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EFFECTS OF DIFFERENT POTTING MEDIA DURING HARDENING OF TISSUE-CULTURED-RAISED-BANANA PLANTS

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ABSTRACT

Investigations were carried out to grow three tissue cultured banana varieties viz. William (W-11), Grand Naine (G-9) and Basrai (B) supplemented with peat moss and soil in different ratios under screen house conditions. The treatments comprised of different ratios i.e. 1:1, 1:2, 1:3, 1:4 of peat moss and soil and peat moss and soil only. Four weeks old rooted banana explants were transplanted in polythene bags. Data collected after sixty days of transplantation regarding growth parameters revealed that maximum survival percentage (100.0), plant height (29.0 cm) and number of leaves (6.3) were recorded from plants grown in polythene bags containing peat moss only. Shoot length and number of leaves were observed as 25.4, 23.7, 24.5 and 17.9 cm and 5.8, 5.0, 4.6 and 4.0 for 1:1, 1:2, 1:3, 1:4 peat moss and soil ratios respectively. While, minimum survival (80%) and growth parameters were recorded in all tissue cultured varieties of banana in soil only. It was concluded that for primary hardening purpose of tissue cultured banana plants peat moss alone or in combination with soil as 1:1 (peat moss and soil) performed better under screen house conditions.

Key words: Banana plants, peat moss, soil, potting media, tissue culture.

INTRODUCTION

Banana (*Musa spp.*) is an important fruit crop of various tropical and subtropical countries of the world as about 117.9 million tonnes of banana fruit is produced annually (FAO, 2018). In Pakistan, province of Sindh ranks atop by producing 90% of the total production of the country only. It has fetched attention of local farmers as provides high returns to its growers.

Due to incidences of banana bunch top and panama wilt diseases in banana field, it was the need of the time to replace the existing infected germplasm with healthy and high yielding seed material. The conventional method for the multiplication/propagation depends on number of suckers that is time dependent. In order to get healthy and high yielding planting material, in vitro multiplication of banana has proved as successful modern technique throughout the world (Al-Amin *et al.,* 2009). By using this technique desired number of plantlets could be produced irrespective of time and season. After *in vitro* micro propagation of banana plantlets, these are transferred to a suitable growing medium and kept in screenhouse for hardening purpose before their transfer into main field by providing light, shade and water under semi-controlled conditions.

Yusmita *et al.* (2015) initiated a study to select best method for the acclimatization of banana plants in shade house. Banana plants' height number of leaves were recorded at maximum level supported with potting material contained mixture of sand and compost (1:1 v/v) during hardening period.

Uzaribara (2015) recommended transplantation of banana plantlets in pots had soil, sand and cocopeat @ 1:1:1 v/v for total period of six weeks under screen house conditions. Suman and Kumar (2015) recorded 95% survival in banana plantlets supplemented with soil mixed with farmyard manure in 1:1 ratio. Patel *et al.* (2015) advocated for use of soil, sand and farmyard manure for good plant growth. Singh (2014) advised to grow banana plants not potting mixture contained 1:1:1 ratio of soil, sand and vermicompost. Ali *et al.* (2011) used alone and different combinations of sand, peat moss and soil. They were of opinion that 100% survival was recorded in banana plants supplemented with peat moss only.

Among other growing medium like rice husk, vermicompost etc., Peat moss is one of the most commonly used organic substrates for the acclimatization of in vitro plants in their early stage. Peat moss is a natural and organic material that helps growing plants to provide enough moisture and essential nutrients during their early growth stages (Lee *et al.*, 2013) for their optimal growth and development (Oberpaur *et al.*, 2010). Due to high cost of peat moss, it is necessary to mix it with soil to make it most suitable and cost-effective potting medium for banana plantlets under screen house conditions. Therefore, an initiative was taken and experiment was designed by

considering following objectives (a) To check the survival of newly banana plantlets as affected by peat moss, soil and their different combinations as potting material (b) To evaluate the growth of micro propagated banana plantlets grown in poly bags filled with different peat moss and soil ratios (c) To find out the most economical potting medium for tissue cultured banana plantlets under screen house conditions.

MATERIALS AND METHODS

The study was conducted for the period of sixty (60) days in screenhouse of Tissue Culture Laboratory at Food Quality & Safety Research Institute, Southern Zone Agricultural Research Centre, Pakistan Agricultural Research Council (PARC) Karachi. Four weeks old tissue cultured banana plantlets of three varieties i.e. William (W-11), Grand Naine (G-9) and Basrai (B) were obtained from Plant Tissue Culture Lab (PTCL), SARC, PARC, Karachi.

Preparation of polythene bags

Polythene bags of 7*4 size were filled with potting media like peat moss, soil and different ratios of soil with peat moss as per treatment schedule. The details of treatments used wereT1= Peat moss only, T2= 1:1 (Peat moss and Soil), T3= 1:2 (Peat moss and Soil), T4= 1:3 (Peat moss and Soil), T5= 1:4 (Peat moss and Soil) and T6= Soil only. The experiment was replicated six times having complete randomized design.

Transplantation of banana plants in polythene bags

Tap water was poured in glass jars containing tissue cultured plantlets grown in rooting media for four weeks. A plastic tub was filled with water and plantlets were taken out from jars, dipped in tub to avoid wilting and excess transpiration from plantlets. The nutrient media was carefully removed from plant roots. Single banana explant was transplanted in each polythene bag of respective treatment. All polythene bags were sprinkled with water after every one hour on first day of transplantation and then after three hours during the next week. Plants were then tagged and required observations were recorded i.e. mortality rate (%), survival percentage, plant height (cm) and number of leaves. The data collected were then analysed statistically by using analysis of variance technique and LSD at 5% level on Mstat-C (computer statistical software, following Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Effect of peat moss and soil in different ratios during hardening of three tissue cultured raised banana varieties was observed (Fig. 1-3).

