

**Review Article****A review on pharmacology and phytochemistry of *Syzygium cumini***

Veeram Anjali*, G. Sindhu, C.Girish

S.V.U. College of Pharmaceutical Sciences, S.V. University, Tirupati, Andhra Pradesh, India

ARTICLE INFO:**Article history:**

Received: 2 October 2017

Received in revised form:

18 October 2017

Accepted: 24 October 2017

Available online: 31 December 2017

Keywords:*Syzygium cumini*,

Ayurvedic system,

Diabetes mellitus.

ABSTRACT

To encourage a disease free healthy life Mother Nature has gifted mankind medicinal plants. The world craves new ideas and looks to the Far East and Asia for inspiration and innovation. There is a wealth of technical data to support the safe use of this plant and this review will produce the data to justify the use of this plant in a wide range in the field of ayurveda. *Syzygium cumini* belongs to the family Myrtaceae. Commonly it is known as a amblang, Jambul, Jambolan and Kala Jamun in India. The seed is used as an alternative natural healing system in the Ayurvedic, Unani and Chinese medicines. It is effective in the treatment of diabetes mellitus, inflammation, ulcers and diarrhea and preclinical studies have also shown it to possess chemoprotective, radioprotective and antineoplastic properties. The present review has been primed to describe the existing data on the information on traditional and medicinal use of the *Syzygium cumini* plant.

Introduction

Numerous medicinal plants are present in a collection of herbal preparations of the Indian traditional health care system (Ayurveda) named Rasayana. From the ancient time, plants have been playing a key role for the betterment of mankind presenting as an extraordinary source of natural medicine. The complexity in formulating chemical based drugs as well as their health related side effects and uprising cost has led worldwide researchers to focus on medicinal plant research. Bangladesh has a vast repository of diverse plant species where about five thousand plants species have been claimed as having significant medicinal values. The researched papers on medicinal plants publishing from last few decades mention the activities of different plant bioactive compounds that are used widely in the treatment of various human ailments

Syzygium cumini belongs to the family Myrtaceae. Commonly it is known as a amblang, Jambul, Jambolan and Kala Jamun in India. *Syzygium cumini* is recommended as a safe drug in various diseases by health organizations in the world[1]. This plant is used for treatment and in prevention of different diseases in Homoeopathy practice from more than one fifty years back in different countries. This plant especially restoration the body weight and inhibits the excessive blood glucose levels, as well as recovery in the activities of antioxidant enzymes like catalyse, peroxidase and super oxide dismutase. Fruits are used in pimples emaciation, prickly heat, diabetes Insipidus, urinary system to cure number of diseases such as urinary tract infections, cystolithiasis, dysuria. *Syzygium* was an important medicinal plant since long and therefore, scientists are also curious to prove the pharmacological and phytochemical actions. *Syzygium cumini*

plant bark is rough and dark grey colour becoming light grey colour with smoother higher up.

The wood of the plant is water proof and leaves have a turpentine, pinkish, dark green with a yellow midrib when mature. The leaves of this plant are used for live stock [2]. The whole plant is having the good nutritional values. This plant starts flowering from February to May, plant flowers are fragrant and small about six mille meters in diameter. The fruits develop by April to July[3]. *Syzygium Cumini* fruits are oblong dark grey colour and fruits are combination of sweet, sour and stringent in flavor.

Mythology

- Rama subsisted on the fruit in the forest for 14 years during his exile from Ayodhya.

- Lord Krishna has been described as having skin the colour of Jamun

Syzygium Cumini seeds: The seed is used as an alternative natural healing system in the Ayurvedic, Unani and Chinese medicines. Bark of *S. cumini* yields a brown dye due to its high tannin content which is used in tanning leather and preserving fishing nets. The seeds and bark are well known in the Far East for the treatment of dysentery and in control of hyperglycaemia and glycosuria in diabetic patients. The astringent bark may be used as a gargle. Fruits are used as a relief for colic, while the wood yields a sulphate pulp that has medicinal uses[4,5].

