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Studies on the effect of media on sucker production of banana cv. POOVAN

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ABSTRACT : *In vivo* macropropagation is an alternative simple and cheap technique for banana multiplication. The experiment was conducted in Completely Randomized Design with 13 treatments in three replications. The treatments consisted of three growing media (FYM, Rice hull, Sawdust), two biofertilizers (*Azospirillum* and VAM) with sand alone as control. Observations on the production of primary, secondary and tertiary buds was recorded. The results of the study revealed that use of FYM + VAM (T_7) as growing media resulted in increasing the primary, secondary and tertiary bud regeneration. The time taken for emergence of primary, secondary and tertiary buds was also earlier in the treatment T_7 (FYM + VAM).

KEY WORDS : Growing media, Suckers, Biofertilizers, Regeneration of buds

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Banana (*Musa* sp.) is one of the most important fruit crops. In India, the area under banana cultivation is 0.83 million hectares with a production of 29.89 million tonnes. In Tamil Nadu, the area under banana cultivation is 1.11 lakh hectares with a production of 5.13 million tonnes and the productivity is 46.10 tonnes/hectare (NHB, 2015). Natural regeneration in banana is comparatively slow due to hormone mediated apical dominance exerted by the main plant. Depending on the variety, a plant produces 5-15 side suckers during its lifespan. Shy suckering is the major constraint in the production of sufficient planting material through conventional approach of several propagating units. Naturally produced suckers are more likely to carry pests and diseases leading to reduced productivity and shortened lifetime of new plantains. Bananas and plantains can now be propagated aseptically in the laboratory through tissue culture techniques. *In vitro* micropropagation eliminates all sucker transmitted pests and diseases. However, tissue culture plants are relatively expensive and not readily accessed by resource poor farmers (Shiv Shankar *et al*., 2014). The alternative technique for *in vivo* macropropagation is a relatively easy and cost effective technique that is carried out in a shed or even in the field. The principle of generating suckers for clean planting material is by removing the apical dominance and exposing lateral buds to allow the rise of many shoots (Baiyeri and Aba, 2005). In the present study, attempts have been made to enhance the rate of plantlet production through macropropagation by the addition bio-fertilizers (*Azospirillum* and VAM) and phytohormones (BAP and IBA) to the growing media (FYM, Rice hull and Sawdust).

RESEARCH METHODS

The experiment was conducted at Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamil Nadu. Sword suckers of healthy, true to type plants of cv. POOVAN weighing around 2.0 to 2.5 kg were washed in running tap water for 15 to 20

minutes. The desheathing leaf bases were removed from the pseudostem and detopped just above the juncture of the corm and aerial shoot. The apical meristem was removed to a depth of 2 cm leaving a cavity of 2 cm diameter in the rhizome with a sharp knife. The rest of the corm was given six to eight cross cuts and incised up to 0.75cm to 1cm depending on the sucker size. The decapitated corms were planted individually in plastic rice bags filled with media (FYM 22 kg, Rice hull 3 kg and Sawdust 5 kg) and incorporated with 30 g of biofertilizer (*Azospirillum* or Vesicular Arbuscular Mycorrhiza) as per the treatment schedule. The corms were treated with BAP 2 ppm at all the stages of decapitation uniformly for all the treatments. The treatments were as follows T_1-Farmyard manure+ *Azospirillum*, T_2- Rice hull + *Azospirillum*, T_3-Sawdust + *Azospirillum*, T_4-Farmyard manure + rice hull + *Azospirillum*, T_5-Rice hull + sawdust + *Azospirillum*, T_6- Sawdust + farmyard manure + *Azospirillum*, T_7-Farmyard manure + VAM, T_8-Rice hull + VAM, T_9-Sawdust + VAM, T_{10}-Farmyard manure + rice hull + VAM, T_{11}-Rice hull + sawdust + VAM, T_{12}-Sawdust + farmyard manure + VAM, T_{13}-Control (sand).

The aerial portion of the primary buds was decapitated, juvenile meristem was removed and 3 to 4 horizontal incisions were given in the young rhizome and covered with media. The same procedure was repeated for secondary decapitation. At the end of tertiary bud stage, individual plants were separated from the substrate washed carefully and treated with IBA 400 ppm before hardening. The individual plantlets were hardened in mixture of soil, sand and farmyard manure (1:1:1) filled in polybags of 200 gauge thickness. Plantlets were sufficiently watered and kept in a shade net containing 70 per cent shade and 70 to 80 per cent humidity. The plants were transferred to main field after 45 days. The observations regarding time taken for emergence of primary, secondary and tertiary buds, number of primary, secondary and tertiary buds and survival percentage of plantlets were recorded and analysed statistically (Panse and Sukhatme, 1985).

