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Review: Study of Antidiabetic activity of Syzygium cumini (Linn.)Seeds

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ABSTRACT:
Syzygium Cumini(linn) [synonym, Eugenia Jambolana] belongs to Myrtaceae family. It is commonly known as Jamun or black plum is premordial to India. In Ayurvedic, it is needs traditionally used for treating various disease conditions. Different parts of plants (bark,leaf,fruit,seed) have been significantly evaluated for their bioactive phytochemical element/compounds. Phytochemicals like maliec acid, oxalic acid,flavonoids,phenols,essentail oils, betalinicacid,friedelin have been proved for their antiallergicantiamnesic, anticancer,anticlastogenic ,antidiabetic, antidiarrheal,antifertility , antiinflammatory, antimicrobial, antinociceptive, antihyperlipidemic,antioxidant, gastoprotective and piles curing properties. In Ayurveda, the Jamun is used as Grahi,Atisara,Kasa,Vishtambhinietc.The seed are claimed to contain alkaloids, jambosine and glycoside jambolinirantimellin which inhibit conversion of starch into sugar Diabetes Mellitus(DM) type-II is long term endocrine metabolic disorder arised due todisturbance in metabolism of carbohydrate, fat, protein and it is symptonized by hyperglycemia. A combination of insulin secrotagogue and insulin sensitizer is used to control blood glucose level.But it have serious and several site effects.Natural products are remarkably safe and good source of anti-diabetic agentz due to low toxicity and cost effectiveness.SyzygiumCumini and it's seed member of Myrtaceae family acquite potential role in regulating diabetic mellitus and it's seed are moderately rich in protein (6.3-8.5%) and contain many other phytochemicals.

I. INTRODUCTION:

Syzygiumcuminiskeels(syn.Eugenia Jambolana Lam.) 'Brihaspati' in Sanskrit, popularly known as Java plum, Malabar plum, black plum, Indian BlackBerry, Jamun, jambul,jambool and belongs to family Mytraceae. S.cumini is large evergreen tree upto 30 m height and grith of 3.6m with tree-trunk upto 15 m found through India upto an altitute of 1,800 m.Today these trees are found growing throughout the Asian subcontinent ,Eastern Africa ,South America, Madagascar, and have also neutralized to Floride and Hawaii in United state of America. A long term endocrine metabolic disorder characerized by hyperglycemia is commonly known as diabetes.This endocrine disorder is due to disturbance in metabolism of carbohydrate, protein,fat either in secretion and mode of action or both of insulin. Current strategy used for treatment is combination of an insulin secretagogue and an insulin sensitizer.

This synthetic therapeutic approach have several side effect such as severe hypoglycemia, digestive discomfort, lactic acidosis, headache, dizziness, and many more. Therefore ,focus on more effective oral hypoglycemic agent from natural sources which superior quality of therapeutic effect and minimum side effects. Various preclinical and clinical studies have been performed to evaluate antidiabetic potential of Syzygium Cumini. Numerous analysis perform in past have indicated that S C seeds,fruit pulp, whole fruit, bark, leaves, flowers posses anti-diabetic activity.

Scientific classification
Kingdom : Plantae
Order :Myrtales
Family :Myrtaceae
Genus: Syzygium
Species: Cumini
Binomial name :SyzygiumCumini (L.) Skeels

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Composition OfJamun Seeds:

Component (Dry basis)	seeds
moisture(%)	11..4
Protein(%)	10.64
Fat((%)	0.88
Ash(%)	2.76
Fibre(%)	3.39
Carbohydrates(%)	71.29
Ascorbic acid(mg)	35.75
Carotenoid (mg)	7.42

Botanical Description

Jambolan is a large evergreen and densely foliaceous tree of upto 25 m tall & is a member of the Mytreae tribe of Mytideae subfamily of the family Myrtaceae. It havegrayish brown thick bark, exfoliating in woody scales & course &discolored lower bark with young grayish-white stems. The wood is whitish, close grained & durable; affords brown dyes & kind of gum kino. The leaves are opposite, simple, entire, eliptic to broadly oblong, smooth, glossy, somewhat leathery with numerous nerves uniting at margin. The length is 5-10 cm & shortly pointed at tips. Petioles are up to 3 cm long, the leaf midrib is prominent and yellowish, and the blades have many closely parallel lateral veins. The flowers are white to pinkish, about 1 cm across, and found in branched clusters at the stem tips. The calyx is cuplike, and there are four petals fused into a cap, and many stamens. The fruit is an ovoid, dark purplish-red, shiny, one-seeded berry up to 2 cm long, with white to lavender flesh.