Syzygium cumini seed : Shows cotyledons consisting of single layered epidermis, mesophyll composed of isodiametric thin-walled, parenchymatous cells fully packed with simple starch grains, oval, rounded measuring 7-28 μ in diameter a few schizogenous cavities are also found.

Scientific classification [6]

Kingdom: Plantae
Unranked: Angiosperms
Unranked: Eudicots
Unranked: Rosids
Order: Myrtales
Family: Myrtaceae
Genus: *Syzygium*
Species: *Cumini*
Binomial name: *Syzygium cumini* (L) Skeels.
SYNONYMS[7]:
Sanskrit: Mahajambu, Ksudrajambu
Assam: Jam
Bengali: Jaam , Kalajam
English: Jambul tree
Gujarat: Gambu, Jamun

Hindi: Jamuna
Marathi: Jambul
Malayalam: Njaval
Orissa: Jamu
Punjab: Jaamun
Tamil: Naval
Urdu: Jamun
Telugu: Neredu
PARTS USED: seeds, leaves, fruits, bark[8].
AYURVEDIC PROPERTIES[9-12]:
Rasa - Kasaya, Madhura ,Amla.
Virya - Sita
Guna- Laghu, Ruksha.
Vipala- Madhura, Katu.



Fig 1: Jamun fruit

Phytochemistry

‘Phyto’ is the Greek word for plant. There are many families of phytochemicals and they help the human body in a variety of ways. Phytochemicals may protect human from a host of diseases. Phytochemicals are non nutritive plant chemicals that have protective effects and disease preventive properties. Fruit of *Syzygium cumini* contains Malic acid is the major acid (0.59 of the wt of fruit), a small quantity of oxalic acid is also reported to be present. Gallic acid and tannins account for astringency of the fruit. The Fruit of *Syzygium cumini* is purple in colour due to the presence of cyaniding diglycosides[13].

Syzygium cumini seed powder: Brown coloured shows a few parenchymatous cells and numerous oval, rounded starch grains, measuring 7-28 μ in diameter. *Syzygium cumini* seeds are extensively used for various ailments such as anti-

inflammatory, hypolipidaemic, antidiabetic and antioxidant, neuroprotective and recently it has been reported for the DNA protection against radiation[4]. Although the *syzygium cumini* seeds were used for several biological activities; the possible cardioprotective activity reported the effect of the *Syzygium cumini* (Jamun) seeds against the DOX induced acute myocardial stress in rats[5]. Phytochemicals such as saponins, terpenoids, flavonoids, tannins, steroids and alkaloids have antiinflammatory effects .Glycosides, flavaloids, tannins and alkaloids have hypoglycemic activities. *Syzygium cumini* might be responsible for its high antioxidant activity. Histopathological studies also promise its protective effect on pancreatic β -cells. Ethanolic extract of *Syzygium cumini* seed kernel also lowers the thiobarbituric acid reactive substance (TBARS) and increased in reducing the glutathione (GSH), superoxide dismutase (SOD) and catalyse (CAT) activity.



Fig 2:Seeds of Jamun

Composition of Fruit

- Analyses of the fruit in the Philippines were reported in 1924 as follows
- Sugar: 12.70 (fructose and glucose; no sucrose),
- Acidity (as sulphuric): 0.63%,
- Acidity (as malic): 0.88%14,
- Crudefiber: 0.3 gm,
- Nitrogen: 0.129 gm,
- Ash: 0.32 gm,
- Calcium: 8.3 mg,
- Phosphorus: 16.2 mg,
- Iron: 1.62 mg,
- Carotene: 0.004 mg,
- Thiamine: 0.008 mg,
- Riboflavin: 0.009 mg,
- Niacin: 0.290 mg,
- Total ascorbic acid: 5.7 mg[15].

