JAYASREE BIOTECH - BANANA GROWING TECHNIQUES

SALIENT FEATURES:

- Offers you, all important varieties of banana plants of top-notch quality that are popular and grown in India.
- The only company in India supplying plants with Batch Numbers. It is meant for uniform plants growth, which results to minimal number of harvests (5-8 harvests).
- The only company in India doing Plants hardening under Poly House to maintain quality standards.
- All our plants are produced as per the standard operating protocol and are certified by DBT, Government of India for quality.
- Our practical experience, expertise and knowledge offers you 'Low or No Variation' in genetic purity of the plants
- 100% Pest & Disease-free plants at the time of supply and certified by DBT
- We use 100% Soilless Potting Media in the poly bag plants, which is free from soil borne insect pests and pathogens.
- We use 100% RO filtered water to grow the plants at highest quality standards, which is free from salinity and all pathogens.
- Uniform in growth and high in yield with Vigorous growth by virtue of good root system.
- Very good after sales service to the farmers and gained goodwill from them.
- Being technically operated by highly qualified and experienced master graduates and more than 25 years experienced technical personnel.
- Jayasree Biotech is working since 2008 for propagation of Tissue culture Banana planting material in Hosur city, Krishnagiri district, Tamil Nadu state.

CULTIVATION PRACTICES FOR TISSUE CULTURE BANANA.

VARIETIES & SPACING:

- Grand Nain: 6ft x 6ft (1200 plants / acre)
- Williams: 6ft x 6ft (1200 plants / acre)
- Elakki: 7ft x 6ft (1037 Plants / acre)
- Theni Nendran: 6ft x 6ft (1200 Plants / acre)
- Quintal Nendran: 7ft x 7ft (890 plants / acre)
- Red Banana: 8ft x 7ft (780 plants / acre)
- Karpooravalli: 8ft x 7ft (780 plants / acre)

SOIL:

Banana grows well on rich loamy soil having pH range of 6.5 to 7.5 with good drainage facility. Avoid highly saline, alkaline, water logged and coastal sandy soil.

CLIMATE:

Banana grows well in the optimum temperature of 25^0 C to 35^0 C with the annual rainfall of 500 to 2000 mm with good distribution. Temperature less than 10^0 C and above 40^0 C are not suitable.

PLANTING SEASON:

Tissue culture plants can be planted throughout the year. Planting schedule should be adjusted to match the harvesting of bunches during peak demand. As High wind velocity affects the bunch, plant such as way that the windy period should not coincide with bunch emergence and development.

LAND PREPARATION:

Plough the field for 2-3 times to the depth of 1.5feet depth followed by using rotovator to get fine tilth of the soil and make a trenches by using tractor single plough as per the above mentioned spacing and fill the below mentioned basal manure in the planting spot as per the above mentioned recommended spacing and mix with the soil before the planting. Avoid very deep trenches, which will lead to lot of pest and disease problems during cultivation and even after the crop completed.

BASAL MANURING (PER PLANT):

Farm Yard Manure	-	10 Kg (or) Vermi compost – 1 kg
Neem cake	-	250 gm
Single Super Phosphate	-	25 gm
Carbofuran 3G	-	5gm
Phorate	-	5gm

Note: Immediate after planting apply **10gm of JAYAZYME granules** and **10gm of VAM** (bio fertilizer) in the soil around the plant base and mix with the soil after that give irrigation immediately to avoid planting stress, better root establishment and build immunity to the plant against bacterial wilt disease caused by Pectobacterium (old name Erwinia). Repeat the Jayazyme granules and VAM application during 3rd and 5th month to get better growth and high yield.

PLANTING:

- Split open the poly bag and remove the plants carefully without damaging the root system and plant in the centre of the pit. The entire root system of the plant should be inside the soil.
- Avoid deep planting.
- Planting in the evening hours is advisable during hot summer season.
- While planting, avoid pressing / tightening soil around the plant by leg. It will lead to root zone congestion & affect the plant establishment.
- Irrigation should be given immediately after planting.
- Sowing sun hemp seeds around the plant and vacant space will be advantageous as it reduces the heat as well as the weed growth. After 45 days the sun hemp plants can be ploughed in to the soil.
- For wind barrier – sow Sesbania seeds in the peripheral area of the field against the direction of prevailing wind.