Phytochemical constituents

The Jamun fruit seeds & pulp have been reported very effective to lower the blood glucose levels in diabetes.

1.**Seeds**-Jambosine, gallic acid, ellagic acid, corilagin, 3,6-hexahydroxy diphenoylglucose, 1-galloylglucose, 3-galloylglucose, quercetin, β-sitoterol, 4,6 hexahydroxydiphenoylglucose.

2. **Stem bark**-Friedelin, friedelan-3-α-ol, betulinic acid,β-sitosterol,kaempferol, β-sitosterol-Dglucoside, gallic acid, ellagic acid, gallotannin and ellagitannin and myricetine.

3**. Flowers**-Oleanolic acid, ellagic acids, isoquercetin, quercetin, kampferol and myricetin.

4. **Fruit pulp**-Anthocyanins, delphinidin, petunidin, malvidin-diglucosides.

5. **Leaves**-β-sitosterol, betulinic acid, mycaminose, crategolic (maslinic) acid, n-hepatcosane, n-nonacosane, n-hentriacontane,noctacosanol, n-triacontanol, n-dotricontanol, quercetin,myricetin, myricitrin and the flavonol glycosides myricetin 3-O-(4''-acetyl)-α Lrhamnopyranosides.

6. **Essential oils**-α-terpeneol, myrtenol, eucarvone, muurolol, α-myrtenal, 1, 8-cineole, geranyl acetone, α-cadinol.

Jambolan is rich in compounds containing anthocyanins, glucoside, ellagic acid, isoquercetin, kaemferol and myrecetin. The seeds are claimed to Contain alkaloid, jambosine, and glycoside jambolin or antimellin, which halts the diastatic conversion of starch into sugar and seed extract has lowered blood pressure by 34.6% and this action is attributed to the ellagic acid content. The seeds have been reported to be rich in flavonoids, a well-known antioxidant, which accounts for the scavenging of free radicals and protective effect on antioxidant enzymes and also found to have high total phenolics with significant antioxidant activity and are fairly rich in protein andcalcium. Java plums are rich in sugar, mineral salts, vitamins C, PP which fortifies the beneficial effects of vitamin C, anthocyanins and flavonoids.

Phytochemical screening for S. cumini leaves extract.

Phytochemical Constituents	Aqueous extract	Methanol extract
Resins	Present	Present
Terpenoid	Moderately present	Present

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Phytochemical Constituents	Aqueous extract	Methanol extract
Saponins	Present	Present
Phenols	Appreciable amount	Moderately present
Flavonoids	Appreciable amount	Appreciable amount
Steroids	Present	Appreciable amount
Alkaloids	Appreciable amount	Moderately present
Glycosides	Moderately present	Moderately present
Tannins	Present	Present
Cardiac glycosides	Moderately present	Present

Description:

Syzygium Cumini(Linn.), commonly known as Jamun Black plum in India. Different parts of plants have been reported to contain variety of components. Fruit pulp contain maleic acid is major acid (0.59 of weight of fruit) in a small quantity of oxalic acid. Gallic acid and tannic acid are responsible for astringency of fruit. The leaves are enriched with acylatedflavonol glycosides, myricetin,myricitin,querecetin,galloyl carboxylase, esterease and tannins. The flowers of S.cumini contain erategolic acid(maslinic acid), flavonoids - isoquercitrin,quercetin,kaempferol,myricetin-3-L-arabinoside,quercetin-3-D galactoside,dihydromyrectin,oleanolic acid, acetyl oleanolic acid, eugenol-triterpenoid A and eugenoltriterpenoid B. Kids contain glycosides jamboline, new phenolic substances,essential oils, chlorophyll, fat ,resin, albumen, tannins(19%) ,phenolic such as ellagicacid,gallic acid(1-2%),caffeic and ferulic acids and derivatives, guaicol,resorcinol dimethyl ether and corilaginin. Stem bark has betulinic acid, β-sitosterol, quercetin, kaempferol ,ellagic acid, gallic acid, myrecetinetc.Various parts of tree have been used traditionally for treatment of various human ailments. SC find it's place in numerous traditional system of medicine like Ayurveda ,Siddha, Unani and Homeopathy.SyzygiumCumini and it's parts have been used as an alternative and complementary medicine ro regulate diabetes.