•Constituents of the seeds are:

- Protein: (6.3 to 8.5%),
- Fat: (1.18%),
- Crude fiber (16.9%),
- Magnesium: 17 mg
- Phosphorus: (2%)
- Potassium: 79 mg (2%)
- Sodium: 14 mg (1%) [16].
- MEDICINAL USES:
- Essential oil distilled from the leaves is used to scent soap and is blended with other materials in making inexpensive perfume.
- Leaves are used as marriage pandals.
- Bark has anti-inflammatory Activity and is used for anemia.
- Bark and seeds are used for diabetes which reduce the blood sugar level quickly

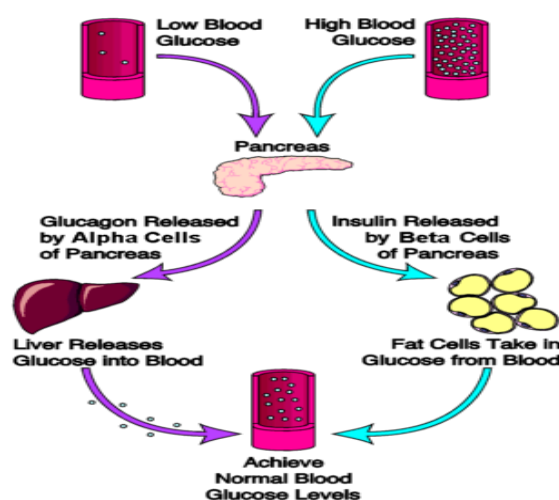


Fig 3: This figure describes the lowering of the blood glucose level by the *Syzygium cumini* extract

Fruit is for dysentery and leave's juice for gingivitis (bleeding gums)

Seed is used in various alternative healing systems like Ayurveda, Unani and Chinese medicine for digestive ailments.

High source in vitamin A and vitamin C.

Pharmacological Studies

Anti- diabetic activity: Ahmad Raza, Masood Sadiq Butt evaluated the potential of both jamun seed and fruit extracts against hyperglycemia. The results of instant research depicted that both the seed and fruit extracts reduce the blood glucose level significantly and also regulate the insulin levels in hyperglycemic rats[18] Karnic et al described that the *Syzygium cumini* (ethanolic) have decreased the blood sugar level by 20 percentages after 1 hour in excessive glucose in rabbits [19].

Anti Allergic Activity: The *Syzygium cumini* is having the anti- allergic effect is due to the inhibition of mast cell degranulation and of histamine and serotonin effects where as the inhibition of esonophil accumulation in the allergic pleurisy model. Briton studies showed that this plant skeels shows antiallergic effect[20].

Anti Inflammatory Activity: have a potent anti inflammatory activity without any side effect to gastric mucosa and other systems also. Muruganandan study shows that *Syzygium* seed is having the anti- inflammatory activity. He also noticed that

more anti inflammatory activities are in *Syzygium cumini* stem and seeds [21].

Anti Pyretic Activity: Chloroform extracts of dried seeds showed antipyretic activity, Sharma et al and Dr. Mahapatra studied methanol extracts of *Syzygium* seeds. The seed extract is administered intraperitoneally to rats at dose of fifty mille grams per kg were active versus yeast induced pyrexia[22].

Anti Diarrhoeal Activity: Mukherjee explained that antidiarrhoeal activity in *Syzygium* against different experimental models of diarrhoea in rats. It produced significant inhibition of diarrhoea and significant decreased gastrointestinal motility in rats (charcoal meal tests) [23].

Preparation of extracts

The *Syzygium cumini* Skeels fruits were first washed well and pulp was removed from the seeds. Seeds were washed several times with distilled water to remove the traces of pulp from the seeds. The seeds and leaves were dried at room temperature and coarsely powdered. The powders were taken equally and extracted with hexane to remove lipids. It was then filtered and the filtrate was discarded. The residue was subjected to successive solvent extraction with Petroleum

ether, Ethyl acetate, Methanol and Water using Soxhlet extraction method, aqueous extract was prepared by cold maceration process. The Plant Extracts Were Concentrated Using Rotary Flash Vaporator (Buchi, Switzerland) And Stored in Desiccator.

