

# Versatile Therapeutic Influence of Eclectic Jamun [*Syzygium cumini* (L.) skeels] for Healthcare

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Jamun or black plum is an important summer fruit. The plant has traditionally been used for its rich nutrition and medicinal value. Jamun has been used for the treatment of diabetes since ages. In Ayurveda, its fruits, seeds, bark and leaves are used as medicine for treating bleeding disorders and other diseases. It is a good source of anthocyanin, effective against analgesic properties. The presence of bioactive compounds such as alkaloids, tannins, phenols, lipids, flavonoids in its leaves, barks, fruits, stems, and roots contributes to rich source for nutrition and medicine. Nowadays, its seeds are famous as anti-diabetic medicine. It reduces the symptoms of diabetes like frequent urination and thirsting. The extract of bark and leaves are too beneficial in the treatment of diabetes.

**Keywords:** Anti-diabetic; Anthocyanin; Therapeutic; Bioactive; Antioxidants; Flavonoids; Phenolics; Pharmacological.

## Introduction

Jamun (Myrtaceae family) is a very common, large, evergreen beautiful tree of the Indian subcontinent. Jamun (also called Jambul, Java Plum in English and botanically accepted as *Syzygium Cumini*) is native to India and indigenous part of Indian folk remedies. In Ayurveda, its fruits, seeds, bark, and leaves are used as medicine for treating bleeding disorders and other diseases. Nowadays, its seeds become famous as anti-diabetic medicine. Jamun has promising therapeutic value due to its various phyto-constituents such as tannins, alkaloids, steroids, flavonoids (Fig. 1), terpenoids, fatty acids, phenols, minerals, carbohydrates and vitamins. The leaves contain antioxidants and have anti-virus, anti-inflammatory properties, while helping lower blood sugar levels, treating constipation and eliminating allergies. Anthocyanins present in berries are known to create anticancer cells in the body. Its juice has bioactive phytochemicals that minimise the risk of liver disease and cancer. Jamun is an important summer fruit linked with numerous curative benefits. The dark colour of the skin is because of anthocyanin, which is a potent phytonutrient. This provides the body with an ample amount of antioxidants that protect the cells in the body from harm caused by oxidative stress and free radicals. Jamun is rich in naturally occurring sugar called fructose and contains very few calories. Jamun is loaded in glucose and water content, making it a suitable fruit to have during the hot summer months. Jamun is an amazing fruit for people suffering from diabetes as it converts starch in the body into energy and thus keeps the blood sugar levels low. It has a low glycemic index (GI) and can be safely consumed by diabetic people to control symptoms like frequent thirst and urination. Jamun works great in aiding digestion as it has diuretic properties that keeps the digestive system cool. It also contains fibre, which can help provide relief from constipation. The iron in it acts as a blood purifier and helps invigorate the red blood cells. The bark, seeds and leaves of the jamun tree is considered to be beneficial in the treatment of diabetes. The seeds are dried and then ground into a fine powder, which is then regularly consumed with food or water to control blood sugar levels. The paste of jamun seeds with cow milk, lemon, gram flour and a few drops of almond oil and rose water make jamun face pack that can safeguard the skin from discoloration and other ailments. A decoction made with the extract of leaves, bark and seeds of jamun also get rid of a range of oral problems. Commercially, jamun is used to make jellies, jams, wines, vinegar and other beverages. It is also used to make squash when combined with sugar, water, citric acid and sodium benzoate. Ripe jamuns are used in making fantastic wines while unripe fruits are employed to produce tart vinegar. Jamun should not be eaten on an empty stomach since it is highly acidic and can irritate the digestive tract, giving way to acidity. Black Plum vinegar is good to reduce enlargement of spleen, diarrhoea, and those have urine retention problems. The fruits are used to prepare

Jamun vinegar, which is beneficial in abdominal diseases such as loss of appetite, abdominal pain, dysentery and (IBS) irritable bowel syndrome. Sometimes, it is also used for indigestion.

