IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 11, Issue 12, December 2024

DOI: 10.17148/IARJSET.2024.111261

Effect Of Growing Media on Efficient Plantlet Production In Red Banana Through Macro Propagation Techniques In Salem District Of Tamil Nadu

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Abstract: Macro propagation is an excellent option for producing quality planting material at a lesser cost. This is a simple method because of the ease of multiplication, saves cost of producing planting material and has the potential of producing 50-60 shoots per sucker in a duration of 4-5 months. It can rapidly multiply plantlets to distribute a new variety or replace plants in disease-affected fields. It can be done locally at low cost and with little training: a private person or a farmers' organization can launch this activity very easily. An experiment was conducted during February-March 2022 and completed during May-June 2022 at Krishi Vigyan Kendra, Salem District of Tamil Nadu in India. Red banana suckers of three to four months old received from the farmers fields were taken for macro propagation techniques in different combination of growing media including soil, sand, vermi compost etc. Different treatments (T1 – Soil alone, T2 – Sand alone, T3 – Vermi compost alone, T4- Soil and sand at 1:1 ratio, T5- Soil and sand at 2:1 ratio, T6 – Soil, Sand and vermi compost at 1:1:1 ratio and T7 – Soil, Sand and vermi compost at 2:1:1 ratio) were replicated thrice in a randomized block design to find out the best suitable media for red banana plantlets production through macro propagation in Salem District. Results revealed that sand was more outstanding growing media over soil and vermicompost. This might be due to the use of reserved nutrition available in the corms and the pore spaces available in sand media is good environment for more number of good quality plantlets production.

Keywords: Suitable Growing media, Red banana, Macro propagation, Salem District

INTRODUCTION

Salem district is an inland district located in North Western Zone of Tamil Nadu. The total geographical area is 5205 sq.km and the district comprises of thirteen taluks and 20 blocks. Of the total geographical area, the net sown area occupies 52.3 per cent (2,72,069 ha) and the total area under horticultural crops in Salem district is 55,620 hectare. The principal horticultural crops are mango, banana, guava, papaya, pepper, coffee, tapioca, turmeric, and flower & vegetable crops etc.

To increase the production and revenue of the farmers growing horticultural crops, timely availability of quality seedlings and planting materials is essential. As area under banana in Salem district is more than 2400 hectares, the demand for quality planting materials of banana is increasing day-by-day not only in Salem district but also in different districts of Tamil Nadu and other States. Banana is basically vegetatively propagated crop and the sucker is the planting material. A plant can produce only 5-20 suckers during its life time of 12 – 14 months. So quality planting materials for important and new banana varieties will not be timely available to the farmers for planting. Hence, it is an urgent need to go for Tissue Culture Banana plantlets which will be of costlier and more sensitive in nature to both biotic and abiotic stresses under field conditions. In this regard, it is necessary to produce the quality planting materials in comparatively more quantities to make the quality planting materials of different banana varieties available for planting in the proper planting season.

Macro propagation is an excellent option for producing quality planting material at a lesser cost. This is a simple method because of the ease of multiplication, saves cost of producing planting material and has the potential of producing 50-60 shoots per sucker in a duration of 4-5 months. It can rapidly multiply plantlets to distribute a new variety or replace plants in disease-affected fields. It can be done locally at low cost and with little training: a private person or a farmers' organization can launch this activity very easily. To promote the production of quality planting materials in Salem and nearby areas, it is proposed to establish a Modern Macro Propagation Unit for production and distribution of different varieties of banana to the farmers and other stakeholders. This in turn is expected to expand area under banana and to increase the income of the farmers and also pave way for entrepreneurship development

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among the women farmers as well as among the women members of different Farmer Producer Organizations in Salem district to pave the way to improve the livelihood of the women farmer or members of different Farmer Producer Organizations. Financial assistance was received from the National Bank for Agriculture and Rural Development (NABARD) and a macro propagation unit was established at Krishi Vigyan Kendra, Salem in which an experiment was conducted to study the performance efficiency of macro propagation in red banana in different growing media.

