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Standardization of Growing Media for Macropropagation of Malbhog (AAB) Banana

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Abstract – **The present study was conducted to standardize the suitable growing media for macroprogation of Malbhog banana. Three growing media *viz.* sawdust (M_1), Paddy husks (M_2) and cocopeat (M_3) were selected for the study. The experiment was laid out in factorial randomized block design with three replications under polyhouse condition. It was observed that the emergence of first primary sucker was significantly influenced by the growing media. Cocopeat required shortest period (18.57) while paddy husk required longer period for emergence of primary suckers (3.88), secondary suckers (8.26) and tertiary suckers (23.84) per corm and similarly, high numbers were also observed when cocopeat was treated with BAP (0.04%). Out of three media used, the highest weight (316.92 g) was recorded in cocopeat which was at par with 309.0 g in sawdust. Cocopeat recorded the shortest time for primary sucker emergence (18.57), decortications of primary suckers (49.95 days), separation of tertiary suckers (82.55 days), higher number of leaves (5.80), and roots (25.16) and bigger sucker (316.92 g). This is the first report of successful macroprogation of Malbhog banana using cocopeat growing medium.**

Keywords – **Macropropagation, Malbhog, Substrate, BAP.**

I. Introduction

Banana (*Musa spp*.) is one of the most important staple foods in the world. Farmers generally prefer naturally produced suckers for establishing new plantations of banana. This may cause attack of the pest and diseases resulting in reduced productivity and shortening of life cycle of new plantation [1]. There is always shortage of naturally produced planting materials for planting in large scale. Huge number of quality planting materials may be made available by tissue culture technique. Propagation of banana plants from tissue culture has some advantages *viz.* early maturity, free from the attack of diseases and produces good quality fruits [2]. However, planting materials produced through tissue culture becomes costlier and the small and marginal farmers cannot effort the higher cost. Under the above circumstances, the new technology *i.e.* macropropagation of banana becomes popular. Reference [3] remarked that banana production is greatly constrained by lack of affordable quality planting material. Macropropagation technique has been proposed as one of the more cost effective methods for producing healthy seedlings. Macropropagation aims overcoming two challenges - it allows the rapid production of more numbers of planting materials which are free from pest and diseases [4]. The system of macropropagation has become popular because of higher yield and farmers are demanding a constant supply of such quality planting materials. Reference [5] opined that macropropagation had been introduced as an alternative technique involving lesser capital and skill to overcome the problem of high cost and skill required for micro-propagation. Macropropagation is a farmer friendly technology complementing field sucker production. This technology may be adopted by using whole suckers, large pieces of the parent corm or sword suckers to produce planting materials by suppressing the apical dominance to stimulate lateral bud development. An increase suckering rate is achieved through decapitation of a sucker in the field (*in-situ*) or by detached corm technique [6].

Generally, paddy husk and sawdust are used as substrates in macropropagation. The earlier reports revealed that the growth of suckers was better in sawdust as compared to paddy husk due to high water holding capacity of sawdust [7]. In the present investigation, cocopeat was also used as growing medium along with paddy husk and saw dust. Cocopeat (coir pith) is used as the soil additive since it can hold large qualities of water, just like sponge. It is used as a replacement for traditional peat in soil mixture or the soil less substrate for plant cultivation [8].

II. Materials and Methods

Sawdust, cocopeat and paddy husk were taken as substrate/growing media for the experiment. Fresh, termite free sawdust was collected from saw mill and fresh paddy husk without any adulteration was collected from rice mill while coco peat was collected from coconut fiber extraction plant situated nearby area of the experimental site.

All the three growing media were kept in moist condition for partial decomposition. Each of partially decomposed growing media was boiled in the water at least for one and half hour for sterilization. Each chamber was filled up with the growing media up to 30 cm.

Four to five months old uniform size suckers of the Malbhog banana were collected from disease free plantation. The roots of the suckers were trimmed and surface of the rhizome were scrapped well with sharp

knife. All the suckers were detopped just above the juncture and were decapitated by cutting the pseudostem just above the rhizome.

The rhizomes were dipped into 0.3 percent Bavistin solution for 30 minutes and were taken out. They were allowed to dry in shade for a day. The apical meristem of each rhizome was removed to a depth of 2 cm making a cavity of 2 cm in diameter and the rhizome was given 4-6 cross wise cuts to avoid the stagnation of water.

