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DOES *SYZYGIUM CUMINI* POSSESS SIGNIFICANT PHARMACOLOGICAL EFFECTS? AN OVERVIEW

Saleem, U.[1]; Ali, N.[1]; Ahmad, B.[2*]

[1]Faculty of Pharmaceutical Sciences, GC University, Faisalabad- Pakistan.
[2] Riphah Institute of Pharmaceutical Sciences, Riphah International University, Lahore-Pakistan.

•ahmadbprof@gmail.com

Abstract

Syzygium cumini has extensive folklore uses and most of them, now, have scientific evidence also. This review expresses the medicinal significance of *Syzygium cumini* on the basis of its profound pharmacological activities.

Key words: *Syzygium cumini,* Folklore uses, Pharmacological activities

Introduction

Syzygium cumini (*S. Cumini*) commonly called Jamun belongs to family "*Myrtaceae*" which comprises about 150 genera and 3600 species and found all over the Indian sub-continent [1-3]. Chemical constituents found in flowers are quercetin, kaemferol, iso-quercetin, myricetin, quercetin-3-D-glucoside, myricetin-3-L-arabinoside, oleanolic acid, dihydromyricetin, eugenol-triterpenoid A, acetyl oleanolic acid and eugenol-triterpenoid B [5]. Roots contain isorhamnetin 3-O-rutinoside and flavonoid glycosides [6]. Leaves are rich in quercetin, acylated flavonol glycosides [7], myricitin, myrcetin, myrcetin 3-O-4-acetyl-L-rhamnopyransides [8], esterase, triterpenoids [9], tannins and galloyl carboxylase [10]. Fruits are source of glucose, raffinose, fructose [11], mallic acid [12], citric acid, anthocyanins [13], gallic acid, malvidin-3-laminaribioside, delphinidin-3-gentioside, petunidin-3-gentioside [14], malvidin [15], cyaniding diglycoside and petundin. The fruits sourness is due to gallic acid and fruits color is due to anthocyanins [14]. Bark is rich in friedelin, betulinic acid, beta sitosterol, epi-fridelanol [18], myricetin, kaempferol, ellagic acid, gallic acid [19], tannins [20], flavonoids and bergenins [21].

Folklore uses

Bark is used in the treatment of sore throat, asthma, bronchitis, dysentery, and ulcers. It is also known to have astringent and blood purifier. Fruit has stomachic and diuretic effect [25]. Ashes of leaves are used for strengthening teeth and gums [26]. Leaves juice along with goat's milk and honey is being used for treatment of dysentery with bloody discharge [25]. Seed extract is used to treat cough, cold, skin problems such as rashes, fever, gastric and intestinal ulcers [27-28].

In all over the world, the fruits are also used for variety of the aliments including cough and ringworm infection [29-30]. This plant has been included in several herbal preparations to exploit its therapeutic potential. Several herbal formulations have been prepared in combination with this plant [31].

Pharmacological activities

Anti-bacterial activity

Essential oil, aqueous, methanol, and methylene chloride extracts of leaves of S. cumini were evaluated for the anti-bacterial activity against *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Neisseria gonorrhoeae, Bacillus subtilis* and *Enterococcus faecalis* using disc diffusion method to measure minimum inhibitory concentration.. The methanol extract was found to exhibit maximum antibacterial activity [32, 33].

Anti-oxidant activity

FRAP and DPPH in-vitro assay were used to evaluate antioxidant activity of methanol and methylene chloride extract of leaves and essential oils of S. cumini. Methanol extract showed greater antioxidant potential than methylene chloride extract[33].

Anti-allergic activity

Leaves aqueous extract was tested for anti-allergic activity by performing test on male swiss webster mice, wistar rats and BALB/c mice. Histamine injection, 100µg/paw, was injected in hind paw of mice that induced significant edema. Extract was administered orally that showed 52% inhibition in edema at 50 mg/kg. Serotonin injection, 100µg/paw, was administered parenterally in hind paw of mice for induction of edema. Extract given orally showed maximum reduction (51 %) in edema at 100 mg/kg. On other hand, edema induced by platelet aggregating factor, 1µg/paw, was not affected by oral extract of *S. cumini* at doses 25, 50 or 100 mg/kg [34].

Anti-inflammatory activity

Ethanol extract of bark was evaluated for above mentioned activity. Anti-inflammatory activity was determined at acute (Carrageenan induced paw edema), sub-acute (formaldehyde and, kaolin-carrageenan induced paw edema) and chronic (cotton pellet granulation test) levels in rats. All the tests revealed significant anti-inflammatory power of the extract [35].

Central nervous system activity

Rota rod test and actophotometer test were performed to evaluate CNS depressant activity of methanol and ethyl acetate extracts of *S. cumini* seed in mice. Extracts were administered orally at 200- and 400 mg/kg dose levels. Both tests showed decrease in activity tested which is indicative of CNS depressant effect of extract [36].

Anti-nociceptive activity

Formalin and hotplate tests were performed to investigate anti-nociceptive activity of hydro-alcoholic extract of *S. cumini* leaves in rats. Extract was administered i.p. at 100- and 300 mg/kg concentrations. Both the tests revealed significant dose dependent anti-nociceptive effect [37].

In vivo anti-diabetic activity

Streptozotocin induced diabetic rat model was used in this study. Methanol and ethyl acetate extracts (200- and 400 mg/kg) were given orally to diabetic rats that displayed significant antidiabetic activity. Mycaminose compound, isolated from *S. cumini*, showed antidiabetic effect at 50 mg/kg oral dosing. The underlying mechanism could be secretagogue effect on beta cells of pancreas [38].

Antigenotoxic effect

Ethanol and aqueous extract of *S. cumini* seeds showed antigenotoxic effect against URE and DMBA genotoxins. Both extracts were administered orally for five days prior to exposure to genotoxins [39].

Positive ionotropic effect

Legendroff's heart perfusion method was used to study ionotropic effect of ethanol extract of *S. cumini* seeds. At 4mg/mL concentration, heart beat increased 42.85% and at 8mg/mL concentration, there was 60% increase in the heart beat indicating positive ionotropic effect [40].

Antispasmodic activity

Contractions were induced in the isolated rat uterus smooth muscles with KCl. Ethanol extract of *S. cumini* seeds exhibited 55% inhibition in muscle contractions that is indicative of seeds antispasmodic activity [40].

In-vitro antidiabetic activity

Starch is hydrolyzed into maltose and oligosaccharides by pancreatic α amylase. The inhibition of α amylase results in less starch digestion which reduces the post-prandial blood glucose levels in diabetic patients. Aqueous extract of *S. cumini* seeds showed 98% inhibition of α amylase activity. The compounds, tetrahydroxy flavanone and betulinic acid, were identified to be responsible for this activity [41].

Conclusion

S. cumuni possesses significant antioxidant potential that seems to be contributing towards its pharmacological effects, which make basis for folklore uses of the plant to treat a number of pathological conditions . Further studies (pharmacological/toxicological) and isolation of active principles could prove an exotic addition to the existing pool of lead compound.

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