Effect of different peat moss and soil ratios on banana (c.v William-11)

Banana plants of variety (W-11) showed optimal growth in polythene bags contained peat moss only (T1) followed by low cost potting material contained peat moss and soil in 1:1 ratio (T2). The plants that were grown in peat moss only remained healthy, had vigorous growth i.e. plant height (22.00 cm) and number of leaves (6.00) as compared to other treatments received different ratios of soil along with peat moss (Table 1). Besides this, mortality rate in newly plants remained 20% that were transplanted in polythene bags contained soil only (T6).

Effect of different peat moss and soil ratios on banana (c.v Grain Naine G-9)

An increase in shoot length (15.10 cm) and number of leaves (5.25) of banana plants were noted that were grown in poly bags contained peat moss only (T1) followed by the plants transplanted in peat moss and soil ratio @ 1:1 (T2) with values of 14.25 and 5.25 cm for the same parameters, respectively (Table 1). While, minimum values for plant height (7.8 cm) and number of leaves (2.1) were recorded from the plants supplemented with peat moss and soil with 1:3 (T4) and soil only (T6). Maximum mortality rate (40%) was noted in T6 where polythene bags were filled with soil only.

Effect of different peat moss and soil ratios on banana (c.v Basrai B)

Minimum mortality rate (0.00 %), maximum plant height (29.00 cm) and maximum number of leaves (6.3) were recorded from plants grown in polythene bags contained potting material i.e. 1:1 and 1:2 with values of 25.4, 23.7 cm and 5.8, 5.0 for plant height and number of leaves, respectively (Table 1).

High mortality rate in newly transplanted banana plants grown in soil only might be due to low water absorption or holding capacity of soil (Vasane and Kothari, 2008). However, due to the physical and chemical properties of peat moss its addition alone or mixing with soil @ 1:1 and 1:2 ratios increased survival percentage, plant height and number of leaves (Uzaribara *et al.,* 2015) of all banana varieties grown during the experiment. A decrease in peat

moss use affected the vegetative growth i.e. plant height and number of leaves with increase in mortality rate (Anbazhagan *et al.*, 2014).

From the results obtained it is concluded that for an economical point of view banana plants could be successfully transplanted in polythene bags containing peat moss only or 1:1 peat moss and soil ratio during primary hardening under screen house conditions.

Table 1. Growth Characters of tissue cultured banana plantlets as affected by different peat moss and soil ratios under screen house conditions.

Treatments	William-11			Grand Naine			Basrai		
	Survival (%)	PH	NOL (cm)	Survival (%)	PH	NOL (cm)	Survival (%)	PH	NOL (cm)
T1= (PM only)	100.0	22.0	6.0	100.0	15.1	5.2	100.0	29.0	6.3
T2= 1:1 (PM+Soil)	90.0	19.3	5.0	90.0	14.2	5.3	95.0	25.4	5.8
T3= 1:2 (PM+Soil)	90.0	19.0	4.5	90.0	10.6	3.3	95.0	23.7	5.0
T4= 1:3 (PM+Soil)	80.0	16.8	4.3	85.0	9.9	2.0	95.0	24.5	4.6
T5= 1:4 (PM+Soil)	85.0	17.7	4.8	80.0	14.0	3.5	90.0	17.9	4.0
T6= (Soil only)	80.0	16.5	3.0	80.0	7.8	2.1	90.0	17.3	4.3
LSD (<0.05)	0.94	0.89	0.39	0.98	0.78	0.33	1.20	0.94	0.44

PH= Plant height, NOL= Number of leaves, PM= Peat moss

1.William-11 2.Gand Name 3.Basrai

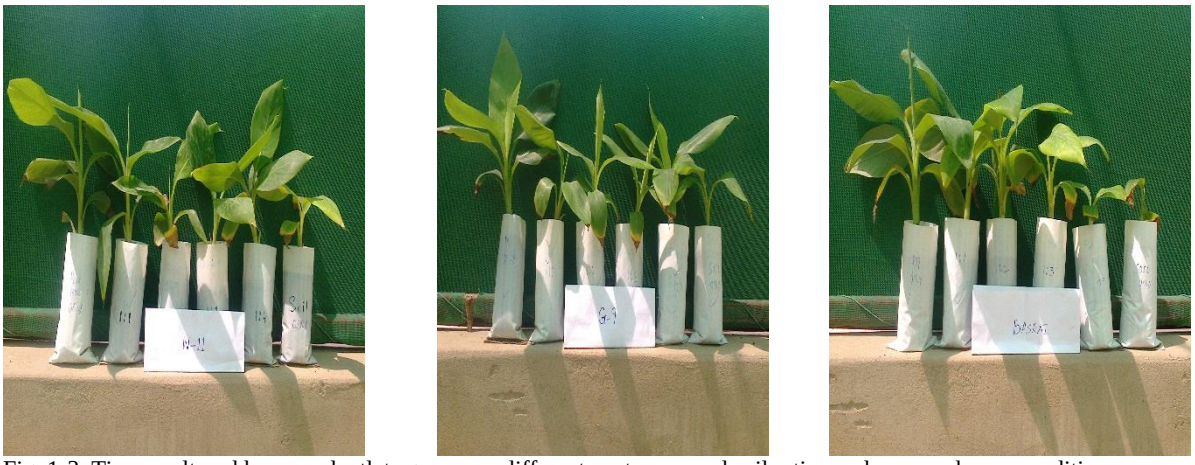

Fig. 1-3. Tissue cultured banana plantlets grown on different peat moss and soil ratios under screenhouse conditions.

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