A REVIEW ON PHARMACOLOGICAL ACTIVITY OF SYZYGIUM CUMINI EXTRACTS USING DIFFERENT SOLVENT AND THEIR EFFECTIVE DOSES

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ABSTRACT

Plants and their extracts have immense potential for the management and treatment of disease. The phyto-medicines used for treatment are not only cheap and affordable but are also purportedly safe as hyper sensitive reactions are rarely encountered with the use of these agents. The Syzygium cumini (Myrtaceae) is a popular traditional medicinal plant in India. This plant exhibiting tremendous pharmacological effect in different experimental works. To summarize all the pharmacological effect and their effective doses in diseased conditions this work is done. Different journals especially electronic journals are searched for collecting the data. In this review we concluded that this plant is highly beneficial for the treatment of disease and for the prevention of disease like diabetes, inflammation, hyperglycaemia and CNS related diseases. However, there is a need for scientific validation, standardization and safety evaluation of plants of the traditional medicine before these could be recommended for treatment of the disease in human.

KEYWORDS: Syzygium cumini, diabetes, antioxidant, effective dose

INTRODUCTION

Nature always stands as a golden mark to exemplify the outstanding phenomena of symbiosis. In the western world, as the people are becoming aware of the potency and side effect of synthetic drugs, there is an increasing interest in the traditional medicines before these could be recommended for treatment of the disease in human.

Chemical constituents of Syzygium cumini (Skeels) The stem bark is rich in eugenin and fatty acid ester. It also contains quercetin kaempferol, bergenins, flavanoids tannins, pentacyclic triterpenoid betulinic acid, ester of epi-friedelanol, Friedelin and a plant sterol Betulinic acid is a naturally occurring triterpenoid, which has demonstrated selective cytotoxicity against a number of specific tumor and active against a verity of infectious agent like HIV, malaria, immunomodulatory and the inflammatory action. It has much beneficial pharmacological activity like anti-inflammatory and lowering blood cholesterol. The presence of gallo-and ellagi –tannins may be responsible for the astringent property of stem bark. The acetone extract of the bark contain partially methylated derivatives of ellagic acid i.e. 3,3'-di-O-methyl ellagic acid and 3,3', 4-tri-O-methyl ellagic acid. Alcoholic extraction of tannins results into their extensive degradation into simple phenolic compounds. The Roots are rich in flavanoids glycosides and isorhaminetin-3-rutinoside. The essential oils isolated from the freshly collected the data. In this review we concluded that this plant is highly beneficial for the treatment of disease and for the prevention of disease like diabetes, inflammation, hyperglycaemia and CNS related diseases. However, there is a need for scientific validation, standardization and safety evaluation of plants of the traditional medicine before these could be recommended for treatment of the disease in human.

INTERNATIONAL RESEARCH JOURNAL OF PHARMACY

www.irjponline.com ISSN 2230 – 8407

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Article Received on: 17/10/12 Revised on: 01/11/12 Approved for publication: 04/12/12

