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Effect of media on growth parameters of banana cv. POOVAN

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ABSTRACT : The present investigation on effect of media on growth parameters of banana cv. POOVAN was carried out at the Department of Horticulture, Faculty of Agriculture, Annamalai University during 2014-2016. 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. The results of the study revealed that the pseudostem height, pseudostem girth and number of leaves produced sucker^{-1} were favourably influenced by the treatment T_7 (FYM + VAM) followed by T_{10} (FYM + Rice hull + VAM). Regarding root production, T_8 (Rice hull + VAM) was found to be the best treatment. Further more survival percentage of plants was higher in the treatments in which FYM was used as the regeneration medium along with VAM.

KEY WORDS : Growing media, Suckers, Biofertilizers, Growth parameters

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Bananas and plantains (*Musa* spp.) are one of the most important tropical fruit crops and they are staple foods in most parts of the humid tropics. In natural regeneration, several types of propagating materials such as maiden suckers, water suckers, sword suckers, butt, peeper and bits are used in establishment of banana plantations but they vary in their suitability (Robinson, 2007). Suckers are the main planting materials and normally remain true-to-type. Bananas and plantains can now be propagated aseptically in the laboratory through tissue culture techniques. *In vitro* micro-propagation eliminates all sucker-transmitted pests and diseases, with the exception of viruses. However, tissue culture plants are relatively expensive and not readily accessed by resource poor farmers, who constitute the biggest percentage of farmers in the region (Shiv Shankar *et al.,* 2014). In macropropagation, a whole sucker, a large piece of the parent corm or a sword sucker can be used to produce planting materials (Faturoti *et al.,* 2002). Repression of apical dominance is usually done through complete/partial decapitation or by detached corm method to stimulate lateral bud development and increase suckering rate. In the present study, attempts have been made to enhance the growth parameters of banana plants obtained through macropropagation by the addition of 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 in the orchard unit of the Department of Horticulture, Annamalai University. 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 upto 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).

At the end of tertiary bud stage, individual plants were separated from the substrate and washed carefully. In each plantlet, at least three to five ramified roots were retained 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 (24x12cm) 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 observation regarding on pseudostem height, pseudostem girth, number of leaves, number of roots and root length were recorded and analysed statistically (Panse and Sukhatme, 1985).

RESEARCH FINDINGS AND DISCUSSION

In the present study, different media combinations had significant effect on pseudostem height (Table 1). The media consisting of FYM + rice hull + VAM (T_{10}) recorded the maximum value for pseudostem height (33.66 cm) closely followed by T_7-(FYM + VAM) which recorded a value of 31.74 cm. The least pseudostem height (21.73 cm) was recorded in T_{13} (control). The increase in plant height due to FYM and biofertilizers may be attributed to the general improvement in the physical and chemical properties of the rooting medium (Dileep *et al.*, 1994). Organic matter has a profound effect on biological, chemical and physical properties of the medium. The addition of FYM improved organic matter content, water holding capacity, increased the pH and microbial activity of the growing media. Through the decomposition of organic matter, chemical elements become available to the crop plants, thereby resulting in better growth.

It can be observed from the data presented in Table 1 that T_7 (6.13 cm) followed by T_{10} (5.66 cm) recorded the maximum pseudostem girth, while the control (T_{13}) recorded the least pseudostem girth (2.17 cm). The leaf

Table 1: Effect of media on pseudostem height, pseudostem girth, number of leaves, number of roots and root length of banana cv. POOVAN

Treatments	Pseudostem height (cm)	Pseudostem girth (cm)	No. of leaves produced plant^{-1}	No. of roots produced plant^{-1}	Root length (cm)
T_1- FYM + *Azospirillum*	30.28	5.33	4.46	8.26	26.91
T_2-Rice hull + *Azospirillum*	24.17	3.96	3.34	9.32	27.81
T_3- Sawdust + *Azospirillum*	22.75	3.59	3.18	5.93	21.26
T_4- FYM + Rice hull + *Azospirillum*	29.18	4.84	4.32	7.67	25.67
T_5- Rice hull + Sawdust + *Azospirillum*	25.33	4.12	3.69	6.54	23.51
T_6- Sawdust+ FYM + *Azospirillum*	26.94	4.43	4.13	7.19	24.27
T_7- FYM + VAM	31.74	6.13	5.13	8.66	27.25
T_8- Rice hull + VAM	24.32	4.02	3.50	10.26	29.26
T_9- Sawdust + VAM	23.46	3.64	3.21	6.22	22.43
T_{10}- FYM + rice hull + VAM	33.66	5.66	4.86	7.82	25.82
T_{11}- Rice hull + Sawdust +VAM	25.79	4.23	3.81	6.83	23.65
T_{12}- Sawdust+ FYM + VAM	28.01	4.61	4.18	7.41	25.18
T_{13}-Control (sand)	21.73	2.17	2.23	4.83	18.27
S.E.±	0.28	0.04	0.03	0.09	0.22
C.D. (P=0.05)	0.56	0.08	0.06	0.18	0.44

