

# STUDIES ON VEGETATIVE PROPAGATION OF CASHEW (*ANACARDIUM OCCIDENTALE* L.)

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## ABSTRACT

Different techniques of vegetative propagation namely, veneer grafting, patch budding, side grafting, epicotyl grafting, mound layering, air layering and stem cuttings have been tried with varied degrees of success. Large scale multiplication of high yielding cashew trees was found feasible using epicotyl grafting. Success was obtained with veneer grafting and air layering also. Side grafting could be made use to improve uneconomic young cashew trees in the plantation.

## INTRODUCTION

The late seventies had proved critical for cashew industry in our country because of uncertain imports of raw nuts from the East African countries, particularly from Tanzania and Mozambique who of late have started setting up their own processing units. It became obvious, therefore, that intensive efforts have to be made to achieve self-sufficiency to cater to the needs of the existing processing units so as to run them on even keel.

Cashew, since the time it was introduced by the Portuguese in the sixteenth century, was being propagated as a self-sown crop or through seeds, which resulted in the spread of heterogeneous populations. Efforts are being made to identify high yielding mother trees and raising of progeny orchards and adoption of improved package of practices to step up production. Clonal selection being one of the major aspects of crop improvement, various techniques of vegetative propagation have been tried with varied degrees of success under different agroclimatic situations in our country and abroad.

A comprehensive project on vegetative propagation of cashew was taken up at CPCRI Regional Station, Vittal and CPCRI Sub-

station, Shantigodu in SK District of Karnataka during 1977-78 and 1978-79 to standardize a technique to suit the region. The results of this project are presented in this paper.

#### MATERIALS AND METHODS

Five different techniques of vegetative propagation viz., (1) veneer grafting done on seedlings raised in polythene bags, (2) side grafting done *in situ* on 4-5 year old seedlings, (3) patch budding done on seedlings raised in polythene bags, (4) patch budding done *in situ* on one year old shoots and (5) air layering, were included under a study adopting a simple factorial design. The details of the experiment are given below :

(1) No. of treatments	..	5 (techniques)
(2) Periods	..	12 (months)
(3) No. of replications	..	4
(4) Plot size	..	25 numbers
Total population	..	$5 \times 12 \times 4 \times 25 = 6000/\text{year}$

Besides the five techniques, studies were also taken up on (1) etiolation girdling and stooling with 4-6 year old cashew trees and (2) epicotyl grafting.

#### Methods

Veneer grafting and patch budding were done on approximately six-month old seedlings raised in alkathene bags of 30-40 cm length and 300 gauge. The seednuts of VTH-11 were used for raising root stocks every month. The first set of root-stocks had become available for grafting/budding in August 1977. Side grafting *in situ* was done on adult cashew trees (4-5 year old) at a height of about one meter from the base and percentage success worked out for each month. In air layering, shoots from the trees of the same age group and uniform vigour were subjected to layering. Percentage of rooted shoots was worked out for each month.

The data collected during 1977-78 and 1978-79 in respect of the five techniques of vegetative propagation are presented in Table 1.

Table 1. Percentage means for month-wise comparison of the five different techniques of vegetative propagation during 1977-78 and 1978-79

Month/ Year	Veeneer grafting in polybags										Mean	
	I		II		III		IV		V			
	1977	1978	1977	1978	1977	1978	1977	1978	1977	1978		
August	..	17.70	38.00	83.02	3.75	8.00	Nil	16.37	26.60	73.00	17.09	43.68
September	..	9.20	16.00	43.00	36.60	2.25	21.00	Nil	64.00	41.00	12.94	35.72
October	..	44.80	18.00	52.35	Nil	2.60	13.00	9.65	51.17	13.95	24.67	31.23
November	..	18.01	12.00	1.20	9.00	5.85	13.00	13.80	61.25	51.00	17.98	30.25
December	..	11.60	14.00	15.40	17.88	10.95	19.00	19.85	59.20	39.80	19.52	34.41
January	..	0.38	18.00	24.60	5.68	6.90	13.00	17.85	55.65	59.05	1.78	30.67
February	..	4.75	8.00	..	14.00	1.05	32.00	24.30	72.90	64.00	14.62	38.18
March	..	..	6.00	..	7.45	6.00	46.00	30.55	60.65	79.05	23.30	40.42
April	..	..	5.00	..	11.92	3.48	38.00	33.35	73.15	74.15	96.00	44.81
May	..	14.10	18.00	..	43.40	1.00	44.00	59.05	87.78	76.60	30.15	54.64
June	..	39.90	38.00	51.80	72.02	11.00	34.00	44.45	58.32	41.95	37.82	53.27
July	..	31.25	42.10	71.70	76.20	14.85	20.00	27.00	40.48	33.00	36.58	42.33
Mean	..	14.41	19.40	24.84	31.4	5.88	25.10	23.32	58.60	46.13	..	..
1977-78	LSD	(P=0.05) for months										4.72
	LSD	(P=0.05) for techniques										13.36
1978-79	LSD	(P=0.05) for months										7.92
	LSD	(P=0.05) for techniques										10.90

Note : Data analysed with arcsin transformation.