The well-known characteristics of the ripe fruit are a very attractive deep purple or black colour, and a highly astringent. The Jamun fruit is rapidly gaining interest in the international arena due to its potential nutraceutical value, and is used in traditional folklore medicine in India. The fruit, similar to other red and blue fruits and vegetables, is also reported to be enriched with flavonoids, essential oils, anthocyanins,

phenolic compounds and antioxidants. Scientific studies have shown that the various extracts of Jamun possess a range of pharmacological properties such as antibacterial, antifungal, antiviral, anti-genotoxic, anti-inflammatory, anti-ulcerogenic, cardioprotective, anti-allergic, anticancer, chemopreventive, radioprotective, free radical scavenging, antioxidant, hepatoprotective, anti-diarrheal, hypoglycemic and antidiabetic effects (Kumar et al., 2011,). The presences of anthocyanins, fibers and ellagitannins which are present in the pulp are important in reducing the oxidative stress-induced diseases.

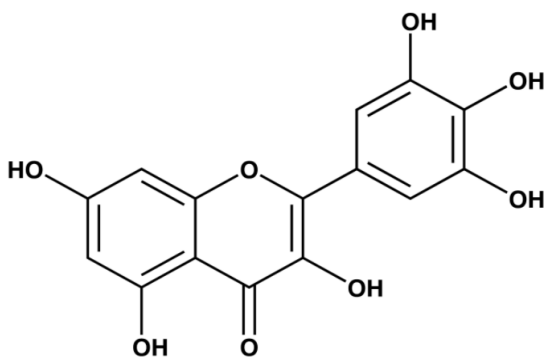


Fig. 1 Chemical Structure of Flavonoid

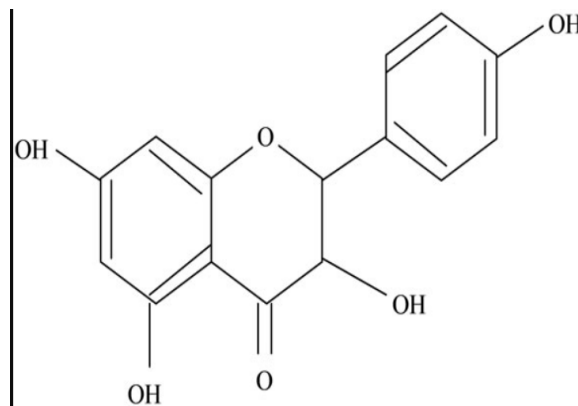


Fig. 3 Chemical Structure of Myricetin

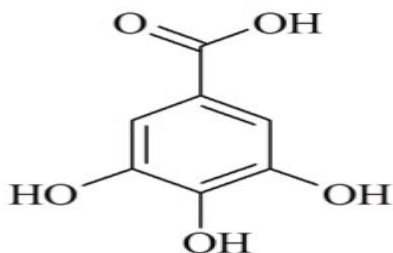


Fig.2 Chemical Structure of Myricetin Gal

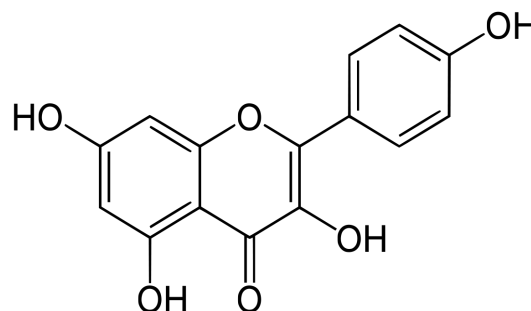
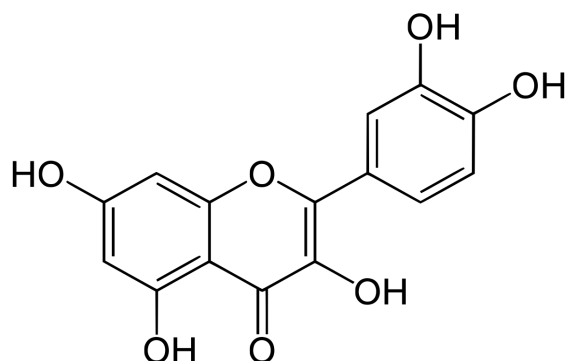