Diabetes is the one of the leading health problem in the world. There are about 537 millions people around the world who have been suffering from diabetes in 2021. The Chinese population has highest number of diabetes patient about 141 millions. India has around 74.2 millions people suffer from diabetes. Diabetes is long term endocrine metabolic disorder characterized by hyperglycemia. Major cause of this metabolic disorder is impaired function of pancreas. Depending upon causes and clinical presentation, diabetes is divided into 4 different types. The insulin dependent Diabetes mellitus (IDDM,TYPE-I) and non insulin dependent Diabetes mellitus(NIDDM,TYPE-II). Type-I diabetes produced due to destruction of β cells of islet of langerhans commonly seen in children's than adult. Type-II diabetes is produced by peripheral insulin resistance and impaired secretion of insulin by pancreas. It is more common and reaching 90-95% populations.

Antidiabetic activity

Anti-diabetic effect of Jamun has been indicated in Ayurvedic pharmacopoeia, Which state that seed powder of Jamun is affective in controlling high blood sugar level. Use of S.cumini in fight against diabetes has been studied by western medicine since more than 130 years. In recent year, numerous preclinical studies have been evaluated extract of various parts, especially seeds of this plant species for anti-diabetic activity.On 30- days treatment with ethanolic extract of seed at doses of 100 mg/kg/day ,blood and urine glucose level of streptozotocin- induced diabetic rats were

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decreased.In addition to blood glucose lowering effect, flavonoid-rich extract of seed was shown to recover peripheral glucose tolerance in streptozotocin-induced rats[500mg/kg/day, 21days] and mice [300mg/kg/day, 15days]. This effect were describe the to increase activity of Peroxisome Proliferator- Activated Receptor[PPAR] Alpha and gamma, which was assessed in 3T3-L1 preadipocyte incubated for 24 hours with Increasing concentration(1-100mg/mL) of flavonoid rich extract of seed. PPARs are group of nuclear receptor proteins,which regulate carbohydrate and lipid metabolism by managing energy homeostasis as transcription factor.

Considering flavonoids already identified in S.cuminiseed.Antihypergylcemic effect of rutin was atributed to inhibit glucose metabolism enzymes hexokinase and glucose -6-phosphate.

Bioactive compounds of Syzygium species.

Syzygium species	Bioactive compounds
S. cumini	Flavonoids, glycosides, alkaloids, terpenoids, steroids, tannins, phenols, cardiac glycosides
S. polyanthum	Tannins, flavonoids, glycosides, alkaloids, squalene
S. samarangense	Flavonoids (2',4'-dihydroxy-3',5'-dimethyl-6'-methoxychalcone and 5-O-methyl-4'-desmethoxymatteucinol)
S. calophyllifolium	Phenolics, tannins, flavonoids
S. aqueum	Flavonoids (myrigalone-B, myrigalone-G, phloretin, europetin-3-O-rhamnoside, myricetin-3-O-rhamnoside and 4-hydroxybenzaldehyde)
S. aromaticum	Oleanolic acid, maslinic acid
S. malaccense	Tannins, triterpenoids, glycosides, flavonoids (myricitrin)
S. alternifolium	Cinnamic acid

II. CONCLUSION

The traditional uses of Jamuns are noted in Ayurveda and it has tremendous health benefits over various ailments Syzygiumcumini has been widely used by traditional practitioners for diabetes and it's related complications from centuries.SyzygiumCumini also having various pharmacological activities such as anti-diarrhoeal,astringent,digestive, anti-bacterial, anti-oxidant, antiviral but most important activity is Antidiabetic. Different active constituents present in seed control glucose homeostasis by attacking on pathway of hyperglycemia process.The present review demonstrated that methanolic extract S.Cumini seeds posses phytochemicals such as alkaloid,flavonoids,glycoside,steroid, cardiac glycoside, saponins, resins phenols , tannins and terpenoidsetc.which are of high therapeutic value.Theresulr suggested that s.cumin seed posses significant anti-diabetic activity.

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