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collected leaf 23 stem, seed, fruits contain α - Pinene, camphene, β - Pinene, myrcene, Ocimene, γ -T erpinene, terpinolene, bornyl acetate, α copaene, β-caryophyllene, α –Humuline, γ-cedine and δ-cedine 24 trans-ocimene, cis-ocimene, β-myrcene, α- tripenol, β- caryophyllene, α –humulene, β-selinene, calacorene, α -muurolole, γ , α –santalol, cis-farnesol: lauric , myristic, palmitic, stearic, oleic, linoleic, malvalic, sterculic, and vernolic acid 25 unsaponifiable matter of the seed fat was also chemically investigated 26. The plant leaves contain an essential oil with pleasant odour. The oil contains terpenes, 1- limonene and dipentene, sesquiterpenes of cadalane type, and sesquiterpenes of azulene type. This essential oil is reported to be responsible for the antibacterial activity of the leaves. The leaves are rich in acylated flavonol glycosides 27, quercetin, myricetin, myricetin 3-O-4- acetyl-L- rhamnopyranoside 28-29, esterase, galloxy carbonylase 30, and tannin 31. The ethanolic extracts of leaves were tested for the presence of various phytoconstituents like tannins, alkaloids, carbohydrates, flavonoids, sterols, & glycosides 32-33. The methanolic extract of leaves content Flavonoid .The HPLC data indicated that leaf extracts contained ferulic acid and catechins. A significant linear relationship between antioxidant potency, free radical-scavenging ability and the content of phenolic compounds of leaf extracts supported this observation 34. The flower are rich in kaempferol, quercetin, myricetin- quercetin-3-glucoside), myricetin-3-L-Arabinoside, myricetin-3-D-Galactoside, dihydromyricetin 35-36. Flower of plant contains Oleanolic acid and other three triterpenoids also reported in the flowers are acetyl oleanolic acid melting point (260-262°C), Eugenia- triterpenoid A and Eugenia triterpenoid B . Flowers also contain ellagic acid 37-38. Ellagic acid arises from lactonization of hexa-hydroxiphenic acid during chemical hydrolysis of tannins 39. The whole fruit consisted of pulp, kernel and seed coat. Total fatty matter was not significant in all three parts of fruit. Detailed mineral analysis showed calcium was abundant in all fruit parts and extracts 40. The fruits contains citric acid41, a nteocynannis 42, delphinidin-3-gentiobioside, maivindin-3- laminaribioside, pentunidin -3-gentiobioside 43 cyaniding diglycoside petunidin and malvidin 44. The sourness of fruits may be due to the presence of gallic acid . The color of fruits might be due to the presence of anthocyanin The purple colour of the fruit is due presence of one or two cyanidin diglycosides 45-46. The fruit contains moisture, protein, fat, crude fiber, ash, calcium, magnesium, phosphorus, iron, potassium, copper, sulfur, chlorine, vitamin A, thiamin, riboflavin, niacin, choline , folc acid of edible portion 47. One of the varieties of jambolan found in Brazil possesses malvidin-3-glucoside and pentunidin -3-glycoside 48. The peel powder of jambolan also can be employed as a colorant for foods and pharmaceuticals and anthocyanins pigments from fruit peels were studied for their antioxidant efficiency stability as extract and in formulations 49. The edible pulp of plant forms 75% of the whole fruit. Various mineral amino acid and vitamins were reported like vitamin C, niacinic acid. fructose are the principal source of sweeteners in ripe fruit with no trace of sucrose. The sugar part is mainly glucose, galactose is probably present, but there is no pentose or rafinose. Cyanidin diglycoside are sap pigments and the actual colour depends on the pH. Maleic acid is the major acid (0.59%) of the weight of fruit. Small quantity of Oxalic acid has been also reported. Tannins mainly Gallic acid is responsible for the astringency effect of the fruits. The astringency activity is due to efficiency to combine with tissues and proteins and precipitate them. Tannins are also efficient for gastroprotective and antiulcerogenic activity 50-51. The waxy component of the fresh pericarp contains a sterol essential oil. The major component appears to be triterpene hydroxyl acid, oleanolic acid. Fresh pulp was rich in carbohydrates. Total phenolics, anthocyanins and flavonoid Jambolan is rich in compounds containing ellagic acid, kaemferol and myricetin. The seeds are claimed to contain alkalioid jambosine and glucotide jamboline or antimellin, which halts the distatic conservation of starch into sugar .The seeds have been reported to be rich in flavonoids, a well known anti oxidant, 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 and calcium,java palms are reach in sugar ,mineral salt,vitamin c, pp which forifies the beneficial effects of vitamin c, anthocyanins and flavanoids starch, Myrcyl alcohol in the unsaponified fraction of seeds and a small quantity of pale yellow essential oil, [α] D are also present. Presence of ellagic acid 52, corilagin and related ellagitannins, 3, 6-hexahydroxydiphenoyl-glucose and its isomer, 4,6-hexahydroxydiphenoyl glucose, 1-galloyl glucose, 3-galloyl glucose and quercetin is reported in the alcoholic extract of Jambul seeds. Fixed oils & Fats are absent, Proteins, Steroids, Triterpenoids are present , Phenols,are present in more quantity. Pharmacological activity and their effective dose Anti diabetic activity Syzygium cumini extract (aqueous suspension) was tested for its antiabetic activity at the different dose levels of 1gm., 2gm., 4gm. and 6 gm./kg body weight. 4 gm./kg dose level was found to exhibit maximum hypoglycemec effect (42.64%) in rabbits. it also produced a significant decrease in the blood sugar level (17.04%) in alloxan diabetic rats. The administration of different doses of aqueous suspension of dried seed kernels in rabbits changes blood sugar level viz., 1gm., 2gm., 4gm. and 6 gm/kg body weight indicate that the optimum dose level is 4 g/kg. The reduction was maximum for the 4 g/ kg body weight dose level being 42.64% as compared to the other dosages. Oral administration of ethyl acetate and methanol extracts of Syzygium cumini (200 and 400 mg/kg) showed significant decrease in blood sugar level. The isolated compound from Syzygium cumini mycaminose at a dose level of 50 mg/kg also showed significant decrease in blood sugar level 55. Oral administration of Syzygium cumini bark extract at dose of 300mg/kg body weight exhibited anti diabetic activity by significantly lowering blood glucose in rats but in case of clinical trial, experiments showing that the tea and extracts prepared from leaves of are pharmacologically inert. Patients and physicians should not rely on the putative anti-hyperglyemic effect of this tea, and perhaps of other folk medicines, that pretend to have such an effect. The investigation of plants with potential clinical utility could start with a clinical trial testing the effect of folk preparations in order to isolate the active principles of those products that show pharmacological activity in this model 55. Antibiaterial Activity 56 Syzygium cumini seed extracts prepared in methanol and ethanol was evaluated for antibacterial by disc diffusion and broth dilution assays. Both extracts exerted a broad spectrum of bacteriostatic action against different gram-positive and gram-negative bacteria. Their minimum inhibitory
Inotropic and Chronotropic Activity

To assure whether antihistaminic effect of the extract using Langendorff preparation, the heart rate increased two fold (60%). The possible mechanism behind this would be the extracellular K+ promoting the influx of Ca2+ into the cell. Extracellular potassium ion influences the ATP sensitive potassium channel which leads to an increase in the intracellular potassium ion concentration. This prevents the hyper polarization of the cellular membrane thereby increasing the cytosolic calcium and by further cell signaling cascades, muscle contraction takes place. The relaxation produced by Sc might possibly act via these signaling pathways.

