and glycosides such as jambolin, which inhibit the conversion of starch into sugar. Numerous reports in both traditional medicine and scientific research have highlighted the significant pharmacological effects of various parts of the jambolan plant. Further research is needed to isolate and identify the active compounds responsible for these effects, which could lead to the development of safer treatments for a range of conditions, including diabetes.

Key words: *Syzygium cumini*, Phytochemistry, Medicinal uses,

Introduction:

Syzygium Cumini belongs to the family of Myrtaceae. It is commonly present in America and Australia. It is distributed all over worldwide. It has a worldwide, although highly unevenly, distributed in tropical regions and the genus comprises of 1 to 100 species and has a local range that extends from Madagascar to Africa throughout the southern East Asiaand around the Pacific. Its high level of diversities occurs from Malaysia, to north-eastern Australia. Plants of this family commonly contains volatile oils which are used as medicine [1]. Many fruits of this genus are safer to eat and act as a traditional medicine in different ethnobotanical practices through the tropical and subtropical regions [2].

Origin And Distribution: Syzygium cumini Skeels as the best-Known plant and it is very oftenly cultivated. The species is grown and harvested in the Indian sub-continent region, and many other places of South east Asia such as (india, Bangladesh, Burma, Nepal, Pakistan, Sri Lanka and Indonesia) it was long being introduced and became native in Malaysia. The plant is cultivated in many different regions where it has

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been used as a fruit producer, ornamental and also for its timber purpose. In India, the plant is present throughout the pasture from the Himalayas to south India [3].

Various plants parts of the tree are known for ethno-medicinal uses, and in particular, the fruits of SC tree are well known for medicinal uses and preparation of health drinks. Studies have shown that the berries contain carbohydrates, minerals an the pharmacologically active phytochemicals. The active phytochemical includes flavonoids, terpenes, and anthocyanins. Ayurvedic and Indian Folk Medicine have elaborated the use of SC for the diabetic treatment much before the advent of insulin. The different extracts of this plant have demonstrated to have a broad range of therapeutic potential including antibacterial, antifungal, antiviral, anti-genotoxic, anti-inflammatory, anti-ulcerogenic, cardio protective, anti-allergic, anticancer, chemo preventive, radio protective, free radical scavenging, antioxidant, hepatoprotective, anti-diarrheal, hypoglycaemic and antidiabetic effects.

The part of plant and their chemical constituent

S. No	Plant part	Metabolic class	Identified compounds	References
1	Leaves	phenolic content and acetylated flavonol glycosides	catechin, cretegolic acid, n-dotricontanol, Ferrullic acid, myrcetin, mycaminose, quercetin, tannic acid, BHA, Tocopherol	Zhi Ping Ruan et al. (2008) & Sarma et al., 2020 [4]
2	Seeds	Polyphenols including Flavonoids, alkaloids, glycosides & phenolic compound, fatty oils	Quercetin, Rutin, 3,5,7,4-tetrahydroxy flavones, caffeic acid, ellagic acid, ferullic acid, albumen, fat, jambosine, ellagic acid , lauric , myristic, palmitic, stearic, oleic acid , linoleic, malvalic and vernolic acid and phytosterols such as β-sitosterol	Ah et al., 2019 [5]
3	Stem bark	Triterpenoids, Resin, Resin, Phytosterol	Oleanolic acid Eugenia-triterpenoid-A Eugenia-triterpenoid-B Ellagic acid,Pentacyclic triterpenoid- Betulinic acid, Pentacyclic triterpenoid- Friedelin, Myricetine, β-sitosterol, Myricyl alcohol	Ivan A R et al . (2006), [6]

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4	Roots		Isorhamine 3-o-rutinoside , myricetin 3-o-robinoside	Bijauliya Rahul Kumar et al (2017) [8]
5	Fruit	Tannins, Glycosides, Vitamin A, C	Oxalic acid, malic acid, gallic acid cyanidine diglycosides, thiamine, riboflavin, nicotinic acid, folic acid	Jadhav V. M. et al (2009) [9]
6	Flowers		Flavonoids: isoquercetin, quercetin, kaempferol, myricetin, Terpenoid: oleanolicacid, Phenolic acid: ellagic acids	Sagrawat [10]

Pharmacological Properties: -

Antidiabetic Activity: -

From the seed extract of S.C. mycaminose compound was isolated. This compound mycaminose (50 g/kg), ethyl acetate and methanolic extracted compound of S. C. seed (200& 400 g/kg) was taken to determine the anti-diabetic activity against streptozotocin (STZ)- induced diabetic rats. The result showed that mycaminose possess anti-diabetic activity. S.C. aqueous seed extract was evaluated for hypoglycemia activity at the dose level of 1mg, 2mg,4mg, 6mg. The result was found that 4mg/kg dose have high hypoglycaemic action. S.C. seed was evaluated and the phytochemical screening indicated that the seed extract contains steroids and flavonoids. Result showed that the flavonoids in S.C. seed plays an important role for anti-diabetic activity [11]. The study evaluated the effect ethanolic extract of S.C. seeds (1.25g/ kg) for twenty-one days. The result showed that the administering of S.C. seed powder to diabetic induced rats reduces the glucose level [12].