Phytochemical Screenings

The seed extracts of *Syzygium cumini* were analysed for the presence of alkaloids, glycosides, tri terpenoids, steroids, saponins, flavonoids, tannins and carbohydrates according to standard methods [17].

1)Test for Alkaloids: 2 ml of dilute hydrochloric acid was added to the 5 ml of extract then treated with Dragondroff's reagent, appearance of an orange brown precipitate showed the presence of alkaloids.

2)Test for Glycosides: The extract was hydrolysed with dilute hydrochloric acid for few hours on a water bath. 1 ml of pyridine and a few drops of sodium nitroprusside solution were added. Then 2-3 drops of dilute NaOH was mixed. Pink colour produced which turn into red indicated presence of glycosides.

3)Test for Triterpenoids: About 5 ml of extract was mixed in 2 ml of chloroform; 2 ml of acetic anhydride and a few drops of conc. H₂SO₄ was added. Reddish violet colour indicated the presence of triterpenoids.

4)Test for Steroids: 10ml of chloroform was mixed with 2ml of extracts and conc. H₂SO₄ was added to form lower layer. A reddish yellow colour at the interface was an indicative of the presence of steroidal ring.

5)Test for Saponins: 15 ml of distilled water was added to the extract and shaken vigorously until formation of a stable persistent froth which indicates presence of saponins.

6)Test for Flavonoids: Few drops of dilute NaOH was mixed with 2 ml of extract. A yellow solution that turns colourless showed the presence of flavonoids.

7)Test for Tannins: In a test tube containing little quantity of extract few drops of 1 % lead acetate were added. Yellow precipitate appeared it showed the presence of tannins.

8)Test for Carbohydrates: The small portion of extract was mixed with 2ml of Molisch's reagent and the mixture was shaken properly. After that 2ml of concentrated H₂SO₄ was poured carefully along the side of the test tube. Violet ring at the interphase was not formed which indicates absence of carbohydrate. These are the phytochemical tests used for the evaluation of phytochemical parameters in *syzygium cumini*.

Conclusion

The effect of *Syzygium cumini* and its phytochemicals should also be investigated for its anti- diabetic activity and chemopreventive effects in other models of carcinogens, that includes chemical, radiation and viral carcinogenesis models. Mechanistic studies responsible for the chemopreventive and radioprotective effects are also lacking and need to be studied in detail. Based on these facts these review high-lights the role of *Syzygium cumini* seeds in various treatments and recommend that further phytochemical and clinical research should be done on this traditional medicinal plant for the

discovery of safer drugs. Studies should also be on understanding which of the phytochemicals are responsible for the observed beneficially effects. Although most of the studies of *Syzygium cumini* as antidiabetic agent with its possible mechanism of action and delaying complications of diabetes such as cataract, neuropathy have been conducted but detailed research on isolation of bioactives through clinical trials followed by standardisation is seriously required to know potential of plant .Most of the pharmacological work was carried out on seeds of *Syzygium cumini* but the pharmacological potential of other parts also required to be explore.

