

Jamun

Jamun (*Syzygium cuminii* Skeels or *Eugenia jambolana*) is an important under exploited or poor known fruit. It is an important fruit plant of the family Myrtaceae or *Myrtle* (Chase, 2009; Wealth of India, 2002). It is a very common, large, evergreen beautiful tree of the Indian subcontinent. Now-a-days, it is found to grow throughout the Asian subcontinent, East-ern Africa, South America, Madagascar and have also naturalized to Florida and Hawaii in the United States of America (Warrier *et al.*, 1996). The other local names of jamun are Indian blackberry, Java plum, Jambu, black plum and Jambul *etc.* (Kirtikar and Basu, 1999; Nadkarni, 2001). All parts of the tree and, importantly the seeds are used to treat a range of ailments, the most important being diabetes mellitus (Sagrawat *et al.*, 2006). According to Singh *et al.*, (2011) Jamun has promising therapeutic value due to its various phyto-constituents such as tannins, alkaloids, steroids, flavonoids, terpenoids, fattyacids, phenols, minerals, carbohydrates and vitamins. Diabetes management through use of jamun has been demonstrated (Singh *et al.*, 2011). The pharmacological trials were mainly carried out using seeds of jamun but the potential of other parts of the tree need to be explored. Jamun fruit has considerable nutritive value. It is a good source of iron apart from being the source of minerals, sugars and other phytochemicals (Nath *et al.*, 2008). The fruits have sub-acid spicy flavor and commonly used as dessert. Apart from eating as fresh, it can also be used for the preparation of delicious beverages, jelly, jam, squash, wine, vinegar and pickles (Sagar and Dubey, 2019).

Area production

The World estimated production of Jamun is 13.5 million tonnes. China is largest producer of jamun and accounting nearly 58% of global production. India is the second largest producer of jamun and contributed 15.40 per cent of total World production. In India Maharashtra is the largest producer followed by Uttar Pradesh, Tamil Nadu, Gujarat and Assam (Sagar and Dubey, 2019).

Origen and distribution

Jamun is an important but under -exploited fruit tree. It is native to India, Myanmar, Sri Lanka, Malaysia, Philippines, Thailand (Orwa *et al.*, 2012) and found throughout Indian plains as well as in Kumaon hills of Uttarakhand up to 1,600 m. It is found grown naturally in as a wild and semi-wild in tropical and subtropical parts of the country *viz.*, Punjab, Haryana, Uttar Pradesh, Maharashtra, Rajasthan, Gujarat, Madhya Pradesh, Bihar, Chhattisgarh, Jharkhand, Karnataka, Kerala, Tamil Nadu and Andhra Pradesh (Singh *et al.*, 2011). It is widely distributed in Sri Lanka, Malaysia, Thailand, Philippines and Australia.

Soil and climate

The Jamun trees can be grown on a wide range of soils - calcareous, saline sodic soils and marshy areas. The well-drained, deep sandy loam with good soil moisture retaining capacity soils are found most ideal for better growth and yield. Jamun plant survives even in alkali soils up to pH 10.5 (Bajpai *et al.*, 2012). It does not like very heavy and light sandy soils.

Jamun thrives well under tropical, subtropical semi arid conditions with an annual rainfall varying from 350 to 500 mm. It requires dry weather during flowering and fruiting. The early

monsoon rains are beneficial for better growth, development and ripening of fruit. The young plants are susceptible to frost. It is also grown in the lower ranges of the Himalayas up to an altitude of 1300 meters. Due to hardness it can withstand prolonged period of drought and flood (Patil *et al.*, 2009; Chovatia and Singh, 2000).

Varietal wealth

Goma Priyanka-This variety was developed through selection from CHES (CIAH-ICAR) Godhra, Gujarat during 2010. It is semi-dwarf, spreading growth habit, dense foliage and drooping branches, early, precocious bearer and suitable for high density planting. It starts flowering in the month of March, ripens in the fourth week of May. Fruit weight (19.86 g) pulp (85.06 per cent), TSS (16.80°Brix), acidity (0.38%), total sugar (12.10%), vitamin C (45.44 mg/100 g). It recorded 43.80 kg fruit yield during 8th year of orchard life under rain-fed conditions of hot semi-arid ecosystem. The shelf life of fruit is 20-25days.

