

# Exploring Knowledge about Medicinal Uses of Jamun

Vaishali Pandurang Kandalkar, Nilam Vitthal Ichake, Tejal Kaluram Bhoir, Punam Kisan Ghude  
Mr. Prashant Bhoir

Siddhi's Institute of Pharmacy, Nandgoan, Maharashtra, India

**Abstract:** *Eugenia jambolana Lam.*, commonly known as black plum or “jamun” is an important medicinal plant in various traditional systems of medicine. It is effective in the treatment of diabetes mellitus, inflammation, ulcers and diarrhea and preclinical studies have also shown it to possess chemopreventive, radioprotective and antineoplastic properties. The plant 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. The present review has been primed to describe the existing data on the information on traditional and medicinal use

**Keywords:** Jamun-Syzygiumcumini; Chemopreventive; Radioprotective; Antineoplastic Activities

## I. INTRODUCTION

Syzygiumcumini (Family Myrtaceae) is also known as Syzygiumjambolanum and Eugenia cumini. Other common names are Jambul, Black Plum, Java Plum, Indian Blackberry, Jamblang, Jamun etc. Today these trees are found growing throughout the Asian subcontinent, Eastern Africa, South America, Madagascar and have also naturalized to Florida and Hawaii in the United States of America [1]. The tree fruits once in a year and the berries are sweetish sour to taste. The ripe fruits are used for health drinks, making preserves, squashes, jellies and wine [1]. In association to its dietary use, all parts of the tree and, importantly the seeds are used to treat a range of ailments, the most important being diabetes mellitus [2]. Different parts of the jambolan were also reported for its antioxidant, anti-inflammatory, neuropsychopharmacological, anti-microbial, anti-bacterial, anti-HIV, antileishmanial and antifungal, nitric oxide scavenging, free radical scavenging, anti-diarrheal, antifertility, anorexigenic, gastroprotective and anti-ulcerogenic and radioprotective activities [2]. (Figure 1) shows the Jamun fruit. \*

## II. COMPOSITION OF FRUIT



Analyses of the fruit in the Philippines were reported in 1924 as follows: Waste, 25%; edible portion: water, 80.80%; ash, 0.70; protein, 0.81; sugar, 12.70 (fructose and glucose; no sucrose); acidity (as sulphuric), 0.63%; (as malic) 0.88% [3]. The following composition per 100 grams of edible portion was reported for fruits freshly picked at the Lancetilla Experimental Garden, Honduras, in 1948: Moisture, 85.8 gm; ether extract, 0.15 gm; crude fiber, 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 [4]. Virmani gives the following analysis: specific gravity, 1.0184; total acidity (as acetic acid), 5.33 per 100 cc; volatile acidity (as acetic acid), 5.072 per 100 cc; fixed acidity, 0.275% as citric; total solids, 4.12 per 100 cc; ash, 0.42; alkalinity of ash, 32.5 (N/10 alkali); nitrogen, 0.66131; total sugars, 0.995; reducing sugars, 0.995; non-volatile reducing sugars, 0.995; alcohol, 0.159% by weight; oxidation value (KMnO<sub>4</sub>, 186.4); iodine value, 183.7; ester value, 40.42. Other reported constituents of the seeds are: protein (6.3 to 8.5%), fat (1.18%), crude fiber (16.9%). Food Uses Figure 1. Jamun fruit in a bunch. Ash (21.72%), calcium (0.41%), phosphorus (0.17%),