Fig. 4 Chemical Structure of Kaempferol



**Fig. 5 Chemical Structure of Quercetin**  
**Physico Chemical Properties of Jamun(Syzygium Cumini)**

The use of Jamun was introduced in western medicine in the mid-nineteenth century, when the first reports on the investigation of its antidiabetic properties were published. (Chagas et al, 2015).The seed, bark, leaf & pulp are used in treatment of diabetes, allergies, viral infection, inflammation & gastric ulcer (Dagadkhair, et al, 2017; Sharma, S. et al, 2012). It also has diuretic, anti-nociceptive, hypothermic, chemoprotective and cardioprotective effect (Katiyar, D. et al, 2016).The Jamun bark is a mixture of bio components like tannins and carbohydrates, they impart as astringent to fight dysentery. Jamun fruit has oblong berries, having dark purple or bluish colour and light pinkish pulp (75%) rich in anthocyanins and single dark brown seed (25%).The fruit has carbohydrates, free amino acids, water soluble vitamins, minerals, and essential oils

(Jadhav et al., 2009). The Jamun seed is rich in glycosides which possess anti-diabetic properties. Jamun juice is used in treating sore throat problems. Jamun fruit juice is effective in enlargement of the spleen. The major bioactive compounds present in the edible part are myricetin (Fig. 2), oxalic acid, gallic acid, citronellol, cyanidin diglucoside, hottenol, phytosterols, flavonoids, carotenoids and polyphenols as well as micronutrients, accounting for numerous health benefits.(Chhikara, P.et al 2018).

#### Nutritive Value of Jamun Fruit

S No.	Nutrient	Percentage
1	Moisture	28.2
2	Protein	0.7
3	Fat	0.1
4	Mineral	0.4
5	Fibre	0.9
6	Carbohydrate	19.7
7	Calcium	0.02
8	Phosphorous	0.01
9	Iron	1.0
10	Calorific Value	83/100gm
11	Anthocyanin	1.8-1.9
12	Pulp	50-65

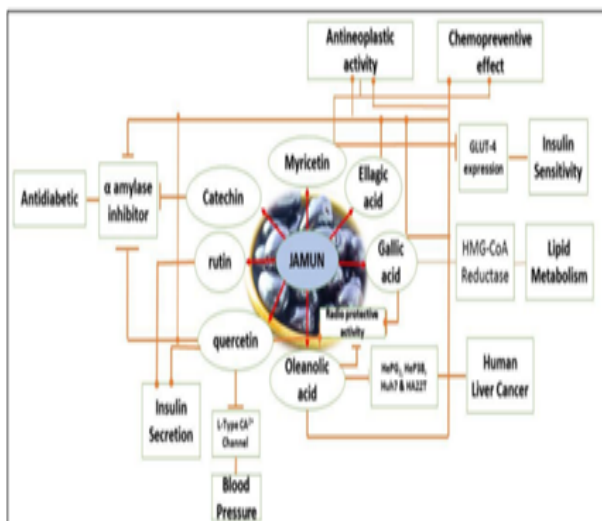
#### Phytochemicals Present In Different Parts of Jamun Plant

Plant Part	Chemicals Present	Uses
Roots	Isohamnetin-3-O-rutinoside and flavonoid glycosides. resin, albumen, gallic acid, essential oil and tannic acids.	The fruit is a good source of anthocyanins, iron, pectin, phenols and protein. Jamun fruit is known to reduce the blood sugar levels and is acclaimed very good for the management of Diabetes mellitus.
Stem bark	Friedelin, friedelan-3- $\alpha$ -ol, betulinic acid, $\beta$ -sitosterol, kaempferol, $\beta$ -sitosterol D-glucoside, gallic acid, ellagic acid, gallotannin, ellagitannin, myricetin	Jamun Bark is helpful for the treatment of urticaria, vomiting, dental problems, diabetes, polyuria and frequent urination. Jamun bark ash is used for nausea and vomiting. Bark of a jamun tree helps treat mouth ulcers credited to its highly acidic nature.
Leaves	$\beta$ -sitosterol, betulinic acid, mycaminose, crategolic acid, n-hepatcosane, myricetin, n-nonacosane, n-hentriacontane, flavonolnoctacosanol, n-triacontanol, myricetin, n-dotriacontane, quercetin, glycosides 3-O-(4"-acetyl)- $\alpha$ L'Rhamnopyranoside S.	Jamun leaves are useful in mouth ulcer, bleeding piles, diarrhea, typhoid fever, etc. Lower blood sugar levels, treating constipation and eliminating allergies. Powder made with Jamun leaves can be applied on the teeth and gums to safeguard from oral ailments like bleeding gums. Chewing clean jamun leaves can help provide relief in symptoms of diarrhea and stomach ulcers. Jamun leaves are prescribed for nausea, vomiting, bleeding disorders, and metrorrhagia.

