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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 6 (6): 587-588, 2003
ISSN 1028-8880

Enhanced Rate of Multiplication of Tissue Cultured Raised Banana (MUSA) Plants in the Field

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Abstract: Multiplication rate of banana plants c.v. Basrai in the field was studied. The results showed that plants raised through culture produced 7.45 suckers plant^{-1} after 14 months of planting. On the other hand, number of suckers produced by banana plants propagated conventionally were 4015 in the same period of time. The results indicated that tissue culture plants produced 44% more suckers. This enhanced rate of multiplication may overcome the limited sucker production in the field.

Key words: MUSA, field multiplication, tissue culture, Basrai

Introduction

Banana cultivation was introduced some fifty years ago in Sindh province of Pakistan because of favorable climate for its growth. At present, more than 33,000 ha are under cultivation with annual production of more than 139500 tons. In Pakistan, Cavandish (Basrai) was found outstanding because of its taste, high yield potential and dwarf nature and was released in 1967 for general cultivation in Sindh (Sheikh *et al*., 1985). It is a triploid with seedless fruit. Conventionally, it is propagated thorough off shoots or suckers. From its introduction, with the passage of time, the area under cultivation went on increasing but ha^{-1} production remained static due to poor agronomic practices. This static production further declined drastically in early nineties due to wide spread of banana bunchy top disease caused by banana bunchy top virus (BTTV). As this virus is transmitted with planting material (suckers) so new fields were also infected. Due to unavailability of healthy nursery plants growers were forced to substitute other crops like sugar cane and cotton.

To overcome the problem, tissue culture technique is being exploited in many countries for the production of disease free plants (Banerjee and De Langhe, 1985; Vuylsteke 1998; Malik *et al*., 2000). The same is being practiced in Pakistan by different tissue culture laboratories. Again the capacity of tissue culture laboratories in the country is limited and cannot meet the demand of banana growers and these plants are delicate and need special care for handling in the field. As an alternate, tissue culture plants can be multiplied *in situ,* to over come this difficulty (Macias, 2001). The objective of the study was to observe *in situ,* multiplication rate of banana plants.

Materials and Methods

Two weeks old suckers of cultivars Basrai were taken from farmers fields in Thatta District and its outer leaves were trimmed to the required size 4 mm which is more suitable size for *in vitro* culture of banana. These plants were multiplied by micropropagation technique at tissue culture laboratory of IABGR, NARC, Islamabad by the protocols developed by Muhammad *et al*., 2000. *In vitro* raised plants were hardened in the green house for two months. When the plants reached 40 cm height these were transferred in the farmers field near Hyderabad, Sindh. Before planting, the pits were filled with compost of cow dung and soil mixture. At the same time eight week old and about 60 cm height suckers were planted to study the comparison of multiplication rate. Total number of sucker production was counted after 14 months of planting when mother plant started fruiting and data was collected of 20 plant each. The means of both the categories were compared using t-test (Steel and Torrie, 1981).

Results and Discussion

On the average, tissue culture plants produced 7.45 off shoots palnt^{-1} (Table 1) while plants through suckers could produce 4.15 shoots plants^{-1} which is 44% less, after 14 months of planting. The t-value at 5% was 7.906 indicating significant differences between two means. It was also observed that variance of both variables were 2.26 and 2.45 for tissue culture and suckers showing that multiplication trend of all the tissue culture raised plants was almost similar and the same was true for plants propagated through suckers. Similar results were observed by Eckstein and Robinson (1995) where tissue culture and conventional plants produced 6.8 and 3.6 suckers plant^{-1} respectively.

The tissue cultured plants started producing suckers after six months of planting which was 4 weeks earlier than the plants grown through suckers. This higher rate of multiplication might be the result of continuation of *in vitro* behaviour of the plants as these plants multiplied at

Table 1: Number of suckers plant^{-1} after 14 months

Tissue cultured plants	Through suckers	Tissue cultured plants	Through suckers
8	5	8	4
6	5	7	3
8	3	6	5
11	7	6	6
8	5	7	4
8	3	7	3
5	3	9	8
8	4	7	2
7	4	10	3
8	2	5	4
Mean	=	7.45	4.15
Variance	=	2.26	2.45
Probability level	=	5%	
t-value Stat	=	7.90	

a much higher rate *in vitro*. Once genes responsible for shoot multiplication are switched on by higher concentration of cytokinens in the media, also perform in the field. Similarly, *in vivo* behavior of banana plants is also reflected *in vitro* (Malik *et al*., 2000). It is also observed that sucker production in banana was controlled by cytokinen/auxin ration and that increased sucker development was promoted by gibberellins and cytokinens being synthesized in the root tips (Swennen, 1984). A well established root system with more root tips and juvenile rhizome may give rise to large count of suckers. The vigorous shoot production of tissue culture plants is also reported by Daniells (1988), Drew and Smith (1990) and Smith *et al*. (1992). In Summary, using tissue culture technique for the production of healthy plants followed by rapid in situ multiplication may overcome the problem of shortage of panting material in the country. It was observed that tissue culture plants produced 44% more suckers in the field conditions.

Acknowledgment

The study was funded by Government of Pakistan vide Agriculture Research Fund (ARF).

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