Fatty acids (palmitic, stearic, oleic and linoleic), starch (41%), dextrin (6.1%), a trace of phytosterol, and 6 to 19% tannin [5]. The fruits are avidly eaten by birds and four footed animals (jackals and civets in India). In Australia, they are a favorite food of the large bat called "flying fox". Analyses of the leaves show: crude protein (9.1%), fat (4.3%), crude fiber (17.0%), ash (6.0%), calcium (1.3%), phosphorus (0.19%) [6]. It consists mainly of mono- or sesqui-terpene hydrocarbons which are "very common in essential oils." Constituents of *Syzgiumcumini* seeds are fatty oils (30 g/kg), including lauric (2.8%), myristic (31.7%), palmitic (4.7%), stearic (6.5%), oleic (32.2%), linoleic (16.1%), malvalic (1.2%), sterculic (1.8%) and vernolic acid (3%) and phytosterols such as  $\beta$ -sitosterol. Further constituents are tannins (6%), predominantly corilagin, ellagitannins, ellagic acid, galloyl-galactoside and gallic acid [7]. The leaf oil consists of 16.91% octadecane, 9.98% nonacosane, 9.38% triacontane, 7.38% octacosane, 4.86% Heptacosane, 4.25% hexadecanoic acid and 4.02% eicosane. The seed oil consists of 33.2% 1-chlorooctadecane, 9.24% tetratetracontane, 8.02% decahydro-8a-ethyl-1,1, 4a,6-tetramethylnaphthalene, 5.29% 4-(2-2-dimethyl-6-6-methylenecyclohexyl) butanol, 5.15% Octadecane, 3.97% octacosane, 1.72% heptacosane and 1.71% eicosane. [8]. Java Plum consist of Energy 251 kJ (60 kcal), Carbohydrates 15.56 g, fat 0.23 g, Protein 0.72 g, water 83.13 g, Vitamin A 3IU, Thiamine (vit B1) 0.006 mg (1%), Riboflavin (vit. B2) 0.012 mg (1%), 0.260 mg (2%) Niacin (vit. B3), 0.160 mg (3%) Pantothenic acid (B5), 0.038 mg (3%) Vitamin B6 0.038 mg (3%), 14.3 mg (17%) Vitamin C, 19 mg (2%) Calcium, 0.19 mg (1%) Iron, 15 mg (4%).

### Uses

Good quality jambolan juice is excellent for sherbet [11, 12], syrup and "squash". In India the latter is a bottled drink prepared by cooking the crushed fruits for 5 to 10 minutes at 140°F, pressing out the juice, combining it with sugar and water and adding citric acid and sodium benzoate as a preservative [13]. Jambolans of good size and quality, having a sweet or sub acid flavor and a minimum of astringency, are enjoyable raw and may be made into tarts [14], sauces and jam. Astringent fruits are improved in palatability by soaking them in salt water [14] or pricking them, rubbing them with a little salt, and letting them stand for an hour [15]. All but decidedly inferior fruits can be utilized for juice which is often comparable to grape juice [16]. When extracting juice from cooked jambolans, it is recommended that it be allowed to drain out without squeezing the fruit and it will thus be less astringent. The white-fleshed jambolan has adequate pectin and makes a very stiff jelly unless cooking is brief [17]. The more common purplefleshed yields richly colored jelly [18] but is deficient in pectin and requires the addition of a commercial jelling agent or must be combined with pectin-rich fruits such as unripe or sour guavas, or ketembillas [18]. In Goa and the Philippines [19], jambolans are an important source of wine, resembling Port [20]. Brandy and a distilled liquor called "jambava" have also been made from the fermented fruit. Jambolan vinegar, extensively made throughout India, is an attractive, clear purple, with a pleasant aroma and mild flavor.

### Uses in Traditional Medicine

1. Traditionally the jambul fruits, leaves, seeds, and bark are all used in ayurvedic medicine.
2. The bark contains tannins and carbohydrates, accounting for its long-term use as an astringent to combat ailments like dysentery (Namasivayamet al. 2008).

3. A glycoside in the seed, jamun is considered to have antidiabetic properties.
4. The seeds have also shown anti-inflammatory effects in rats and antioxidant properties in diabetics (Chaudhuri et al. 1990).
5. Jamun fruit seeds and pulp have been reported to serve various purposes in diabetic patients, such as lowering blood glucose levels and delaying diabetic complications including neuropathy and cataracts.
6. Jamun is most often recognized as an adjuvant therapy in type-2 diabetes.
7. Jamun fruit reduces the sugar in the blood and is very good in the control of diabetes. Its seeds contain Glucoside, Jamboline and Ellagic acid, which are reported to have the ability to check the conversion of starch into sugar in case of excess production of glucose (Giriet al.1985).
8. All parts of the jamun can be used medicinally and it has a long tradition in alternative medicine. The plant has been viewed as an antidiabetic plant since it became commercially available several decades ago.
9. Ayurvedic texts suggest that 1-3 g of seed powder per day is an average dose. Additionally, juice of ripe fruits in the amount of 0.5-2 tsp (2.5-10 ml) at least three times daily has been recommended for the treatment of diabetes.