RESEARCH FINDINGS AND DISCUSSION

It can be inferred from the data presented in Table 1 that the number of buds produced varied significantly among the treatments. The maximum number of primary, secondary and tertiary buds (4.20, 6.55 and 8.89, respectively) was recorded in T_7 (FYM + VAM), followed by T_{10} (Rice hull + FYM + VAM) and T_1 (FYM + *Azospirillum*) with values of (3.73, 5.86 and 8.23 and 3.23, 5.36 and 7.32), respectively. The least number of primary, secondary and tertiary buds (1.02, 2.01 and 3.23,

Table 1: Effect of media on production of primary, secondary and tertiary buds in banana cv. POOVAN

Treatments	No. of primary buds produced	No. of secondary buds produced	No. of tertiary buds produced
T_1- FYM + *Azospirillum*	3.23	5.36	7.32
T_2-Rice hull + *Azospirillum*	1.68	2.74	5.83
T_3- Sawdust + *Azospirillum*	1.19	2.25	5.24
T_4- FYM + Rice hull + *Azospirillum*	2.80	4.98	6.81
T_5- Rice hull + Sawdust + *Azospirillum*	2.39	3.39	6.09
T_6- Sawdust+ FYM + *Azospirillum*	2.01	4.14	6.34
T_7- FYM + VAM	4.20	6.55	8.89
T_8- Rice hull + VAM	1.81	3.08	5.86
T_9- Sawdust + VAM	1.23	2.37	5.42
T_{10}- FYM + rice hull + VAM	3.73	5.86	8.23
T_{11}- Rice hull + Sawdust +VAM	2.47	3.77	6.15
T_{12}- Sawdust+ FYM + VAM	2.16	4.43	6.67
T_{13}-Control (sand)	1.02	2.01	3.23
S.E.±	0.07	0.10	0.06
C.D. (P=0.05)	0.14	0.21	0.12

respectively) was recorded in the control (T_{13}).

The results of the present study revealed that different media combinations had significant effect on time taken for bud emergence in banana (Table 2). The media consisting of FYM +rice hull + VAM (T_{10}) showed earliest primary, secondary and tertiary bud emergence (16.92, 18.57 and 18.14 days, respectively) followed by T_7- FYM + VAM (18.54, 19.23 and 19.03 days, respectively). The treatment T_{13} (control) took the maximum days for primary, secondary and tertiary bud emergence (24.95, 24.99 and 25.38 days, respectively).

The physical composition of the nursery potting medium can have profound effect on the supply of water and air to the growing plant as well as affect anchorage and nutrient and water holding capacity of the medium (Dayarani *et al.,* 2013). Better performance of FYM may be attributed to its ability to improve biological properties of the medium and hence, using FYM as a potting medium might have helped in providing, ample aeration and sufficient organic matter. Reports of Rahman *et al*. (2005) and Ali *et al*. (2011) also support the results of the present study as they obtained higher number of banana plantlets in the potting mixture containing soil and FYM. VAM fungi avail nutrients from the cortical root cells to sustain themselves and in turn provide an array of benefits to the host plants. Hence, in the present study also, incorporation of VAM in the potting media resulted in increasing the regeneration efficiency of the suckers.

In banana low suckering ability associated with the strong apical dominance is linked to high endogenous auxin levels (Arinaitwe *et al.*, 2000). Cytokinins and auxins work antagonistically and thus, an application of cytokinins decreases the apical dominance, while an application of auxin increases the apical dominance as reported by Osei (2006). The present study shows that treatment of desheathed and decorticated suckers with BAP solution of 2.0 mg l^{-1} enhanced the proliferation of plants when compared to the control. Similar results have also been reported by Macias (2001) and Dayarani *et al*. (2013) in banana.

Thus, it can be concluded from the results of the present study that use of FYM along with VAM as growing media enhanced the regeneration of primary, secondary and tertiary buds of plants in banana cv. POOVAN. The macropropagation technique optimized in the present study is user friendly, cost effective, relatively simple, requires minimum skill and expertise and is suitable for adoption by banana growers at the farm level.

Table 2 : Effect of media on time taken for emergence of primary, secondary and tertiary buds in banana cv. POOVAN

Treatments	Time taken for emergence of primary buds (days)	Time taken for emergence of secondary buds (days)	Time taken for emergence of tertiary buds (days)
T_1- FYM + *Azospirillum*	19.66	19.74	20.15
T_2-Rice hull + *Azospirillum*	22.98	23.88	23.82
T_3- Sawdust + *Azospirillum*	23.95	24.63	24.69
T_4- FYM + Rice hull + *Azospirillum*	20.27	20.37	20.64
T_5- Rice hull + Sawdust + *Azospirillum*	22.01	22.63	22.59
T_6- Sawdust+ FYM + *Azospirillum*	21.17	21.45	21.88
T_7- FYM + VAM	18.54	19.23	19.03
T_8- Rice hull + VAM	22.43	23.49	23.68
T_9- Sawdust + VAM	23.67	24.29	24.21
T_{10}- FYM + rice hull + VAM	16.92	18.57	18.14
T_{11}- Rice hull + Sawdust +VAM	21.79	22.37	22.23
T_{12}- Sawdust+ FYM + VAM	20.87	20.92	21.24
T_{13}-Control (sand)	24.95	24.99	25.38
S.E.±	0.12	0.16	0.14
C.D. (P=0.05)	0.24	0.32	0.28

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