Thar Kranti- This variety was also developed through selection from CHES (CIAH-ICAR) Godhra, Gujarat during 2013. Fruit ripens during 4th week of May. It recorded high fruit yield (50.00 kg/plant), fruit weight (20.80 g), pulp per cent (84.50), TSS (18.50° Brix), titratable acidity (0.42 %), total sugar (12.60 %) and vitamin C (49.45 mg/100 g) under rain-fed conditions of hot semiarid ecosystem.

Katha Jamun- This variety was developed through selection from ICAR-CIAH, Bikaner. It ripens during mid June. It is high yielding variety, average fruit weight (8.00 g), pulp (70.0%), TSS (9.0° Brix), acidity (0.42%) and vitamin C (34.00 mg/100 g). It is suitable for processing purpose.

Narendra Jamun 6- This variety was developed through selection made at NDUAT, Faizabad. It has better fruit qualities. The fruit is oblong type, higher fruit weight and pulp: seed ratio.

Rajendra Jamun 1-This was developed from Bihar Agricultural College, Bhagalpur, Bihar. It is early variety ripen during May-June. This is high yielding variety (40-45 kg/ tree), average fruit weight (12.86 g), pulp (88.40%), TSS (18.20° Brix) and acidity (0.31%). Krian Duat-It has larger, thick leaves and red inner bark. Fruits with purple flesh are more astringent than the white fleshed types.

Paras-This variety was released from Gujarat Agriculture University. It is seedling selection from Gujarat known for its large size, sweet and juicy fruits.

Konkan Bahdoli- This variety developed from PDKV Akola, Maharashtra, semi-spreading, dense foliage, fruit Oblong in shape, colour of mature fruit dark purple, pulp content (80-90%) and TSS (12.0 to 15.0 ° Brix).

Ra Jamun-This is a common cultivar grown under north Indian conditions. It produces big size fruits, fruit length (2.5 to 3.5 cm) and diameter (1.5 to 2.0 cm). Fruits are oblong with deep purple or bluish black in colour at full ripe stage. Fruit is juicy with small size seed and ripens in the month of June-July.

Rajendra Jamun 1-This was released from Bihar Agricultural College, Bhagalpur, Bihar. It is early variety (May-June), high yielding (450 kg/ tree), TSS (18.20° Brix), acidity (0.31%), fruit weight (12.86 g) and pulp (88.40%).

CISH J 37-Selection made from land race of ICAR-CISH, Lucknow. It is mid season variety, ripe during second week of June. Fruit large in size (22-24 g), pulp (92.26 per cent), TSS (16.

40°Brix), ascorbic acid (49.88 mg /100g) and has a total antioxidant value (38.30 mg AEAC/g). It is higher yielding variety (200–300 kg/ plant).

CISH J 42-Seedless accession obtained from a land race of Chandauli district of Uttar Pradesh by ICAR-CISH, Lucknow. Fruit small in size (8.0g), pulp (97.90 %), TSS (14.47 °Brix), ascorbic acid (34.14mg/100g), tannin (0.231 %), anthocyanin (1.56 %) and antioxidant value (5.54 mg /g fresh weight AEAC). It recorded total phenol content (26.78 mg/g fresh weight) and flavonoids (1.21mg/g fresh weight). The selected type has good processing potential into value added products due to absence of seed.

Selection 1- This variety was developed through selection by Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. It was found most promising with regard to fruit weight (14.55g), seed weight (1.73g), higher pulp content (90.05%), higher total soluble solid (21.23 ° Brix) and total sugar (20.24%).

Propagation

Jamun is propagated through seed and vegetative means. If propagated through seed exhibits a great variation due to inevitable heterozygosity (Mishra *et al.*, 2014). Jamun is polyembryonic fruit crop so that the nucellar embryo can be used for production of uniform plant but the juvenile phase of such plant is more (Rekha *et al.*, 2020). The major advantages of vegetative propagated plants are true to type, dwarf, short juvenile phase, etc. The different methods of vegetative propagation *viz.* budding (patch and shield), and grafting (inarching, soft wood grafting) are practiced in jamun by the different researcher.