Anti Inflammatory Activity:

Ethanolic extract of S. cumini used for anti-inflammatory activity on formaldehyde and carrrageenin induced oedema ,the rate of dose is about 125mg significantly the extract shows anti-inflammatory activity [13]. Methanolic extract and ethyl acetate of syzygium cumini leaves provides anti-inflammatory activity. Activity in the paw oedema of Wister rat induced with carrageenan, at 200 dose level the exponential study of s. cumini leaves shows anti-inflammatory activity [14]. The methanolic extract and ethyl acetate of syzygium cumini leaves provides anti-inflammatory Activity in paw oedema of wister rat induced with carrageenan ,at 200 and 400mg/kg dose level administrated orally the experimental study of s.cumini seed shows anti-inflammatory activity [16].

Anti Hyperlipidimic Activity: -

The syzygium cumini ethanolic extract exhibits anti hyperlipidemic activity in rats induced with triton X-100 induced hyperlipidemia in rats. the active constituents of the plant like triterpenoids, tannins, flavanoids are responsible for antihyperlipidimic activity these have the ability to decrease total triglyceride level,total cholesterol level in rats. Atorvastatin(10mg/kg) is used as standard drug. (17) when the rat of high cholesterol diet is treated with SC extract it significantly decreases triglycerides, serum cholesterol, atherogenic index, low density lipoproteins, very low density lipoprotein, it increases ratio of high density lipoproteins in hyperlipidemic rats. (18) Coronary heart disease is majorly caused by disorder like hyperlipidemia. syzygium cumini acts as antihyperlipidimic drug prevent atherosclerosis induced disorders. Entire plant is used as medicinal purpose, the chief constituents of plant like glucoside,ellagic acid, kaempferol, myricetin, and anthocyanin these active constituents plays a major role in pharmacological

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activities which may include anti diabetic, anticancer, anti-hyperlipidaemic, antioxidant, antibacterial, anti-fungal and anti-diarrheal activity [19]

Cardioprotective activity

The most common cause of death worldwide is cardiovascular disease, and the many Jamun extracts have been tested for their cardioprotective efficacy in a variety of preclinical settings. In hypertensive rats, the hydroalcoholic extract of Jamun leaves, given orally at a dose of 0.5 g daily for 8 weeks, has been shown to lower blood pressure [20]. According to the combined results of these preclinical and clinical model investigations, Jamunleaf also acts as cardioprotective agent.

Antioxidant activity

Free radical scavenging experiments have demonstrated the antioxidant activity of several Jamun components. Furthermore, nitric oxide (NO) free radical scavenging activity has increased in response to the concentration of the Jamun leaf and seed extracts [21]. Free radicals such as hydroxyl (OH), superoxide (O2), and DPPH have been discovered to be scavenged by the aqueous extract of Jamun fruit skin [40]. The leaf extract's DPPH radical scavenging and ferric reducing power (FRAP) in methanol extract and its portion of ethyl acetate, chloroform, n-hexane and water were assessed. The most effective fraction for scavenging FRAP and DPPH radicals was determined to be ethyl acetate [22]. The in vitro scavenging capacity of a 1:1 dichloromethane and methanol (DCM-MET) extract of Jamun leaves was examined. The jamun extract was discovered to scavenge OH free radicals in a dose- dependent manner, with 350 g/mL having the most effect. Additionally, this extract reduced the production of O2 • radicals, with 250 g/mL having the highest impact. The maximum effect was obtained with 80 g/mL for both radicals. It similarly equally suppressed DPPH and ABTS+ free radicals (23]

Gastroprotective, Antidiarrheal, and Antimicrobial Activity

Gastric ulcer is the most commonly diagnosed illness of the human digestive system [24]. Previous investigations revealed that the ethanol extract of *S. cumini* seeds reduces streptozotocin- and ethanol-induced peptic ulcers [25]. In addition, research findings showed that tannins from *S. cumini* offer excellent protection from hydrochloric acid- and ethanol-induced gastric ulceration by minimizing the gastric mucosal damage [26]. *S. cumini* seeds mixed with jaggery (non-centrifugal cane sugar) were reported to impart relief from diarrhea and dysentery. Likewise, tannins present in *S. cumini* fruits are well-known for their anti-diarrheal potential [27]. Moreover, *S. cumini* seed and flower with silver nanoparticles (AgNPs) exhibited notable antimicrobial potential when tested at concentrations between 31.2 and 2000 µg/mL against several bacterial and fungal species such as *A. naeslundii, C. albicans, F. nucleatum, S. aureus, S. epidermidis, S. mutans, S. oralis,* and *V.dispar* comparable with the activity of crude extracts tested at concentrations between 648 and 5188 µg/mL [28].

Conclusion:

The traditional medicinal plant Syzygium cumini (L.) has shown significant potential in clinical applications due to its various pharmacological actions. It contains essential compounds that encapsulate the unique characteristics of the plant. While there have been numerous studies on the pharmacological activities of the phytochemical constituents of Syzygium cumini (L.), there is still much research to be done on developing innovative drug delivery systems for the plant extract and its isolated compounds. Additionally, focus should be placed on conducting chemical and toxicity studies of Syzygium cumini (L.) for further insights.

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