Table 2. Grouping of shoots on the basis of girth and total no. of shoots available for treatment during one year period

Group	Girth (range in cm)	No. of trees dispersed in the group	No. of shoots available for treatment	Mean no. of shoots available	Remarks
I	..	1	15	15.0	Emergence of fresh shoots continued
II	..	3	59	19.7	
III	..	2	32	16.0	
IV	..	3	84	28.0	
V	..	6	202	33.7	
Total	..	15	392	26.1	

Table 3. No. of shoots treated at different periods, number rooted, percentage rooted layers and percentage survival

Date of treatment	No. of shoots treated	No. rooted in polybags	Rooted layers (%)	Establishment in polybags (%)	Remarks
June 15, 1978	..	101	64.3	75.2	Total no. of shoots treated—392
September 26, 1978	..	35	70.0	57.1	
November 29, 1978	..	55	55.0	54.5	Overall rooted layers percentage —60.7
March 21, 1979	..	32	53.3	62.5	
June 29, 1979	..	15	60.0	66.6	

Fifteen adult cashew trees were subjected to etiolation girdling and stooling during February 1978. Girth of each stool was measured and the stools were classified into five groups to know whether a correlation existed between stool girth and production of shoots. The details of grouping of shoots on the basis of girth and total number of shoots available for treatment during one year period are furnished in Table 2. The number of shoots treated at different periods, number rooted, percentage rooted layers and percentage survival in polybags are given in Table 3.

Epicotyl grafting was tried, adopting whip and cleft methods, to find out the efficacy of each method during monsoon of 1979 and 1980. The details of the grafting done and meteorological observations recorded in 1979 and 1980 are furnished in Table 4.

#### RESULTS AND DISCUSSION

The technique of air layering was significantly superior over other techniques except side grafting and patch budding *in situ*. Patch budding gave significantly better success than the budding done on seedlings raised in polybags. During the first year of the trial (1977-78), patch budding gave significantly higher success than side grafting, both done *in situ*. The techniques compared over the two years had shown much difference relating to success achieved with the technique and this was due to improvement in the skill and management acquired during 1978-79 over the previous year (Table 1). The techniques showed significant difference between the months and the most successful months being May, June and July for grafting and March, April and May for air layering and February, April, May and September for patch budding. Air layering and patch budding *in situ* were superior over the other techniques tried. The trials conducted by Phadnis *et al.* (4) revealed that veneer grafting done during early rainy season on five month old stock plants proved much successful than on older root stocks. The studies made by Rao *et al.* (5) with side grafting have shown that February to May gave higher per cent of take while monsoon was found to be suitable for side grafting. The results obtained with budding in different centres of All India Coordinated Spices & Cashewnut Improvement Project (Anony-

mous 1981) were at great variance, which might be due to varied agroclimatic situations prevailing in different regions.

The trials conducted to propagate cashew by etiolation, girdling and stooling indicated the feasibility of multiplication of clonal material by this method. The studies revealed that mound layers could produce secondary and tertiary roots as opposed to air layers where the roots were confined within the polythene wrapping (Menon and Nagabhushanam, 1979). The trials further revealed that out of 392 shoots treated at different periods (Table 4) 60.7% of the shoots struck roots and when these shoots were

Table 4. Details of propagation of cashew by epicotyl grafting adopting

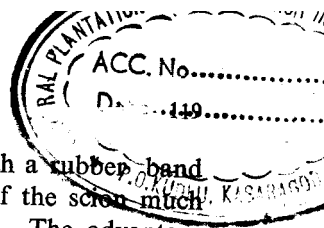
Month	1979				1980			
	<i>Cleft method</i>		<i>Whip method</i>		<i>Cleft method</i>		<i>Whip method</i>	
	No. made	Success (%)	No. made	Success (%)	No. made	Success (%)	No. made	Success (%)
June ..	40	20.0	40	10.0	100	60.0	100	45.0
July ..	40	30.0	40	20.0	100	68.0	100	50.0
August ..	50	28.0	50	22.0	100	63.0	100	47.0
September	40	15.0	40	10.0	100	56.0	100	44.0
October ..	40	10.0	40	10.0	100	48.0	100	40.0
November ..	40	12.5	40	5.0	100	47.0	100	38.0

The difference between the means of the two methods

separated and planted in alkathene bags, 65.5% of the layers survived.

Propagation of elite trees of cashew by stooling and layering may prove economical because no wrapping material and saw dust or moss is required as in the case of air layering. Further, it is risk free since the damage due to wind is nil (Nagabhushanam and Menon 1980). In trials with epicotyl grafting done in two ways, the success was marginal (30%) without a significant difference between the two ways of grafting during the first year of the trial. The percentage of success was improved further (68%) with a modification in the technique in which the scion after grafting

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was covered with a polythene bag and secure with a rubber band near the base, in order to prevent desiccation of the stem much before the cambial union took place (Table 4). The advantage with epicotyl grafting is that it could be taken up indoors in heavy rainfall regions. Further, the technique ensures quick multiplication in a given time within unit area of space. The commercial application of the technique of epicotyl grafting has been successful with jack to the extent of 80 per cent. Cleft method of grafting being easier to practise, this technique may enjoy wide popularity with the nurserymen.

'Clefts' and 'Whip' methods and meteorological data recorded

Meteorological observations									
1979					1980				
Rain	No. of	Temp. °C		R. H.	Rain	No. of	Temperature		R.H.
fall (mm)	rainy days	Maxi- mum	Mini- mum	(%)	fall (mm)	rainy days	Maxi- mum	Mini- mum	(%)
841.2	19	37.0	26.4	85.3	1461.0	29	32.5	26.0	92.0
1168.5	27	30.7	23.9	90.3	1277.0	31	31.0	25.0	91.0
528.8	21	30.6	24.5	85.5	1107.0	31	31.0	25.5	90.0
300.4	13	33.0	24.5	84.7	183.5	19	35.0	28.0	88.0
222.4	14	35.5	24.5	77.7	244.5	13	36.0	30.0	80.0
223.4	9	34.3	24.5	79.9	68.5	8	37.5	30.5	75.0

was not significant.

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