BED FORMATION:

During 3rd month apply 2 to 3 tractor loads of farmyard manure per acre, neem cake and form the beds of width 3ft and 20cm height along the planting rows. Keep the drip lateral tube on the beds. Double lateral tube per row of banana plants is preferable after bed formation to get high yield.

IRRIGATION METHODS:

a. ***Flood Irrigation***:

- Irrigate the field regularly once in 3-5 days depending on soil type, condition, moisture and

climate. Excess watering should be avoided to prevent water logging.

b. ***Drip Irrigation***:

➢ Watering and fertilizer can be combined (fertigation) and can be given to the plants at their root zone in calculated quantities.

> Water and fertilizer wastage can be avoided. So with the available water, more area could be cultivated

FERTILIZER APPLICATION:

Fertilizer application depends on the fertility of the soil. It is advisable to analyze the soil before planting and follow recommendations stipulated by our company (or) the Local Horticulture Department (or) the soil testing laboratories.

However, the general recommendations are given below as a guidance value:

General recommendation: (from planting to harvest)

N	**:**	**P**	**:**	**K**	
200	**:**	80	**:**	480	in grams / per plant

FERTILIZER SCHEDULE

a.) Soil Application:

Based on the growth of the plant, apply fertilizers at 0.5ft, 1ft, 1.5ft, 2ft, 2.5ft distance from the plant by make a circular trench of 2 inch depth, apply fertilizers in the trench and close the trench with the soil. Give irrigation immediately.

I. FOR GRAND NAIN & WILLIAMS (Dosage in gm / per plant)

After planting	***DAP***	***Urea***	***MOP***	***Magnesium Sulphate***	***Zinc Sulphate***	***Jayazyme granules***
30th Day	50	25	25	-	-	10
60th Day	50	50	50	-	-	-
90th Day	75	50	75	-	-	20
105th Day	-	-	-	20	5	-
120th Day	-	50	100	-	-	-
135th Day	-	-	-	20	5	-
150th Day	-	50	100	-	-	20
165th Day	-	-	-	20	5	-
180th Day	-	50	150	-	-	-
210th Day	-	50	150	-	-	-
240th Day	-	25	150	-	-	-
270th Day	-	-	100	-	-	-
TOTAL =	**175**	**350**	**900**	**60**	**15**	**50**

II. FOR ELAKKI BANANA & THENI NENDRAN (Dosage in gm / per plant)

After Planting	DAP	Urea	MOP	Magnesium Sulphate	Zinc Sulphate	Ferrous sulphate	Borax	Calcium Nitrate	Jayazyme granules
30th Day	50	-	25	-	-	-	-		10
60th Day	50	25	50	-	-	-	-		
90th Day	50	25	75				-	10	20
105th Day	-	-	-	30	10	-	-		
120th Day	50	40	100	-	-	-	-	10	
135th Day	-	-	-	-	-	20	20		
150th Day	50	40	125	-	-	-	-	10	20
165th Day	-	-	-	-	-	20	20		
180th Day	-	40	125	-	-	-	-		
210th Day	-	40	150	-	-	-	-		
240th Day	-	40	150	-	-	-	-		
270th Day	-	-	100	-	-	-	-		
	250	250	900	30	10	40	40	30	50

III. RED BANANA, KARPOORAVALLI & QUINTAL NENDRAN (Dosage in gm / per plant):

After planting	DAP	Urea	MOP	Magnesium Sulphate	Zinc Sulphate	Ferrous sulphate	Borax	Calcium Nitrate	Jayazyme granules
40th Day	50	25	25	-	-	-	-	-	10
80th Day	50	50	50	-	-	-	-	-	-
100th Day	-	-	-	25	10	-	-		-
120th Day	50	50	75	-	-	-	-	10	25
140th Day	-	-	-	-	-	20	20	-	-
160th Day	50	50	125	-	-	-	-	10	25
180th Day	-	-	-	25	10	-	-	-	-
200th Day	50	50	150	-	-	-	-	10	-

220th Day	-	-	-	-	-	20	20	-	-
240th Day	-	50	150	-	-	-	-	-	-
280th Day	-	50	150	-	-	-	-	-	-
320th Day	-	50	150	-	-	-	-	-	-
360th Day	-	-	150	-	-	-	-	-	-
TOTAL =	250	375	1025	50	20	40	40	30	60

b.) For drip irrigation:

As above give fertilizers up to 90th day directly in the soil. After 90th day give fertigation through drip irrigation by giving 80% of the above mentioned quantity as per the table. After 90th day give Urea and use white MOP on daily basis by splitting the quantity in to equal dosage for the next 30 days period. All other fertilizers should be given on weekly basis by splitting the quantity equally as weekly one dosage.