Few commercially important varieties include Robusta, Dwarf Cavendish, Red Banana and Nendran [1, 6, 7]. Edible bananas are propagated vegetatively using suckers which are produced through tissue culture, macro-propagation and suckers from the field [10]. Sword suckers are preferred since they are vigorous as reported by [6]. Tissue culture requires high technology for mass production of disease-free plantlets. However, such tissue culture facility and plants produced are not affordable by small holder farmers who are collectively major producers of banana. The sword sucker, rhizome and rhizome bits are used as start-up materials in banana macro-propagation. The number and quality of plantlets generated varies with type of media, variety, method of corm preparation, health of plant and treatment with hormones [8]. Macro-propagation is employed to produce relatively good quality plantlets to meet the demand of planting materials for the banana farmers. Suitable growing media is found to be effective in producing good quality plantlets and hence to study the effect of growing media, an experiment was conducted in Red Banana Variety to find out the most suitable and available growing meida.

METHODS AND MATERIALS

An experiment was conducted during February- March 2022 and completed during May-June 2022 at Krishi Vigyan Kendra, Salem District of Tamil Nadu in India. Red banana suckers of three to four months old received from the farmers fields were taken for macro propagation techniques in different combination of growing media including soil, sand, vermi compost etc. Banana macro propagation unit established in the Krishi Vigyan Kendra, Salem was utilised to conduct the experiment. Banana macro propagation techniques validated by the National Research Centre for Banana located at Thiruchirapalli were followed in production of quality plantlets in red banana variety. Different treatments (T1 – Soil alone, T2 – Sand alone, T3 – Vermi compost alone, T4- Soil and sand at 1:1 ratio, T5- Soil and sand at 2:1 ratio, T6 – Soil, Sand and vermi compost at 1:1:1 ratio and T7 – Soil, Sand and vermi compost at 2:1:1 ratio) were replicated thrice in a randomized block design to find out the best suitable media for red banana plantlets production through macro propagation in Salem. The observations were recorded on number of days to sprouting, Number of primary shoots generated per corm, Number of secondary shoots generated per corm, Number of roots per plantlet after 90 days of hardening, Root length (cm) after 90 days of hardening, Root girth (mm) after 90 days of hardening, Number of Plantlets harvested per corms and Survival percentage (%) and were analysed statistically.

RESULTS AND DISCUSSION

Macro-propagation is an effective and cost-efficient method for producing quality planting materials. This technique involves processes such as decortication and decapitation, which can yield approximately 15-20 plants or suckers, depending on the cultivar. These shoots can then be rooted and hardened similarly to tissue culture plantlets. This method benefits farmers by enabling them to multiply their preferred varieties easily and reduce the cost of planting materials. In the decortication process, the pseudostem of the mother corm or sword sucker is cut transversely about 2 cm above the collar region. The apical meristem is then removed, creating a cavity approximately 3 cm deep. This removal breaks the apical dominance, activating the lateral buds and promoting the growth of side suckers. Auxins, synthesized in the meristematic region, are eliminated during this process, leading to an increase in cytokinin levels. Cytokinins then accumulate in the corm and spread laterally, encouraging the uniform development of multiple shoots. The apical meristem is removed to a depth of 3 cm, leaving a cavity about 2 cm in diameter. The remaining corm is given 6-8 crosswise cuts, preventing sprouting from the upper meristematic region. Healthy sword suckers, weighing between 500 g to 1 kg and characterized by narrow pointed leaves, are selected. These suckers are washed in water boiled at 60°C for one minute and then treated with a Trichoderma fungicide solution for 30 minutes. After treatment, the suckers are decorticated or detopped just above the juncture of the corm and aerial shoot, followed by 6-8 crosswise cuts. The treated corms are then planted in a macro-propagation unit with a spacing of 30 x 30 cm. Regular irrigation and maintenance are carried out to support growth. Primary shoots typically emerge within 15-25 days. Once the plantlets reach the four-leaf stage, which takes about 35-45 days, a second treatment is performed. This involves removing the juvenile meristem from the primary shoots and making 4-6 horizontal cuts in the young rhizome. Secondary shoots develop in approximately 45 days. The same procedure is repeated for secondary shoots to produce tertiary buds. Once the tertiary shoots fully open their leaves, they are carefully separated from the suckers with their roots intact. These plantlets are then placed in plastic bags filled with a potting mixture of red soil, sand, and farmyard

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manure (FYM) in a 1:1:1 ratio. This simple yet effective technique ensures healthy plantlets and helps farmers efficiently multiply planting materials at a lower cost.