The primary suckers were decapitated by removing the growing points and 2-4 horizontal cuts were given for the young rhizome to produce secondary buds thereby producing tertiary buds. The tertiary suckers with 3-4 well developed leaves were separated from the mother corm carefully without damaging the roots. The corms with roots of the separated tertiary plantlets were dipped into the Bavistin solutions (0.3%) for 30 minutes and then transplanted in the polybags having 5-6 pierced holes (15 cm x 20 cm size) containing the mixture of soil and decomposed cow dung at the ratio of 1:1 for hardening in shade.

III. Results and Discussion

A. Moisture Content of Growing Media

Moisture retention or moisture contents of growing media are very much important for proper growth of plants. The present study revealed that moisture content of three different growing media *viz.* sawdust, paddy husk and cocopeat of the experimental plot varied depending upon type of the medium used. The highest moisture content was found in cocopeat (77.0 %) followed by sawdust (61.34 %). This might be due to smaller air space present in cocopeat which became suitable for growth of suckers after partial decomposition. The significantly lowest moisture content (37.0 %) was present in paddy husk indicating the least water holding capacity. According to [9], differences in available water holding capacity among media could be due to their total porosity and types of pores.

B. Duration of Emergence of Suckers

Primary, secondary and tertiary suckers were produced within shortest period in cocopeat as compared to sawdust and paddy husk used as media. Paddy husk required longer period for emergence and decortications of suckers. The delay in emergence of suckers in paddy husk could be attributed to low moisture content *i.e.* least water holding capacity of paddy husk than other two media. Cocopeat and sawdust could retain higher moisture contents which might have helped in emergence and development of new shoots earlier from the corms. On the other hand, cocopeat and sawdust decomposed earlier than paddy husk supplementing the available nutrients present in these two media. This might have also helped in faster growth of the suckers making decortications earlier. Reference [7] reported that sawdust had higher water holding capacity and thus retains more moisture than rice hull.

C. Number of Sucker Production

Among different media, cocopeat produced highest number of suckers followed by sawdust while the lowest was recorded in paddy husk. It was found that cocopeat (M_3) produced the highest number of primary suckers (3.88), secondary suckers (8.26) and tertiary suckers (23.90). Paddy husk (M_2) produced least number of primary suckers (3.33), secondary suckers (6.91) and tertiary suckers 19.43) and were significantly different from number of primary suckers produced in cocopeat (M_3). It might be due to the characteristics of cocopeat which is considered as a good growing media component with acceptable pH, electrical conductivity and other chemical attributes with high water holding capacity [10] while raw rice hull has low water holding capacity and high pore spaces [11].

D. Root Growth of Tertiary Suckers

Production of primary roots differed significantly in different media used in the present investigation. Cocopeat (M_3) produced the highest number of primary roots (4.25) and was at par with the values of sawdust (M_1). The lowest number of roots was counted in paddy husk (M_2). Cocopeat (M_3) produced longer roots of 10.63 cm while there was no significant effect of media on girth of primary roots.

IV. Conclusion

The present investigation revealed that macropropagation of banana may be carried out successfully to produce large number of uniform and good quality planting materials within a period of 6-7 months. Paddy husk required longest period for sucker emergence and lowest production of suckers and roots. Besides, now-a-days prices of paddy husk and sawdust are not sufficiently available in most of the cities. On the other hand, cocopeat is cheaper, readily available and is a source of nutrients after decomposition. Therefore, cocopeat might be considered as the best growing medium for macropropagation.

Table I. Effect of different media on sucker production

Medium	Primary sucker emergence (days)	Number of suckers per corm		
		Primary suckers	Secondary sucker	Tertiary sucker
Sawdust	20.80	3.63	7.40	22.29
Paddy husk	22.18	3.33	6.91	19.43
Cocopeat	18.57	3.88	8.26	23.90
CD (5%)	1.42	0.37	0.30	0.71

Table II. Effect of media on root growth of tertiary suckers

Medium	Number of Primary roots	Length of primary roots (cm)	Girth of primary roots (cm)
Sawdust	4.14	10.19	0.66
Paddy husk	3.92	9.03	0.63
Cocopeat	4.25	10.63	0.67
CD (5%)	0.23	0.70	NS

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