Other cultural practices:

- Avoid intercropping of any cucurbitaceous plants and tomato, which will spread Cucumber Mosaic viral disease (CMV) to Banana plants.
- From 15th day after planting and up to 5th month spray our JAYAZYME liquid @ 2 ml with BPM Banana special @ 5ml per litre water once in 15 days on the top leaves and crown portion. After flowering spray on the fruits 3 – 5 times in 15 days interval between the sprays.
- Apply VAM (bio fertilizer) @ 20gm per plant during basal and 45th day after planting in the soil.
- While spraying any pesticides add any wetting agent / spreader to achieve maximum efficiency.
- Remove male flower buds one month after emergence of last hand.
- Cover the bunches with banana bunch sleeves to protect them from sunlight and cold injury.
- After bunch emergence support should be given by using casurina (or) Eucalyptus poles (or) tying with rope to guard against wind.
- The Side suckers and hanging dried leaves around the plants should be removed in regular interval.

PEST & DISEASE MANAGEMENT.

I. PESTS

1. LEAF EATING CATERPILLAR:

Symptom: The young larvae feeds on tender leaves by scraping and later they feed on leaves causing holes. In the young stages, they can be seen in masses on the leaves scraping the green matter resulting in scarring on the leaves.

Control: Spray on the leaves with Monocrotophos @ 2.5ml / lit. of water (or) Novaluron @ 0.5ml / lit. of water (or) Corogen @ 0.2ml / lit. of water.

2. NEMATODES:

Symptom: Red / Black lesions and knots on the roots. Leaves turn yellow, poor plant growth and yield. The infested plants tip over easily.

Control: Apply Carbofuran 3G (or) **Paecilomyces** @ 10gm per plant at the time of planting and 20gm per plant during 3rd month and 6th month after planting will avoid Nematode problem (or) Cartop Hydrochloride @ 5gm per lit drenching.

3. APHIDS:

Symptoms: The brown coloured aphid sucks the leaf sap. The infested leaves dry up quickly and fall from the plant. Aphids also act as vectors in transmitting bunchy top virus.

Control: Spray on the top leaves and crown with Acephate @ 1gm / lit. of water (or) Imidacloprid @ 0.5ml / lit. of water to control aphids.

4.THRIPS

Symptoms: Affected fruits have brown, discoloured and scarred regions.

Control: Spray Fipronil @ 2ml / lit. of water (or) Imidacloprid @ 0.5ml / lit. of water on the flowers and fruits.

5. STEM BORER

SYMTOMS : Exudation of gum like plants sap, faecal matter from the holes bored by the larvae. Upward movement of nutrients hampered and plant growth, bunch maturity will be stopped. This pest breeds and more active during summer followed by monsoon season.

Control : Uproot and burn the infected plants. Remove the dried leaves regularly and keep the garden always clean. Inject 2.5ml. of Monocrotophos solution (150ml of Monocrotophos in 350 ml of water) in the Pseudo stem at 1feet above the ground level by making the slanting hole and inject the medicine after that close the hole with cement (or) clay soil. While making hole / injection, the center pseudo stem should not get damaged.

II. DISEASES:

1.BACTERIAL RHOZOME ROT (ERWINIA):

SYMPYOMS: The disease is severe during summer and spreads through soil and water. Leaves exhibit boiled appearance. Bacteria enters through roots, affects corm and corm under goes soft rotting. The drying starts from older leaves towards the centre or the incidence may start from central core leaf. The disease normally affects plants from planting up to 4 months. Afterwards it disappears. Affected plants breaks easily even with a gentle push.