The results regarding the number of plantlets and different growth parameters of different growing media were presented in the Table 1.

Table 1. Effect of growing media on sprouting and plantlets production in red banana

Treatmentss	Number of days to sprouting	Number of primary shoots generated per corm	Number of secondary shoots generated per corm	Height of plantlets (cm)	Number of roots per plantlet after 105 days	Root length (cm) after 90 days	Root girth (mm) after 105 days	Number of Plantlets harvested per corms
T1 – Soil alone	27.5	3.5	10.5	25.5	8.5	15.5	30.0	12.5
T2 – Sand alone	**21.5**	5.0	14.5	30.5	10.5	20.5	35.0	27.0
T3 – Vermi compost alone	25.5	4.5	12.0	26.5	9.0	16.0	30.5	15.5
T4- Soil and sand at 1:1 ratio	**23.0**	4.5	13.0	27.5	9.5	18.5	33.5	23.0
T5- Soil and sand at 2:1 ratio	25.0	3.0	11.5	27.0	8.5	15.5	32.0	21.0
T6 – Soil, Sand and vermi compost at 1:1:1 ratio	**24.5**	4.0	12.5	27.5	9.0	17.0	32.5	21.5
T7 – Soil, Sand and vermi compost at 2:1:1 ratio	26.5	3.5	12.0	28.0	8.5	17.0	31.5	17.5
Mean	24.79	4.00	12.29	27.50	9.07	17.14	32.14	19.71
CV	8.28	9.25	6.85	12.5	11.80	9.50	5.85	8.50
CD (0.05%)	1.25	0.32	1.50	2.50	0.75	1.20	1.25	3.25

The time duration from planting of corms in media to end of plantlets production took 3 months. The shortest duration to primary shoot emergence was recorded in T2 sand alone (21.5 days) followed by T4 soil and sand at 1:1 ratio (23.0 days) while longest duration was recorded in T1 soil alone (27.5 days). The highest number of primary shoots was recorded from corms planted in T2 sand alone (5.0) followed by T4 soil and sand at 1:1 ratio (4.5 days) while lesser number of primary shoots was recorded in T5 Soil and sand at 2:1 ratio (3.0). The higher number of secondary shoots per corm also recorded in T2 sand alone (14.5) followed by T4 soil and sand at 1:1 ratio (13.0) while lesser number of secondary shoots was recorded in T1 soil alone (10.5). After 90 days plant height was observed taller plantlets were observed in T2 sand alone with 30.5 cm followed by T7 – Soil, Sand and vermi compost at 2:1:1 ratio with 28.0 cm. The shorter plantlets were recorded in T1 soil alone with 25.5 cm. With regard to root growth parameters such as number of roots, root girth and root length also T2 showed good results. Regarding number of plantlets, T2 – Sand alone produced more number of plantlets (27.0) followed by T4 soil and sand at 1:1 ratio (23.0) while lesser number of plantlets was recorded in T1 soil alone (12.5). Similar results were observed by many researchers [2, 3, 4, 5, 9] in banana macro propagation of banana.

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CONCLUSION

According to the results of the experiment it could be concluded that different components of media had influence on the production of banana plantlets through macro-propagation. Almost all the parameters tested proved that sand was more outstanding over soil and vermicompost. This might be due to the use of reserved nutrition available in the corms and the pore spaces available in sand media is good environment for more number of good quality plantlets production. Hence based on the availability of sand, it can be utilised to produce more number of good quality plantlets by macro propagation in red banana. The quality of corms also very important in producing good quality plantlets.

ACKNOWLEDGEMENTS

The authors would like to thank DDM, Salem and Chennai Regional Office, NABARD located at Chennai for financial assistance for the conduct of experiment.

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