Orchard establishment

The land is prepared by removing of unwanted plants, ploughing, harrowing and leveling. The prepared land should have a gentle slope to facilitate proper irrigation and drainage to avoid water stagnation during the monsoon season. Traditionally, it is planted in square planting system at 8 x 8 m distance. Recently it is planted at 10 x 5 m, 5 x 5 m distance. Under high density planting (HDP) system jamun are planted at 2.5 x 2.5 m with canopy management for higher productivity. The pit size (90 x 90 x 90 cm) was dug during April-May and keeps open for about 2-4 weeks for weathering to destroy harmful soil microorganisms and pests. The well rattan farm yard manure (FYM) is mixed with soil in 1:3 ratio and filled pits. Planting should be done after first monsoon rain. While planting, one should be careful to see that the earth ball of the plant remains intact and graft union well 15-20 cm above from the ground level. The planting should be done during evening and if required apply irrigation. The plants are stacked with help of bamboo. The ideal time of planting is rainy season (July-August) and it can be done during February with assured irrigation facility. In the initial 2-3 years of orchard establishment, the plants should be protect from severe winter and high temperature.

Nutrient management

In general, jamun tree are not fertilized because of more vegetative growth and poor fruiting. In pre bearing plant 20 kg of well rattan farm yard manure (FYM) and in bearing plant 50-80 kg is considered beneficial. Recently to get higher yield and income from jamun orchard need proper nutrients management as per soil nutrient status report. A five years jamun tree is required farm yard manure (50-80kg), nitrogen (500g), phosphorus (300g) and potash (300g). In jamun new shoots emerge in two distinct flushes, *i.e.* from February to May and August to October. The

flush which appears in the month of February produces maximum growth and flowering, (Misra and Bajpai, 1971). The flower bud differentiation (FBD) has been noticed on 5 to 10 month old branches and it started from last week of January and continued upto 45-50 days. The fertilizers are applied during monsoon season. The soil physical, biological and chemical properties were also influenced by different organic source of nutrients.

Irrigation

Jamun is grown in tropical, sub-tropical successfully. Under arid and semi arid conditions, it is grown with manage mental practices for frost, high temperature. It is a hardy tree and it can be grown successfully without irrigation under tropical, sub-tropical climates and in semi-arid conditions assured irrigation is required for better yield and quality of fruit. The fruit size, pulp per cent, yield was significantly reduces due to the absence of sufficient moisture in soil during fruit growth stage. The young plant should be irrigated at 10-15 days interval and bearing at monthly interval March to May. During autumn and winter months, just an occasional irrigation may be applied when the soil is dry. This will also save the trees from frost in winter. The withholding of irrigation during the months of September-October and February-March helps in promoting fruit bud formation, blossoming and fruit setting. Drip irrigation system has shown promising response where water scarcity is major problem and has been found very effective in rain fed conditions. Plants should be irrigated through drip at alternate day with 60 per cent wetted area recorded better growth, yield and quality.

Harvesting and yield

The seedling jamun plants are start bearing after 8-10 years, while budded/grafted ones after 4-5 years of planting. However, commercial production starts after 8 to 10 years of planting and continues upto 50 to 60 years old. The fruits ripen in the month of June –July depending upon the variety and agro-climatic conditions. The ripe fruit is deep purple or black in colour and picked immediately. The fruits are delicate and picked singly with hand and care should be taken to avoid any damages to fruits (Singh, *et al.*, 2008). For harvesting, the picker climbs on the tree with a bag of cotton on the shoulder. When the bag is full, either the picker comes down from the tree and empties it into baskets or with the help of rope lowers the bag down to the ground and person standing below the tree empties the bag into baskets gently. The fruits are generally harvested daily and delivered to markets on the same day as they have very low shelf life. The average annual yield of fruit from a full grown (20 years) seedling tree is about 80-100 kg and from a grafted one (10 years) it is around 60-70 kg.