

BENCH GRAFTING WITH GREEN BUDS IN *HEVEA BRASILIENSIS*

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Bench grafting (bench budding) of *Hevea brasiliensis* (Willd. Ex Adr. De Juss) Mull. Arg. with green buds was attempted using the clone RR11 105 and the study was repeated for three consecutive years. Buddings were opened after 30 and 40 days. Effect of delaying the opening (beyond the normal period of 20 days) on bud burst was also studied. All the budded plants were raised in polybags to determine the success of their establishment and growth characters such as height and diameter of the scion, number of leaf whorls and leaves. Results indicated that bench grafts opened 40 days after budding had highest percentage of success (84.76%) and establishment rate (65.71%). Growth of the plants under all the treatments were more or less on par. Bench grafting with green buds is feasible and grafted plants are as good as nursery grafted plants.

INTRODUCTION

Generally in rubber, grafting is carried out in the nursery or in the field during rainy season (Edgar, 1958). During the moist weather conditions, success rate of grafted plants was higher (Marattukalam and Premakumari, 1982). However, due to adverse climatic conditions like severe rainfall, high/extremely low temperature outdoor grafting, on many occasions, is found not feasible or resulted in very poor budding/establishment rate. To overcome such adverse situations, grafting can be carried out indoors as in the case of several other plants like apple, citrus, pine and oak (Mahlstedt and Haber, 1966; Macdonald, 1986). Adoption of bench grafting can solve the problem of budding of rubber grafts under unfavourable situations. Earlier, Marattukalam and Annamma Varghese (1993) reported bench grafting in rubber using brown

colour buds. In this context, studies were undertaken at the Rubber Research Institute of India to explore the possibility of carry-ing out bench grafting in rubber using green coloured buds. Another aim of the study was to find out whether the delay in opening the budding has any influence on the success of budding, establishment rate and growth of the bench grafted plants in polybags.

MATERIALS AND METHODS

Vigorously growing, six months old seedlings having a collar girth of about 2.5 cm were used as stock plants. Buds were obtained from RR11 105 and the green shoots of around two months growth were used in the present study. Commonly followed budding technique was adopted for bench- and nursery grafting (Saraswathyamma and Marattukalam, 1996);

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both indoor and outdoor grafting were carried out by the same budder under comparable agroclimatic conditions. Complete randomized block design was adopted with 35 replications (each graft was considered a replication). There were four treatments viz., 1) bench grafting and removal of bandage 20 days, 2) 30 days and 3) 40 days after budding and 4) nursery budding.

Ten days after removal of bandage, budding success was recorded. In the case of nursery grafting, instead of bandage, polythene strips were used and these were removed after 20 days. Budded stumps were planted in polybags and nursed carefully. All recommended cultural operations were adopted uniformly for both

bench- and nursery grafted plants (Potty, 1980). About one year after from the date of budding, establishment success and growth characteristics such as height of the scion, diameter of the scion at five cm from the base, number of leaf whorls and total number of leaves were recorded. The study was repeated for three consecutive years. Data were analysed statistically.

RESULTS AND DISCUSSION

Bench grafting and removal of bandage after 40 days exhibited better performance than any other treatments in terms of budding success (Table 1). Though this treatment was not significant during third year, overall results indicated its superiority over other treatments.

Table 1. Success percentage of budding in different years

Budding per cent	Treatment	Z Values			
		T1	T2	T3	T4
First year					
68.57	T1	-	-1.71	-2.77**	-1.39
85.71	T2		-	-1.20	0.33
94.29	T3			-	1.50
93.55	T4				-
Second year					
54.29	T1	-	0.23	-2.29*	-2.04*
51.43	T2		-	-2.52*	-2.24*
80.00	T3			-	0.29
77.10	T4				-
Third year					
68.57	T1	-	-0.26	-1.09	-0.26
71.43	T2		-	0.84	-0.00
80.00	T3			-	0.84
71.43	T4				-
Mean					
63.80	T1	-	0.88	-3.47**	-2.11
69.52	T2		-	-2.63**	-1.25
84.76	T3			-	1.40
77.14	T4				-

