

Production Technology of Banana

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SUMMARY

Banana (*Musa paradisiaca* L.) is herbaceous, perennial, monocotyledonous and monocarpic fruit crop that belongs to family Musaceae in the order Scitamineae. Banana is also referred as ‘Kalpatharu’ (plant of virtue), Adam’s fig, Queen of tropical fruits, Tree of wisdom and Apple of the paradise. Banana is grown all over India and is available round the year. The major banana growing states are Tamil Nadu, Gujarat, Maharashtra, Andhra Pradesh and Karnataka. The fruit is easy to digest, nearly free from fat and cholesterol. Consumption of banana reduces the risk of constipation, hypertension, high blood pressure etc., due to the presence of fibres and phytochemicals and hence, considered as functional food.

INTRODUCTION

Banana is an important fruit crop of the genus *Musa* (family - Musaceae), which is cultivated primarily for food and secondarily for the production of fibre used in the textile industry and also for ornamental purposes. Today’s edible parthenocarpic banana is originated from the two wild species – *Musa acuminata* and *Musa balbisiana*. Banana is vigorously growing, monocotyledonous herbaceous plant. It is not a tree, but a high herb that can attain up to 10 meters of height. The cultivars vary greatly in plant and fruit size, plant morphology, fruit quality and pest, disease resistance. Most bananas have a sweet flavor when ripe, exceptions to this are cooking bananas and plantains. Plantains are always cooked before consumption and are higher in starch than desert bananas. The two groups of plantains viz., French and Horn, produce fewer fruit per plant than desert bananas. (Radha and Mathew, 2007).

Varieties

Dessert type: Robusta, Dwarf Cavendish, Grand Naine, Rasthali, Vayal vazhai, Poovan, Nendran, Red Banana, Karpooravalli, Matti, Sannachenkadali, Udayam and Neypoovan are popular varieties in banana. Cavendish groups are generally preferred in export market.

Culinary type: Monthan, Vayal vazhai, Ash Monthan and Chakkia are cultivated for culinary purpose. Nendran is a dual purpose variety used for dessert and culinary.

Soil and Climate: Being a tropical crop, banana requires warm, humid climate. The optimum temperature ranges from 10 to 40⁰ C. Well drained loamy soils are suitable for banana cultivation. Alkaline and saline soils should be avoided.

Season of planting

Wet lands	Garden lands	Hill Banana	Padugai lands
Poovan, Rasthali, Monthan, Karpooravalli and Neypoovan can be cultivated during February – April. Nendran and Robusta can be cultivated during April – May.	Banana can be cultivated in garden lands during January – February and November – December.	April – May (lower Palani hills), June – August (Sirumalai) are the suitable seasons for cultivating hill banana.	In Padugai lands, the crop can be cultivated during January – February and August – September.

Propagation

Vegetative method

Commercial bananas are seedless and propagated exclusively by vegetative means. The banana has a reduced underground stem, called the rhizome, which bears several buds. Each of these buds sprouts and forms its own pseudostem and a new bulbous rhizome. These daughter plants are called suckers. Banana is mostly propagated by rhizomes and suckers *viz.*, sword sucker and water sucker. Sword suckers have a well developed base with narrow sword-shaped leaf blades at the early stages. Water sucker possess broad leaves, which do not produce healthy banana clumps. Suckers of 2-4 months age are selected for planting. Other planting materials are whole or bits of rhizomes. Basrai variety in Jalgaon (Maharashtra) is propagated by dormant rhizomes. After cutting the parent plant, the rhizomes are removed from the soil, stored in dry place for about 2 months. During the resting period the remaining part of pseudostem at the bottom falls off, leaving prominent heart bud. Conical rhizome should be selected while flat rhizomes should be rejected. The weight of the rhizomes should be 500 g-750 g. It should be 3-4 months age at planting. Very small rhizomes will give bigger size fruits with late flowering while bigger size rhizomes flower early but bear small size fruit/bunches. Since banana is highly unstable in genetic constitution, the suckers/rhizomes should be selected from plants, which are healthy, having all the desirable bunch qualities and high yielding ability possessing atleast 10 hands in a bunch.

Tissue Culture

Now-a-days banana plants are also propagated through tissue culture. Varieties like Shrimanti, Gross Michael and Grand Naine are commonly produced using tissue culture technique. Normally disease free plantlets with 3 - 4 leaves are generally supplied in pots for raising secondary nursery. Plants are initially kept in shade [50%] and as they harden, shade is reduced gradually. After 6 weeks, plants do not require any shade. Normally two months of secondary nursery is good enough before the plants are planted in the field pits.

Spacing

Sl. No.	Varieties	Planting distance (m)	Plant population /ha
1.	Dwarf Cavendish	1.5 x 1.5	4440
2.	Robusta and Nendran	1.8 x 1.8	3080
3.	Rasthali, Poovan, Karpooravalli, Monthan	2.1 x 2.1	2260

Irrigation

Irrigation must be given immediately after planting. Life irrigation after 4 days and subsequent irrigations are to be given once in a week for garden land bananas and once in 10-15 days for wetlands. Irrigation must be given copiously after every manure application. Drip irrigation @ 5-10 litres/plant/day from planting at 4th month, 10-15 litres/plant/day from 5th month to shooting and 15 litres /plant/day from shooting to till 15 days prior to harvest is recommended.

Intercropping

Leguminous vegetables, beetroot, elephant foot yam and sunhemp can be grown as intercrops. Avoid growing cucurbitaceous vegetables.

