A MODIFIED CONVENTIONAL PROPAGATION TECHNIQUE FOR BANANA (*Musa* spp)

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ABSTRACT

Studies were conducted with three banana varieties to identify an in-situ propagation technique for rapid planting material production. Four to five months old plants were decapitated and the growing terminal points were suppressed to induce lateral buds to develop into suckers. Sucker emergence initiated 7-10 days after decapitation and continued up to 6 weeks in all varieties. Number of suckers produced at 90 days after decapitation were 5-8 in Ambul kesel, 9-15 in Alu kesel and 7-17 in Seeni kesel. All the suckers were virgin and majority were located in the upper position of the corm and a few in the middle position. Suckers were not produced from the lower position. Two and a half months old suckers produced by this technique were planted and the crop was raised with the recommended management practices. Growth performance and yield parameters were compared with those produced by cormal bits of the three varieties.

KEY WORDS: Corm, Decapitation, Positional development, Propagation, Propagules, Sucker emergence.

INTRODUCTION

In Sri Lanka there is a growing interest to cultivate banana on a commercial scale mainly under major irrigation schemes. However, the unavailability of healthy planting materials is a major constraint for large-scale cultivation. Banana is conventionally propagated by suckers that develop from cormal lateral buds. The corm activates a few sporadic side buds which develop into suckers (Purseglove, 1978). These suckers take 4 -5 months to reach transplanting maturity. According to Pureglove (1978), a single corm can produce 3-4 suckers during the life span of the mother plant. However, suckers attached to a bearing plant tend to reduce bunch size (Stover, and Simmonds, 1987) and diminish the internal composition within the stools (Simmonds, 1970). Since the natural rate of sucker production cannot meet the demand for planting materials, a number of methods have been developed to raise suckers using pieces of corm referred to as bits or pieces and by inducing lateral buds of the corms of 5-7 months old plants (Baker, 1959 ; Purselove, 1978). It has been shown that bits must contain at least a single side bud and be about 2.5 kg in weight (Purselove, 1978). An average size corm can produce 4-5 bits. Success of this method is only about 50% and involves a series of management practices from mother plant selection up to the stage of transplanting maturity of the next plant.

Propagation of banana by tissue culture technique is more efficient in terms of productivity. A single banana meristem can generate about 500 rooted suckers in three consecutive proliferations which are ready for field planting in 12 months (Rajapaksha *et al*, 1993). However, this technique is costly and needs laboratory facilities and technical expertise.

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PROPOGATION TECHNIQUE FOR BANANA

The objective of this study was to identify an *in-situ* propagation method to obtain planting materials in a comparatively short time and to evaluate the performance of the suckers in comparison to those produced conventionally.

MATERIALS AND METHODS

This study was conducted at the Field Crops Research and Development Institute, Maha Illuppallama in 1996 and at the Regional Agriculture Research and Development Centre, Angunakolapelessa in 1999.

Four to five months old banana plants of three varieties, namely *Ambul* (sour), *Alukesel* (ash plantain) and *Seeni* (Sugar) kesel were used with 50 plants of each variety. The pseudo stems were removed or decapitated at about 2 cm. above ground level and re-growth of the terminal growing points of the suckers were suppressed with a pointed instrument. The cut surface was covered with soil and heaped to form a soil mound. The plants were irrigated during dry periods. When the shoots started to emerge from the corm, each plant was fertilized with 120g urea, 80g triple superphosphate (TSP) and 250g muriate of potash (MOP). Growth parameters and positional developments of the suckers along the corm were studied. The corm was demarcated into three portions starting from the collar towards the distal end, the first 15 cm as the top position, the next 15 cm the middle position and the remaining portion the lower position.

A modification of this technique was tested at RARDC, Angunakolapelessa with the objective of minimizing the operations to suppress the development of the major growing points of the corm. The decapitated plants in these experiments were not covered with soil mounds. Instead, 8–10 mm size pegs were inserted though the cut surface of the corm to suppress the development of the growing points. Rest of the management practices were similar to those used in the Maha Illuppallama experiment. Growth parameters of the developing suckers were recorded in all three varieties. The positional development of the suckers was studied only in Ambul variety.

To study the subsequent development of suckers in the field, two and half months old well grown suckers (3-3.5 kg in weight) of the 3 varieties were collected and established in three separate adjacent blocks. Fifty suckers of each variety were established at a spacing of 3m x 3m in a rectangular system and the standard cultural practices recommended by the Department of Agriculture were followed. Fertilizer was applied at the rate of 120 g urea, 80g TSP and 150g MOP, per clump at 4 months interval commencing 2 months after planting. Plants were irrigated during dry months. The cultivation was maintained under slashed condition. Data on harvests were evaluated for yield parameters.