References

1. Jadhav V.M., Kamble S.S. and Kadam V.J. Herbal medicine, *Syzygium cumini* a rievew. *Res J. Pharmacy*,2009; 2(8): 1212-1219.
2. Janick Jules and Paull Robert E. (2008). The Encyclopedia of Fruit & Nuts. CABI International, United Kingdom, 1-160. ISBN: 978-0-85199-638-7.
3. Chen Jie and Craven Lyn A. (2017). *Syzygium*. in Wu, Zhengyi; Raven, Peter H. & Hong, Deyuan, Flora of China (online), eFloras.org, retrieved 2015-08-13.
4. Patel Soncharan, Shanmugarajan T.S., Somasundaram. and Maity Niladri, Protective effect of *Syzygium cumini* seeds against doxorubicin induced cardiotoxicity in rats *International Journal Of Pharmacy & Life* .2010;1(2):23
5. Oliver.B, 1880, Oral hypoglycaemic plants in west Africa, *J.Ethnopharmacol*,2:119-127.
6. [http : // en . wikipedia . org/ wiki / Jambool](http://en.wikipedia.org/wiki/Jambool).
7. The Ayurvedic Pharmacopoeia of India, Part-I, 1st edition, Vol-II, The controller of publications, Delhi, 1999, 54-57.
8. Joshi, S.G., Medicinal plants, Oxford and IBH publication, New Delhi,2004,294.
9. The Ayurvedic Pharmacopoeia of India, Part-I, 1st edition, Vol-II, The controller of publications, Delhi, 1999, 54-57.
10. Ross. I. A., Medicinal Plants of the World, 2 nd edition, Vol-1, Humana Press, Totowa,New Jersey, 2003, 445-451.
11. [http : // en . wikipedia . org/ wiki / Jambool](http://en.wikipedia.org/wiki/Jambool).
12. Joshi, S.G., Medicinal plants, Oxford and IBH publication, New Delhi,2004,294.
13. The Wealth of India, Vol-X, CSIR, New Delhi, 1982, 100-104.
14. P. Wester, *Journal of food Plants of the Philippines, Bulletin* 39, 3rd Edition, Philippine Department of Agriculture & Natural Research, Burette of Agriculture, Manila, 1924.
15. H. Munsell, L. Williams, L. Guild, C. Troescher, G. Nightingale and R. Harris, "Composition of Food Plants of Central America," *Food Research*, 1949; 14(2): 144-164

16. The US Department of Agriculture and the US Department of Health and Human, "Dietary Guidelines for Americans," 2010. <http://ndb.nal.usda.gov/2012>
17. Harborne JB (1998). *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis* (Chapman and Hall International Edition, New York) 3rd Edition.
18. Ahmad Raza et al. *Syzygium cumini* seed and fruit extract attenuate hyperglycemia in diabetic rats. 2017;4(4):2221-1691.
19. Karnic C.R. A clinical trial of a composite herbal drug in treatment of diabetic mellitus (madhumeha), *Aryavaidyan*, 1991; 5, 36-46.
20. Brito F.A., Lima L.A., Ramos M.F., Nakamura M.J., Cavalher-Machados S.C., Henriques M.G. and Sampaino A.L. Pharmacological study of antiallergic activity of *Syzygium cumini* (L) Skeels. *Brazilian journal of medical and biological research*, 2007;40, 105-115.
21. Muruganandan S., Srinivasan K., Chandra S., Tandan S.K., Lal J. and Raviprakash V. (2001). Anti-inflammatory activity of *Syzygium cumini* bark. *Fitoterapia*, 72(4), 369- 375.
22. Mahapatra P.K., Chakraborty D. and Chaudhari A.K.N. . Anti-inflammatory and antipyretic activities of *Syzygium cumini*. *Planta Med*, 1986;52(6), 540.
23. Mukherjee P.K., Saha K., Murugesan T., Pal M. And Saha B.P. Screening for antidiarrhoeal profile of some plant extract of specific region of West Bengal, India. *Journal of Ethnopharmacology*, 1998; 60(1):85-89.

Cite this article as: **Veeram Anjali, G. Sindhu, C.Girish.** A review on pharmacology and phytochemistry of *Syzygium cumini*. **Indian J. Pharm. Biol. Res.** 2017; 5(4):21-28.

All © 2017 are reserved by Indian Journal of Pharmaceutical and Biological Research

This Journal is licensed under a **Creative Commons Attribution-Non Commercial -Share Alike 3.0 Unported License**. This article can be downloaded to **ANDROID OS** based mobile