Intercultural operations

Desuckering : During the life cycle, banana produces number of suckers from the underground stem. If all these suckers are allowed to grow, they grow at the expense of the growth of the main plant and hence the growth of the sucker should be discouraged. Removal of unwanted suckers is one of the most critical operations in banana cultivation and is known as desuckering. Such suckers are removed either by cutting them off or the heart may be destroyed without detaching the sucker from the parent plant. Removal of suckers with a portion of corm at an interval of 5-6 weeks hastenes shooting and increased the yield.

Earthing Up: In case of furrow planting earthing up should be done during rainy season to avoid water logging while during winter and summer the plant should be in the furrow.

Propping: Propping operation is carried out in areas with high wind speeds. Pseudostems are propped up with bamboo, especially, at the time of bunch emergence

Removal of male flower bud (Denavelling): Removal of male bud after completion of female phase is necessary. Once the process of fruit setting is over, the inflorescence rachis should be cut beyond the last hand otherwise it grows at the cost of fruit development. This helps in early maturity of the bunch

Bunch Covering: Bagging (bunch covering) is a cultural technique used by planters where export quality bananas are grown. This practice protects bunches against cold, sun scorching, against attack of thrips and scarring beetle. It also improves certain visual qualities of the fruits. Bunch covering with dry leaves is a common practice in India. Transparent polyethylene sleeves with 2% (during cool season) - 4% (during summer season) ventilation can be used to cover the bunch immediately after opening of the last hand.

Application of fertilizers

General recommendations for garden land and wetland banana (gram/plant/year)

Details	N	P	K
Garden land			
Varieties other than Nendran	110	35	330
Nendran	150	90	300
Wetland			
Nendran	210	35	450
Rasthali	210	50	390
Poovan, Robusta	160	50	390

Growth regulators

To improve the grade of bunches 2, 4-D at 25 ppm (25 mg/lit) may be sprayed on Poovan and Co 1 banana after the last hand has emerged. This will also help to remove seediness in Poovan variety. Spray CCC 1000 ppm at 4th and 6th month after planting.

Micronutrients

Spraying of micronutrients viz., ZnSO₄ (0.5%), FeSO₄ (0.2%), CuSO₄ (0.2%) and H₃BO₃ (0.1%) and 3, 5 and 7 months after planting helps to increase yield and quality of banana.

Crop duration

The bunches will be ready for harvest after 12 to 15 months of planting.

Harvesting

Bananas are harvested raw and allowed to ripen later. The dwarf bananas are ready for harvest within 11- 14 months after planting, while tall cultivars take about 14-16 months to harvest. A bunch usually takes 90-120 days to mature after shooting, depending on climate and cultural practices. The maturity of banana is indicated by drying of top leaves, change in colour of fruits from dark green to light green and tendency of the floral end of the fruit to fall by slightest touch by hand. The mature fruit becomes plumpy and all the angles are filled in completely. The method of harvesting depends on the height of the plant. Low growing varieties are harvested by cutting through the bunch stalk about 30-35 cm above the top hand. With taller varieties, the stem of the plant will be partly cut through to bring the bunch down within the harvester's reach.

Harvesting for export

- Irrigation of banana plantations should be stopped well in advance of the harvest date, preferably a week, so as to facilitate drying of the soil for movement of labour, harvesting, loading, etc.
- For cutting (harvesting) the bunches, one cutter and one helper are required. The bunch should be cut in one stroke 20 cm to 25 cm above the first band or 7.5 cm to 10 cm from the tip of the fingers of the first hand. The helper should hold the same portion and place it carefully on the freshly cut leaves spread on the ground. The last hand is removed if undersized.
- For carrying bunches to packing shed it is necessary that after 15 minutes of harvest, when the latex flow ceases, the bunches should be taken two at a time on stretchers and should not be allowed to come into contact with soil.
- Temporary sheds should be erected near banana fields and all operations such as cutting into hands, application of fungicidal paste should be carried out under the shade.
- Bunches selected should be green, three-fourth mature, whole, free from rubbing, scratching, bruises, sunburns or other blemishes. Bunches having malformed fingers, octopus-shaped hands, broken, torn or split fingers *etc.* should be rejected.

Packaging and its details

For export: For packaging bananas, telescopic boxes of 5 ply strength and of the following dimensions need to be used

Top = 48.25cm X 31.75cm X 20.25cm -5 ply

Bottom= 47.50 X 31.25cm X 19.75cm -5ply

Gap plate= 3 ply

Foam sheet or foam pad= 20 mm thick, 38cm X 25cm size with 10 mm holes. Weight of final packed box is approximately 13.0 kg.

For domestic market

Bananas are transported as full bunches in trucks and are ripened at the destination and then cut into hands and transported in plastic crates.

Storage and transport

Bananas can be transported over long distance from the tropics to world markets. The fruit requires careful handling, rapid transport to ports, cooling, and refrigerated shipping. Bananas are stored at 13 °C (55 °F). After a few days, the fruit begins to ripen and is distributed for final sale. Unripe bananas cannot be held in home refrigerators because they suffer from the cold. Ripe bananas can be held for a few days at home. If bananas are too green, they can be put in a brown paper bag with an apple or tomato overnight to speed up the ripening process. Carbon dioxide (which bananas produce) and ethylene absorbents extend fruit life even at high temperatures. This effect can be exploited by packing banana in a polyethylene bag and including an ethylene absorbent. The bag is then sealed with a band or string. This treatment increases the shelf life to 3- 4 weeks without the need for refrigeration.

CONCLUSION

Banana is considered as one of the most favourite fruits of people. It is a dessert fruit crop and also staple food to millions of people in the world. It provides nutrition and well-balanced diet and contributes to livelihood through crop production, processing and marketing. Its year round availability, affordability, taste, nutritive and medicinal value makes it a favourite fruit among all class of people.

REFERANCES

Radha, T. and Mathew, L., 2007, Fruit Crops, pp. 33-35.