RESULTS AND DISCUSSION

Sucker production

The two techniques tested to suppress the major growing points of the decapitated stems performed equally well in sucker production. In about 7-10 days after decapitation, sucker emergence continued up to 6 weeks in all three varieties. Number of suckers produced 90 days after decapitation were 5-8 in Ambul kesel, 9-15 in Alu kesel and 7-17 in Seeni kesel. These observations agree with the usual trend of sucker production in the three varieties. Seeni kesel and Alu kesel produce more suckers compared to Ambul kesel even in conventional propagation methods.

Sucker shape and size

All the suckers were uniform in appearance and size 90 days after decapitation. They could be identified as virgin suckers having slightly conical shaped stems and broad leaves. They were about 70-80 cm in height and 2.5-3.0 kg in weight.

Positional distribution of suckers

Sucker distribution along the corm is given in Table 1. The upper position of the corm yielded twice as many suckers as the middle position and no suckers emerged from the lower position. This positional effect on sucker initiation could be due to suppression of the apical dominance. Stover and Simmonds (1987) also stated that lateral meristem activity is suppressed by the parent or by the dominant suckers in banana. Ofrrell *et al.* (1989) found that shoot development from lateral buds of large suckers was suppressed by the apical meristem. The rate of sucker emergence is affected by the depth of the apex below the soil surface (Karikari and Amankwah, 1977). It was observed that the technique resulted only in the production of broad-leaved suckers and this may be due to the influence of positional effects. It has been documented that only the bottom position of the corm force out the narrow leaved suckers (Purseglove, 1978).

Data also showed, that stem girth and leaf number were higher in suckers that originated from the upper position when compared with those that emerged from the middle position of the corm (Table 1). This indicates that the former have initiated earlier than the latter as reported by Karikari and Amankmah (1977). Failure of the lower position to produce suckers may be due to the depletion of reserve food in the corm due to the sucker production activities of the other two positions. The modified conventional method produced a higher number of suckers within a shorter period (Table 2). This technique can be repeated in the same place at 5-6 months intervals and requires minimum management practices.

Performance of the subsequent crop

Growth and yield attributes of the suckers developed by conventional (bits) and modified conventional techniques of the three varieties are given in Table 3. All the values are comparable with those of suckers raised from cormal bits during *maha* season 1995/96. All attributes monitored during subsequent development of suckers produced by this technique were comparable with those produced by cormal bits. No inferior qualities were observed in the suckers produced by the modified technique. Therefore suckers produced from the modified technique is acceptable for banana cultivation.

Economics of the technique

Data show that the cost of producing the first lot of suckers by the proposed technique is only Rs 3.79 (Table 4). Cost of subsequent lots will be even less as no establishment costs are incurred.

CONCLUSIONS

The modified conventional sucker production method is effective, less cumbersome and less costly than the conventional method.

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Table 1. Sucker distribution along the corm after decapitation.

Parameter	Top position (15 cm.)	Middle position (15-30 cm.)	Lower position (below 30 cm.)
	(Average of 30 corms of three varieties)		
Number of suckers	5.13 (±0.27)	3.70 (±0.25)	-
Stem girth 2 cm above corm (cm)	30.25 (±0.65)	26.62 (±0.87)	-
Number of leaves	5.30 (±0.22)	4.50 (±0.13)	-

Table 2. Performance of the modified conventional technique

Parameter	
No of suckers produced	5-20
Percentage success	100%
Time taken for field planting	2 - 2.5 months
Continuity of sucker production	Possible
Type of sucker	Broad leaved
Management practice	None

Table 3. Performance of suckers produced by the modified technique in comparison to the conventional method

	Crop raised with suckers			Crop raised with bits		
	Ambul	Seeni	Alu	Ambul	Seeni	Alu
50% flowering (days)	293	353	300	292	303	295
SE ±	0.95	0.85	1.19	0.86	0.95	1.79
Height at flowering (m)	2.51	2.8	2.36	2.46	2.64	2.36
SE ±	0.01	0.02	0.02	0.04	0.08	0.05
No. of hands/bunch	10	09	04	10	10	06
SE ±	0.45	0.56	0.21	0.37	0.50	0.24
Yield t/ha	14.54	10.77	8.43	13.67	11.28	8.65
SE ±	0.92	0.41	0.32	0.65	0.58	0.60

Table 4. Cost of producing planting materials for a 0.4 ha (1 ac.) nursery

Item	Cost (Rs.)
Planting materials (@Rs.12 / plant for 2530 plants)	30,360
Agro chemicals	1,000
Irrigation	2,000
Fertilizers	11,385
Labour (@ Rs.130 for 25 days)	3,250
Total Expenses	**47,915**
No of suckers produced (@ 5 suckers /plant)	12650
Income (@ Rs.12 /sucker)	151,800
Income over expenses	103,885
Cost of producing one sucker	3.79

Assumptions

Cultivable land area leaving 5% for roads, bunds etc.- 3800 m^2

Spacing of plants in nursery - 1.5m x 1m