Control: Apply Jayazyme granules @ 10gm to 20gm per plant at the time of planting, 15th day, 45th day and 90th day after planting will avoid this disease. Alternatively, application of Trichoderma and Pseudomonas @ 10gm per plant at the time of planting mixed with cowdung manure will be advantageous. (or)
3rd and 10th day after planting apply bleaching powder in the soil @ 1 pinch (i.e. 5gm) per plant and pour water immediately on the bleaching powder to dissolve it. If it reoccurs repeat the same @ 20gm per plant

2.SIGATOKA LEAF SPOT

Symptoms: Dark brown oval to circular spots on the lower leaves of the plants. The center of the spot eventually dries up and gives the appearance of an eye spot. The infection is severe during the winter and rainy season. Sometimes it may lead to premature fruit ripening and complete failure of maturity of bunches. The spots will appear in the bottom leaves first and spread to the top leaves like fire.

Control: Remove and destroy all the infected leaves. When the lower leaves are affected by a few spots, give 4 sprays at 3 weeks interval is recommended as follows: Nativo @ 0.5gm per lit. water (or) Roko @ 1.5gm in 1 lit water (or) Tilt @ 1ml + Roko @ 1gm in 1 lit water. Good drainage, weed control, timely de-suckering and correct spacing helps in reducing the disease incidence.

3. PANAMA WILT (mainly for Elakki, Karpooravalli variety):

Symptoms: Yellowing of old leaves progressing to young leaves. Affected leaves collapse near petiole and hang. Reddish brown discoloration in cross-section of rhizome & pseudo stem. The

earlier history of infected fields and water logging fields are more prone to this disease. After infection occurs, it spreads through water to other healthy plants.

Control: Avoid repeated cultivation of these varieties in the infected soils. Avoid water logging (or) excess watering during the entire growing period.

As a prophylactic measure apply bioagents like Trichoderma and Pseudomonas fluorescence at the time of planting and repeat at regular intervals with organic manure in soil application (or) send through drip irrigation @ 1 lit per acre once in 15 days (2 days before giving enrich the bio pesticides solution with organic jaggery @ 500gm per 200 lit water). After infection drench the soil around the plant base with carbendazim drenching @ 2gm per lit water at regular interval.

4. CIGAR END ROT & BLACK SPOT ON FRUITS:

Symptoms: Cigar End Rot - Black necrotic rot appears at the tip of fingers. Black spot – appearing black spots on the fruits surface.

Control: Remove the floral remnants by hand as soon as the finger emerges.

Spray the bunch with Roko (or) Bavistin @ 1gm / ltr of water (or) Nativo @ 0.3gm / ltr of water and later cover the bunch with NON WOVEN bunch sleeves.

VIRAL DISEASES:

1. BANANA BUNCHY TOP VIRUS (BBTV).

Symptoms: The infected plants have short, narrow and almost erect leaves with short petioles giving the characteristic rosette appearance, stunted growth and do not produce any bunch. This disease spreads through conventional suckers and Tissue culture plants purchased from non-certified labs by govt. of India. Vector called Aphids spreads this disease from infected plants to healthy plants very easily. Disease occurs mostly for the plants grown under / near the shade area of other big trees.

Control: Use plants from Jayasree Biotech for the planting, which is 100% disease free and tested for all the viral diseases. The diseased plants should be uprooted and destroyed by burning immediately to prevent further spread. Adapt clean orchard management practices.

Spray on the top leaves and crown potion with Acephate @ 1gm (or) Imidacloprid @ 0.5ml (or) Monocrotophos @ 2.5ml / lit water to control aphid (vector) to avoid spreading the disease.

HARVEST:

Harvest the bunches 100-110 days after bunch emergence. Angularity of fruits should disappear completely at the time of harvesting.

DRIP EQUIPMENTS MAINTENANCE:

Periodical maintenance of drip irrigation materials is the only way to achieve efficient irrigation, fertigation to get bumper yield and for the longevity of irrigation equipment.

- Sand & screen filters: clean daily basis.
- PVC sub main flush valves: open weekly one time and allow flush out to clean.
- Lateral Tube end cap: open monthly one time and allow flush out to clean. Once in every 6 month, for 1 acre drip pipes give 3 litres of nitric acid mixed in 30 litres of water and send through a drip fertigation system after that wait for 12 – 15 hours and open the PVC flush valves and lateral tube end clip to flush out all the algae and scale sedimentation.

Disclaimer: all the above cultivation details are based on our trial plot results and the results from the farmers, who followed these practices. The information in the booklet mentioned may vary depending on the place, soil and climate.

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