production was also found to be enhanced (5.13) in the treatment T_7 in which FYM + VAM was used as the potting media. The next best treatment was T_{10} (FYM + rice hull + VAM) which recorded a value of 4.86, while the control (T_{13}) recorded the least number of leaves (2.23). The increase in leaf production may be due to better nutrient availability leading to higher production of photosynthetically functional leaves due to the nutrient rich growing media (Borah *et al.*, 2008). The findings of the present study are in line with the earlier reports of Shailesh Vasane and Kothari (2008) in banana and Usman *et al.* (2014) in rough lemon who observed increase in growth parameters of seedlings due to addition of FYM in the potting mixtures. The increase in the leaf production may also be attributed to the high production of photosynthates due to the addition of VAM fungi. The mycorrhizal colonization in the roots of VAM inoculated plants would have resulted in the channeling of nutrients thereby, increasing the leaf production (Thaker and Jasrai, 2002). Shailesh Vasane and Kothari (2008) and Game *et al.* (2009) have also reported on the beneficial effect of VAM on the growth of seedlings.

The results presented in Table 1 revealed that root production was enhanced in the treatment in which rice hull + VAM was used as the growing media (Table 1). The treatment T_8 (Rice hull + VAM) recorded the maximum number of roots and root length (10.26 and 29.26) followed by T_2- (Rice hull + *Azospirillum*) which recorded the value of 9.32 and 27.81, respectively. The control (T_{13}) recorded the least number of roots (4.83) and root length (18.27).

Rice hull is a by-product of the rice milling process. In many studies, rice hulls have been used as substrate for potting media (Tsakaldimi Marianthi, 2006). Similar findings have been reported by Baiyeri (2005) in weaning of banana plantlets, where the rice hull based media were better than the saw dust based ones. In another study also it was reported that rice hull media was found to be superior to the soil media (Ugese, 2010). Significantly more number of roots per plantlet and maximum root length were found in rice hull media with combination of VAM. This may be due to the increased levels of growth promoting substances, available phosphorus and other nutrients with the application of VAM.

It can be observed from the results presented in Table 2 that the survival per cent of plants ranged from 90.87 per cent in T_7 (FYM + VAM) to 62.73 per cent in T_{13} (control). The treatment in which FYM along with biofertilizers was used as growing media (T_1, T_4, T_6, T_7 and T_{10}) showed good response at hardening stage with good survival rate of more than 85 per cent when compared to rice hull and sawdust media. Reports by Ali *et al.* (2011) and Ahmed *et al.* (2014) support the results of the present study as they obtained better survival and growth of banana plants in potting mixture containing FYM. It was also noted that tertiary buds derived from the treatment with VAM and IBA showed better root system and survived better during the

Table 2: Effect of media on survival percentage of plants in banana cv. POOVAN

Treatments	Survival percentage of plants
T_1- FYM + *Azospirillum*	88.52
T_2-Rice hull + *Azospirillum*	78.33
T_3- Sawdust + *Azospirillum*	70.27
T_4- FYM + Rice hull + *Azospirillum*	87.02
T_5- Rice hull + Sawdust + *Azospirillum*	80.58
T_6- Sawdust+ FYM + *Azospirillum*	85.98
T_7- FYM + VAM	90.87
T_8- Rice hull + VAM	78.54
T_9- Sawdust + VAM	72.46
T_{10}- FYM + rice hull + VAM	89.67
T_{11}- Rice hull + Sawdust +VAM	82.47
T_{12}- Sawdust+ FYM + VAM	84.32
T_{13}-Control (sand)	62.73
S.E.±	0.55
C.D. (P=0.05)	1.10

acclimatization stage. These results are in line with the earlier reports indicating that mycorrhizal symbiosis significantly improved banana nutrition even under low fertile soil conditions as the mycorrhizal hyphae are more efficient than roots alone in nutrient uptake and ability to change the root architecture (Sajith *et al.*, 2014).

It can be concluded from the findings of the present study that use of FYM along with VAM as growing media enhanced the pseudostem girth, leafs production plant^{-1} and survival percentage of plants. Rice hull along with VAM as growing media enhanced the root production plant^{-1} and root length. 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.

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