Table 2. Success rate of establishment in bench grafted *Hevea* plants

Establishment per cent	Treatment	Z Values			
		T1	T2	T3	T4
First year					
62.86	T1	-	1.44	-0.50	0.49
45.71	T2		-	-1.93	-0.96
68.57	T3			-	0.99
57.14	T4				
Second year					
25.71	T1		-1.75	-4.30**	-1.51
45.70	T2		-	-2.70**	0.24
77.14	T3			-	2.92**
42.86	T4				-
Third year					
42.86	T1	-	-0.25	-0.72	-1.20
45.73	T2		-	-0.48	-0.96
51.43	T3			-	-0.48
57.14	T4				-
Mean					
43.80	T1	-	-0.28	-3.19**	-1.24
45.71	T2		-	-2.92**	-0.97
65.71	T3			-	1.97*
52.38	T4				-

T1, T2, T3 and T4: bench grafts opened after 20,30,40 days after grafting and nursery grafts, respectively.

*, **: significant at five and one per cent level, respectively

Plants obtained through nursery grafting showed significant budding success than bench grafting and removal of bandage on 20 or 30 days after budding. Results indicated that retaining the polythene bandage over the bud for longer time had favourably influenced bud take. In this connection it may be noted that bench grafted plants had no leaves or green stem which in turn drastically restricted the photosynthetic activity of these plants. Due to the poor supply of photosyn-thates, formation of new cells which are essential for the union of the bud with the stock was proba-bly at a slower rate (Hartman and Kester, 1968). This might have resulted in a longer dura-tion for the completion of the union process. Keeping the buds covered for such a long duration might have favourably influenced the process of bud take resulting in higher budding success. Good performance of the nursery grafts may be because budding was carried out on growing plants. Analysis of data on success or establishment indicated that there was no significant difference between the treatments in the first and third year (Table 2). During the second year, bench grafting and removal of bandage 40 days after budding was significantly superior to all others treatments at one per cent probability.

Plant height recorded in the present study was not significant among the treatments, except in the first year where T1 and T4 had an edge over T2 and T3 (Table 3). Nursery grafted plants registered significantly higher collar diameter (Table 4). No significant variation was observed in terms of number of leaf whorls and number of

Table 3. Height of the bench grafted scion

Treatment	Mean height of the scion (cm)		
	I year	II year	III year
T1	1.81 (66.98)	1.70 (54.39)	1.77 (62.13)
T2	1.72 (53.53)	1.78 (64.59)	1.77 (62.75)
T3	1.68 (53.29)	1.72 (60.76)	1.77 (61.25)
T4	1.81 (68.25)	1.69 (53.67)	1.70 (53.40)

Figures in parenthesis denote mean of the original values observed in the study and statistically not significant

Table 4. Scion diameter of the bench grafted plants

Treatment	Mean diameter of the scion (mm)		
	I year	II year	III year
T1	0.74 (5.72)	0.66 (4.83)	0.72 (5.65)
T2	0.66 (4.80)	0.74 (5.74)	0.67 (5.07)
T3	0.65 (4.86)	0.75 (6.36)	0.71 (5.33)
T4	0.77 (6.23)	0.64 (4.97)	0.68 (5.19)

leaves. As far as leaves/leaf whorls are concerned both bench- and nursery grafted plants were on par with each other (Table 5). Present study indicated that bench grafting with green buds is feasible in rubber. Delay in opening of budding considerably increased the budding success in bench grafts. Trial has also proved that growth of bench grafted plants are in no way inferior to that of nursery grafts.

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Table 5. Number of leaf whorls and leaves of the bench grafted scions

Treatment	Mean number of leaf whorls			Mean number of leaves		
	I year	II year	III year	I year	II year	III year
T1	0.48 (3.09)	0.45 (3.00)	0.51 (3.33)	1.08 (13.82)	1.02 (12.22)	1.02 (12.67)
T2	0.40 (2.75)	0.42 (2.75)	0.45 (3.00)	0.90 (9.88)	1.06 (13.38)	0.99 (11.81)
T3	0.40 (2.67)	0.38 (2.74)	0.45 (3.00)	0.96 (12.00)	1.01 (14.89)	1.03 (13.28)
T4	0.47 (3.10)	0.40 (2.73)	0.44 (2.95)	1.12 (15.45)	0.96 (11.53)	1.07 (14.00)

Figures in parenthesis denote mean of the original values observed in the study and statistically not significant

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