### **III. MATERIAL AND METHODS**

Raw Material processing a. Seed collection- The seeds were purchased from local market of Jodhpur. B. Cleaning- The seeds were washed with water to remove dust and dirt particles. C. Drying- The cleaned seeds were dried in an oven at 60°C for 7 hours to reduce the moisture content. After drying the seeds were stored in air tight containers for analysis. D. Size reduction- The seeds were crushed by Mortar and pestle into small pieces for effective extraction of the oil. 2.2 Determination of Physical Properties of the seeds[9] a. percentage of moisture 40 g of seeds were taken in a silica crucible and dried in an oven at 800 C for 7 hours. The weight of crucible and seeds sample was recorded after every 2 hours using cooling in desiccators. This procedure was repeated till a constant weight is obtained. The moisture content was calculated by the formula  $M\% = 100 (W_2 - W_1) / M$  b. Determination of the percentage of Jamun oil Extracted 150 ml. of normal hexane was taken in a round bottom flask. 30 g of crushed seeds were filled in a thimble. The apparatus was heated at 600C and allowed for three continuous extractions. The experiment was repeated with different amounts of samples and the weights of extracted oil were taken. From these values the % oil was calculated. 2.3. Extraction of oil in Soxhlet Extract 300 ml of petroleum ether (40-600C range of boiling point) was taken in round bottom flask. 10 gram of crushed seeds was taken in a thimble and it was placed in apparatus. The soxhlet was heated at 600c. The extraction process by Soxhlet was carried out for 30 minutes. The thimble was removed from the tube, dried in oven, cooled in desiccators and the weight was noted. This process was repeated to get the maximum extract. 5 g of sample seeds were taken and same procedure was repeated. After complete extraction the resulting micelle/resulting mixture was taken for solvent recovery. The oil thus obtained was cooled and filled in a viol. 2.4. Characterization of the Extracted Jamun seed oil a. Determination of Boiling point of oil The boiling point of oil was obtained by heating it on heating mantle to form the bubbles. The temperature of oil was obtained using a thermometer in it. B. Determination of Refractive Index Adobe Refractometer was used to determine the refractive index of the oil. The values were taken at 30o C. c. Determination of Specific gravity Density bottle was used for specific gravity determination. The weight of 25 ml. capacity bottle was taken and it is filled with oil sample. The weight of oil and bottle was noted. The same process was repeated with water as reference standard. D. Determination of Saponification value ISO 3657 (1988) indicator method [10] was applied to determine Saponification value. 2g (M) of oil was weighed in a conical flask and 25 ml. of N/10 ethanolic KOH is added to it. A reflux condenser was fixed on it and allowed to heat for 1 hour. A few drops of phenolphthalein indicator was mixed to warm mixture and titrated against M/2 HCl (N) to get the colorless solution. The volume of HCl used was noted as V1. The same steps was repeated with blank simultaneously also and volume was taken (V0). S.V. (Saponification value) was calculated by following formula.  $S.V. = 56.1 N (V_0 - V_1) / M$  e. Determination of Acid Value [12] 25 ml of diethyl ether and 25 ml of ethanol was mixed in a beaker of 250 ml. capacity. This mixture was added to 10 g (W0) of oil filled in a 250 ml conical flask and a few drops of phenolphthalein indicator were mixed to it. The mixture was titrated against M/10 NaOH with continue shaking to get dark pink color at volume of NaOH V0. The free fatty acids were calculated as  $FFA = 2.82 \times 100 \times V_0 / W_0$  The acid

value was calculated as FFA/2. F. Determination of Iodine value ISO 3961 (1989) method [11] was used to determine the Iodine value. 0.4 g oil (M) was weighed into a conical flask with 20 ml. of carbon tetra chloride to dissolve it. 25 ml. of Dam's reagent was added in fume chamber. The flask was swirled vigorously after inserting stopper. It was placed in dark for 2.5 hours. After that 20 ml of 10% aqueous KI and 120ml of water were added to the contents. It was titrated with M/10 sodium thiosulphate solution to get a pale yellow solution. 1% starch indicator was added to get blue color. It was again titrated till disappearance of blue color (V2 ml). The same procedure was repeated with the blank solution (V1ml). The iodine value (I.V.) was calculated by the expression:  $I.V. = 12.69C (V1-V2)/M$  g. Determination of Viscosity Redwood viscometer no.1 was used to determine the viscosity of oil sample. It was recorded as redwood second at room temperature. 50 ml of oil was allowed to flow through orifice. The time to flow of oil is noted in redwood seconds

### Medicinal Properties

The jamun has received far more recognition in folk medicine and in the pharmaceutical trade than in any other field. Medicinally, the fruit is stated to be astringent, stomachic, carminative, antiscorbutic and diuretic (Srivastava et al. 1983). Additionally, a fruit extract showed antimicrobial and cytotoxic activities and may potentially be used on typical antimicrobial products. In comparison to other non-traditional fruits jamun showed considerable high antioxidant activity, which can constitute such as anthocyanins, tannins.



