

PLANT GROWTH AND ROOT DEVELOPMENT OF TISSUE-CULTURED "William Hybrid" BANANA PLANTLETS IN DIFFERENT POTTING MIXTURES

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ABSTRACT

Tissue-cultured "William Hybrid" banana plants were planted in the perforated polythene bags filled with different composition of potting mixtures at various proportion of soil, farm yard manure (FYM) and wood ash. Plant survival, plant height, leaf size and root number was significantly affected by the treatments imposed, but the leaf number was not. Potting mixtures devoid of FYM or of soil had lower growth of banana including root number as compared to those with various ratios of both the soil and FYM. In some treatments, addition of ash helped to increase plant height and root number slightly; however, at absence of soil in the mixture plant stand, leaf area and number of roots decreased considerably. This suggest that organic manure must be present in the soil from 25 to 75% of the media for planting tissue-cultured banana plantlets.

Additional Key Words: *Musa* sp., growth medium, plant survival

Banana is grown in many countries of the world where tropical climates prevail for its proper growth and development. In Nepal, this fruit crop is grown throughout the inner Terai and Terai regions. Its planting is also extended to valleys and river basins of mid-hill districts where climatic conditions favour for its growth and fruiting.

The decline in growth and yield of improved bananas is associated with many managerial and biological problems that are observed in the farmers' fields. Thus, most farmers go for planting local varieties rather than improved ones. In a given conditions of adequate plant sanitation and field management of bananas the improved cultivars out yield the local varieties. As a result improved cultivars are also produced in some districts in spite of several, yet serious problems (Thapa, 1993; Shrestha et al. 1994; Shrestha, 1998). These problems limit banana production in Nepal causing a huge import of banana from other countries to meet the ever-increasing demand for the fruit in the country.

Recently, farmers and entrepreneurs have taken keen interests on the expansion of area under banana cultivation. Because the conventional planting materials i.e. sword suckers carry disease and pest problems, they have threatened banana industry in Nepal. Thus, disease and pest free planting materials are produced by micropropagation techniques through tissue culture giving clean and healthy planting clones in large quantities. Since these plants small and need considerable attention in the nursery for their growth before they are taken to the field ensuring good establishment.

In November of 1991, 200 plantlets of banana derived from tissue culture were brought from the BioTech Nursery, Baneshwor to the Horticulture Farm of the Inst. Agric. Anim. Sci., Rampur. For good plant growth and root development these plants were planted in polythene bags of 5-kg capacity in the nursery block giving different potting mixtures in a replicated trial. The variation in the treatments was the differences in the amounts of soil, FYM and wood ash contents. The ratio of soil: FYM: ash (either 0 or 20 g) in 10 treatments were as follows:

T 1 (100:0:0), T 2 (100:0:20 g), T 3 (75:25:0), T 4 (75:25:20 g), T 5 (50:50:0), T 6 (50:50:20 g), T 7 (25:75:0), T 8 (25:75:20 g), T 9 (0:100:0), and T 10 (0:100:20 g). As per treatment the soil, FYM and ash were mixed together properly and filled in each bag. One plant was planted per

bag on 24 November 1991 and growth parameters such as plant survival, plant height, leaf number, leaf size (length x width) and root number were recorded on 25 February 1992. The data were analyzed and presented on Table 1.

Table 1. Effect of potting mixtures on the growth and root development of tissue-cultured "William Hybrid" banana plantlets in 1992.

Treatments S % - F % - A g	Plant stand #/5 plants	Plant height cm/plant	Leaf number #/plant	Leaf area sq.cm/leaf	Root number #/plant
100 - 0 - 0	3	15.8	7.6	53.4	12
100 - 0 - 20	5	27.5	6.1	126.4	17
75 - 25 - 0	5	35.2	7.2	219.1	18
75 - 25 - 20	5	40.5	7.4	170.4	21
50 - 50 - 0	5	44.7	7.6	252.1	25
50 - 50 - 20	5	48.6	7.3	252.7	15
25 - 75 - 0	5	48.2	6.9	251.1	19
25 - 75 - 20	4	42.3	6.9	202.1	11
0 - 100 - 0	2	30.3	5.5	106.8	11
0 - 100 - 20	1	25.8	6.5	72.6	6
LSD at 5%	1.5	10.3	NS	50.7	7.7

Note: S = soil, F = farm yard manure, A = wood ash, and NS = not significant at 5% level.

Except leaf number other plant parameters such as plant survival, plant height, leaf size and root number are significantly affected by potting mixture composition (Table 1). In those potting mixtures with soil the number of plants survived was only a few and the minimum survival was recorded when wood ash was added to the FYM in the mixture. This indicates a toxicity of ash to the plantlets in absence of soil. This is further supported by low plant height, leaf number and root number. But, when the potting mixture contained soil and ash the plant stand was as high as in other treatments, which had soil, FYM and ash in various ratios.

The maximum plant height was obtained from the treatments, which had 25 to 75, parts of soil or of FYM in the mixture. Addition of ash to these mixtures did not influence plant height. The height was significantly less when potting mixtures contained only soil. Both the soil with ash and FYM with ash produced similar but lower plant height than the other treatment mixtures comprising of soil, FYM and ash in various proportions. A similar observation on average leaf area and root number was recorded. The smallest leaf was observed from the treatment, which contained only soil in the medium. In general, a decrease in soil contents and increase in FYM with or without added ash in the mixture increased in the leaf size. The mixture devoid of either soil or FYM produced significantly reduced leaf sizes. The average root number per plant was maximum when the medium contained soil and FYM at the ratio of 1:1. When soil and FYM are present in the medium an addition of wood ash to the mixture did not increase root number. This indicates that tissue-cultured banana plants would grow better in the soils containing 25 to 75% well-decomposed manure.

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