Central nervous system activity

Ethyl acetate and methanolic extract of Syzygium cumini seed were undergone for investigating its Central Nervous System activity (CNS) of Albino mice in rota rod and actophotometer at the dose level of 200 mg/kg and 400 mg/kg. Both the extract exhibited significantly CNS activity. The ethyl acetate and methanol extracts of Syzygium cumini seed at the dose level of 200 and 400 mg/kg administrated orally exhibited significant reduction of activity compared with control group of animals. This study established CNS activity in Syzygium cumini seed.

α Amylase inhibitors

The aqueous extract of S. cumini or Eugenia jambolana seeds showed higher inhibition against the porcine pancreatic α-amylase among the medicinal plants studied. The α-amylase inhibitors from S.cumini seeds were separated from the extract by preparative thin layer chromatography into fractions with different Rf values. The fraction with Rf value between 0.285 and 0.43, which showed maximum inhibitory activity, was eluted and analyzed by LC-MS. The compounds identified from the seed extract of S. cumini were betulinic acid and 3, 5, 7, 4'-tetrahydroxy flavanone, which were reported earlier from S. formosanum and other plants.

Antinociceptive activity

The analgesic potential of S. cumini leaf extracts using hydroalcoholic solventswas assessed in rats. Hot plate and formalin tests were used to estimate cutaneous nociception whereas measurements of forelimb grip force were done to assess muscular nociception under normal and inflammatory conditions. In the hot plate test, Syzygium jambos extract produced a significant increase in the withdrawal response latencies in a dose-dependent manner (10–300 mg/kg i.p.). The extract (100–300 mg/kg i.p.) significantly reduced pain scores in all the phases of the formalin test with an analgesic efficacy.

Anti-inflammatory activity

Significant anti-inflammatory activity was observed in carrageenin (acute), kaolin-carrageenin (subacute), formaldehyde (subacute)-induced paw edema and cotton pellet granuloma (chronic) tests in rats. The extract did not induce any gastric lesion in both acute and chronic ulcerogenic tests in rats. The extracts of S. cumini seed possessed varying degree of anti-inflammatory activity when tested at various doses. The methanol extract at the dose of 400 mg/kg showed high significant anti-inflammatory activity at 4 h, where it caused 62.6% inhibition, as compared to that of 5 mg/kg of diclofenac sodium.

In Vitro Glucose uptake activity

Syzygium cumini act on glucose transporter (Glut-4), peroxisome proliferator activator receptor gamma (PPARY) and other PPAR receptors.
and phosphatidylinositol 3' kinase (PI3 kinase) involved in glucose transport. Activity suggests that. *S. cumini* activate glucose transport in a PI3 kinase-dependent fashion. *S. cumini* are anti-diabetic medicinal plants being used in Indian traditional medicine. Different solvent extracts extracted sequentially were analysed for glucose uptake activity at each step and methanol extracts were found to be significantly active at 100 ng/ml dose comparable with insulin and rosiglitazone.

**Chemopreventive activity**

*Syzygium cumini* seed extract can possibly play an important role as a chemopreventive agent against oxidative stress and genomic damage. Aqueous and ethanolic extracts of *Syzygium cumini* seed extract showed significant protective effects against hydroxyl radical induced strand breaks in pBR322 DNA. The in vivo experiments with aqueous *Syzygium cumini* seed extract showed significant protective effects against chromosomal damage induced by the genotoxic carcinogens URE and DMBA. Biochemical analyses registered significant inhibition of hepatic lipid peroxidation and increase in GSH level and activity of GST, SOD (superoxide dismutase) and CAT (catalase).

**Antifungal activity**

Aqueous, ethanol and n-hexane extracts from leaves, fruit, root-bark and stem-bark of *Syzygium cumini* (L.) Skeels were tested for their antifungal activity against Ascoscytha rabiei (Pass.) Lab., the cause of blight disease of the chickpea (Cicer aritinum L.). Different concentrations, namely 1, 2, 3, 4, 5% of both aqueous and the two organic solvent extracts were used in this study. Aqueous extracts of all the four test plant parts, namely leaves, fruit, stem-bark and root-bark, showed significant antifungal activity.

**CONCLUSION**

Chemical nature, stability and bioefficacies of anthocyanins from fruit peel of *Syzygium cumini* Skeels 

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Source of support: Nil, Conflict of interest: None Declared