### IV. CONCLUSION AND SCOPE

The percentage of oil was found as 10%, which is quite satisfactory for industrial consumption. Since the oil is a non-drying oil so it can be used in manufacturing of soap. In addition to its medicinal values the oil can also be used as a binding material of natural drugs. The yield of seeds and their oil percentage are affected by a number of factors like environmental conditions, variety of plant, age of plant, collection timings, storage etc. Out of them many parameters can be controlled for better results. A number of fields could be tried on the basis of present results and previous research to seek the applications of Jamun seed oil in specific manner. In summarized form it can be concluded that Jamun seed oil should be studied further and the products should be standardized for better applications.

**REFERENCES**

- [1] P. Warriar, V. Nambiar and C. Ramankutty, "Indian Medical Plants," Orient Longman Ltd., Hyderabad, Vol. 5, 1996, pp. 225-228.
- [2] H. Sagrawat, A. Mann and M. Kharya, "Pharmacological Potential of Eugenia Jambolana: A Review," *PharmacogenesisMagazice*, Vol. 2, 2006, pp. 96-104
- [3] P. Wester, "Journal of food Plants of the Philippines," Bulletin 39, 3rd Edition, Philippine Department of Agriculture & Natural Research, Burette of Agriculture, Manila, 1924.
- [4] H. Munsell, L. Williams, L. Guild, C. Troesch, G. Nightingale and R. Harris, "Composition of Food Plants of Central America," *Food Research*, Vol. 14, No. 2, 1949, pp. 144-164. doi:10.1111/j.1365-2621.1949.tb16218.x
- [5] A. Ranjan, A. Jaiswal and B. Raja, "Enhancement of Syzygiumcumini (Indian Jamun) Active Constituents by Ultra-Violet (UV) Irradiation Method," *Scientific Research and Essays*, Vol. 6, No. 12, 2011, pp. 2457-2464.
- [6] E. Giovannucci, E. Rimm and Y. Liu, "A Prospective Study of Tomato Products, Lycopene, and Prostate Cancer Risk," *Journal of Natural and Cancer Natural*, Vol. 94, No. 5, 2002, pp. 391-398
- [7] K. Lock, D. Stuckler, K. Charlesworth and M McKee, "Potential Uses and Health Effects of Indian Raspberry," *British Homeopathic Journal*, Vol. 339, 2009, pp. 459- 452.
- [8] A. Kumar, T. Jayachandran and P. Aravindhan, "Neutral Components in the Leaves and Seeds of Syzygiumcumini," *African Journal of Pharmacy and Pharmacology*, Vol. 3, No. 11, 2009, pp. 560-561.
- [9] The US Department of Agriculture and the US Department of Health and Human, "Dietary Guidelines for Americans," 2010. <http://ndb.nal.usda.gov/2012>
- [10] M. Baliga, P. Bhat and B. Baliga, "Phytochemistry, Traditional Uses and Pharmacology of Eugenia jambolana Lam. (Black Plum): A Review," *Food Research International*, Vol. 44, No. 7, 2011, pp. 1776-1789. doi:10.1016/j.foodres.2011.02.007
- [11] A. Benthall, "Trees of Calcutta and Its Neigh borhood. Thacker," Spink & Co. Ltd., Calcutta, 1946.
- [12] W. H. Brown, "Wild Food Plants of the Philippines," Bulletin 21, Department of Agriculture and Natural Resources, Bureau of Printing, Manila, 1920.
- [13] G. Lai, G. Siddappa and G. L. Tandon, "Preservation of Fruits and Vegetables," *Indian Council of Agriculture Research*, New Delhi, 1960.
- [14] W. Kennard and H. Winters, "Some Fruits and Nuts for the Tropics," Misc. Pub. 801, Agricultural Research Service, US Dept. Agric, Washington, 1960.
- [15] I. H. Burkill, "A Dictionary of the Economic Products of the Malay Peninsula," Vol. 1, Crown Agents for the Colonies, London, 1935.
- [16] E. Quisumbing, "Medicinal Plants of the Philip Pines," Tech. Bui. 16, Department of Agriculture and Natural Resource, Manila, 1951.
- [17] C. D. Miller, K. Bazore and M. Bartow, "Fruits of Hawaii," 2nd Edition, University of Hawaii Press, Hawaii, 1955.
- [18] O. W. Barrett, "The Tropical Crops," The Macmillan Co., New York, 1928.
- [19] W. Harris, "Notes on Fruits and Vegetables in Jamaica," Government Printing Office, Kingston, 1913.
- [20] J. Dastur, "Useful Plants of India and Pakistan," 2nd Edition, D. B. Taraporevala Sons & Co., Mumbai, 1943.