Flowers	Oleanolic acid, ellagic acids, isoquercetin, quercetin (Fig. 5), kaempferol, myricetin. (Fig. 4)	Flowers are borne in the axils of leaves on branch lets.The flowers are Sessile, small (7-12 mm), white in color and with thin membranous petals.
Fruit pulp	Anthocyanins,delphinidin,petunidin , malvidin-glucoside.Carbohydrate, Phenylpropanoid, Monoterpene, Benzenoid	Protect from heart diseases, high blood pressure and the risk of stroke.Polyphenols of jamun fruit have shown superior antioxidant capacities when compared to the standard polyphenols (Singh et al., 2018).Anticancer property of anthocyanins in Jamun fruit was reported (Nazif, 2007).
Essential oils	$\alpha$ -terpineol, myrtenol, eucarvone, muurolol, $\alpha$ -myrtenal, 1, 8-cineole, geranyl acetone, $\alpha$ -cadinolpinocarvone	The essential oil $\beta$ -Caryophyllene present in jamun leaves exhibits anti-inflammatory properties while caryophyllene oxide possesses anti-mycobacterial properties. (Machado, et al. 2013.)Jamun leaves contain 82% of total essential oils (Chikara et al., 2018).
Seed powder	Jambosine, gallic acid, ellagic acid, corilagin, 3, 6-hexahydroxy, $\beta$ -sitosterol, diphenyl glucose, quercetin, 1-galloyl glucose, 3-galloyl glucose, 4, 6hexahydroxydiphenoylglucose	The powder of the seeds of Jamun is highly beneficial in reducing the blood sugar level. It promotes digestion and is effective for a healthy heart and liver. It is also essential for maintaining bone health, blood dysentery, hoarseness, bilious diarrhoea, bed wetting in children and excessive urination in adults.

Myricetin Gallic acid Quercetin Cyanidin Catechin Phytosterols Flavonoids Oleanolic acid Polyphenols  $\beta$ -sitosterol $\alpha$ -terpineol Ellagic acid

**Major Bioactive Compounds Present in jamun Fruit**



**Phytochemical Present In Jamun And Their Health Benefits**

**Health Benefits**

Jamuns are a powerhouse of nutrients. Different plant parts have been claimed to contain different constituents, due to which they possess an assorted pharmacological perspectives.

**Antioxidant Properties**

Jamun fruit has been recognized as a nutraceutical fruit due to the presence of antioxidants

such as ascorbic acid, anthocyanins and total phenols. There is a very high anthocyanin content in *Syzygiumcumini* fruits which attributes to its antioxidant and free radical scavenging activity. Blackberry is considered as source of natural antioxidants and the seeds supply substantial antioxidants that provide health promoting and disease preventing effects.

**Anti-Inflammatory Properties**

Blackberries provide antioxidants known as anthocyanins. These compounds may reduce inflammation, boost immunity, and reduce risk of heart disease. *Syzygiumcumini* seed has been reported to possess anti-inflammatory activity against histamine, serotonin and prostaglandin. Jamun contains polyphenol compounds which are reported to have anti-inflammatory activity in humans.The stem bark ash of *Syzygiumcumini* mixed with water or oil used as an anti-inflammatory agent and used to treat burns. Regular consumption of jamun prevents hardening of arteries which leads to atherosclerosis, reduces the various symptoms of high blood pressure thereby controlling hypertension and prevents strokes and cardiac arrests.

**Anti-Diabetic Properties**

Jamun is very effectively long used as a traditional as well as preventive measure in the treatment of Diabetes Mellitus (Singh, Y. et al., 2019). The seed helps to convert starch into energy and keep the blood sugar levels into check.*Syzygiumcumini* and its extracts reduce the symptoms of diabetes like frequent urination and thirsting. Prabakaran, K. et al. (2017), demonstrated that the extract of *Syzygiumcumini* has potent  $\alpha$

amylase inhibitor with a higher degree of inhibition. Raza et al. (2017) conducted an experiment to study the effect of fruits and seed extracts of Jamun and found that this extract can reduce the level of blood glucose level in rats and it has also capacity to regulate insulin level. The seeds of the fruit have active ingredients called jamboline and jambosine. These substances slow down the rate of sugar released into the blood and increases the insulin levels in the body. It converts starch into energy and reduces the symptoms of diabetes such as frequent urination and thirsting.

#### **Antimicrobial and Anti- Bacterial Properties**

Jamun leaves have significant antimicrobial activity against both gram-positive and gram-negative bacteria.

(Sahu, P.P. et al 2020) Syzygiumcumini seed extract has antibacterial and antifungal activity to some microorganisms and these extracts may be used in treatment of skin wounds. The antibacterial activity observed for Syzygiumcumini thought may be due to the presence of monoterpene aldehydes. The study reveals that Syzygiumcumini (jamun) seeds have a great potential for antibacterial action (Das, S. et al. 2019). The preliminary investigation of different solvent extracts of jamun shows that aqueous and ethanolic extract had significant antimicrobial activity against tested microorganism as compared to acetic acid and petroleum ether extract. The methanol, ethanol and acetone extracts of Eugenia jambolana (Lam.) seeds have significant antimicrobial activities against Streptococcus aureus, Shigella, Pseudomonas and Salmonella isolates with an inhibition zone of 11 to 35 mm (Ogato, et al., 2015).

#### **Anti-Cancer Properties**

Epidemiological data suggests that intake of antioxidants via increased consumption of dark colour fruits like jamun contributes toward a reduced risk of certain types of cancers. (Sharma, V. et al. 2019). Jamun possess anti-neoplastic, radio-protective and chemo-preventive effects, all of which are useful in the prevention and treatment of cancer. Jamun seeds are also having antimicrobial and antioxidant properties (Bajpai et al., 2005) which help to prevent skin cancer (Vasi and Austin, 2009). Gallic acid, ellagic acid, flavonoids and anthocyanins present in Jamun are reported to prevent experimental carcinogenesis in various organs and may have contributed to the anti-carcinogenesis. Very often, women are suffered from breast cancer. (Aquil et al. 2016) conducted an experiment to study the potential of Jamun against 17 $\beta$ -estrogen-mediated breast cancer and the study of m-RNA in inhibition of disease.

#### **Cosmetics Properties**

Terpenes are used in cosmetics industry for generating flavors and fragrance due to their pleasant scent. Triterpenes are particularly useful compounds for dermatological conditions. Ursolic acid, for example, widely diffused in many plants, is a pentacyclic triterpene used in cosmetic preparations for skin revitalization. Extract of syzygiumcumini with these constituents can be used in appropriate

formulation of cosmetic product to prevent acne, blemishes, wrinkles and pimples and can be used as anti-aging, skin conditioning, hair growth promoter. Jamun detoxifies, purifies the blood and blesses us with blemish free radiant skin.

#### **Aim of the Study**

In this review paper precise information regarding Jamun's phytochemical constituents, traditional, pharmacological and therapeutic applications has been delineated appropriately.

#### **Conclusion**

A high number of constituents have been extracted both from the aerial as well as underground parts of the plant Syzygiumcumini using various solvents. It is clear that this tree is of high value in terms of its potential for pharmaceutical formulation. Jamun is traditionally used for the treatment of various diseases especially diabetes and related complications. The present article has focused on the recent research investigations carried out on the diverse pharmacological actions of Jamun. Various parts of the plant and their extracts have been used for anti-diabetic action, but very less study has been performed on its isolated phyto constituents. Apart from its utility in diabetes, it is a very useful drug as anti-bacterial, anti-fungal, anti-viral, anti-cancer, anti-hyperlipidemic, hepatoprotective, cardio protective, gastro protective and so on. Thus, further studies need to be performed with respect to pharmacological action of its isolated constituents, its mechanism of action and clinical studies. By going through all the research work which is been done up till now regarding the role which Syzygiumcumini plant species is playing in the field of medicine one thing is clear that this plant possess many characteristic property which could be used by in the medication and will also help in the improvement in the field of medicines. If the future scope is to be discussed then it must be seen that Syzygiumcumini or Jamun holds up many advantages in the way of treatment of diabetes.

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