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Success of cashew grafts cv. Vengurla-4 as influenced by polyshed environments

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ABSTRACT

An experiment was conducted in cashewnut grafting nursery under open and closed polyshed conditions to evaluate the success of cashew grafts under modified environment. Under open space conditions average success of grafting was 30 and 41 percent during 2001-02 and 2002-2003 seasons respectively. The variation in success ranged from 30 to 100 per cent under polyshed condition during both years. The percentage of success was very low in hot (April) a well as in cool climate (December) under open conditions whereas, it was fairly high under hot as well as cool climate inside polyshed. The success of grafting showed highly significant positive correlation with maximum temperature and with difference in maximum and minimum daily temperature.

Key words: Cashewnut, Graft, Polyshed, Temperature, Humidity, Graft success.

Cashew (*Anacardium occidentale* L.) is an important export crop of India which is grown over an area of 7.32 lakh hectares in eight states of the country. The Konkan region of Maharashtra is the most suitable for cashew cultivation. The area under cashewnut crop increased from 40,000 hectares during 1990 to 1.25 lakh hectares by year 1999 (Lavekar, 1999) which may be due to the new grafting technology developed at the Regional Fruit Research Station, Vengurla. Graft success in cashewnut is season bound and needs high ambient temperature. As a consequence, the grafting season is restricted to hot summer months from March to May and post rainy months of October and November. It is also affected by local temperature conditions due to which success of grafts varies from location to location. However, recent development of green house/ polyhouse technology could be used conveniently to modify the temperature conditions on small scale. It provides additional advantage of high CO_2 concentration within the plant canopy promoting vigorous growth of plant. Using the polyhouse technique, it is possible to increase the temperature markedly during low temperature period. In view of this the present investigation was conducted to evaluate and quantify the influence of polyshed environment on graft

Table 1 : Per cent success in cashew grafts under polyshed and open space condition at different meteorological weeks

Month	Grafting period	MW	Grafting success %			
			Season 2001-2002		Season 2002-2003	
			Polyshed	Open space	Polyshed	Open space
December	17/12-23/12	51	30	5	30	15
	24/12-31/12	52	40	5	45	15
January	1/1-7/1	1	80	45	80	55
	8/1-14/1	2	95	55	95	55
	15/1-21/1	3	85	30	100	60
	22/1-28/1	4	100	50	100	60
	29/1-4/2	5	95	25	100	55
February	5/2-11/2	6	85	60	90	60
	12/2-18/2	7	80	40	85	55
	19/2-25/2	8	85	30	85	50
	26/2-4/3	9	80	30	80	50
March	5/3-11/3	10	85	75	85	60
	12/3-18/3	11	80	50	80	50
	19/3-25/3	12	70	15	70	45
	26/3-1/4	13	80	5	80	15
April	2/4-8/4	14	85	0	80	15
	9/4-15/4	15	85	10	75	10
	16/4-22/4	16	85	20	80	15
	23/4-29/4	17	75	30	70	30
		Mean	78.95	30.26	79.47	40.53

take in cashewnut.

MATERIALS AND METHODS

An experiment was conducted in cashewnut grafting nursery at Agricultural Research Station, Mulde during two seasons starting from December to April 2001-2002 and 2002-2003, respectively to evaluate the success of cashew grafts under modified environment i.e. closed polyshed in comparison to open condition. It was conducted in factorial R.B.D. with two replications on *Vengurla 4* (V-4) variety of cashewnut as test genotype and in each meteorological week (MW) starting from 51 to 17 MW with 19 grafting dates. In order to subject to varying temperature and humidity regimes the grafts were prepared every week and 10 grafts were placed in closed polyshed and open-air conditions. The grafts in different treatments were regularly watered and other usual nursery

Table 2 : Temperature and humidity conditions in polyshed and open shed at different meteorological weeks of grafting of cashew.

Month	Period	MW	2001-2002								2002-2003							
			Polyshed				Open space				Polyshed				Open space			
			Max. temp. °C	Min. temp. °C	RH I	RH II	Max. temp. °C	Min. temp. °C	RH I	RH II	Max. temp. °C	Min. temp. °C	RH I	RH II	Max. temp °C	Min. temp °C	RH I	RH II
December	17/12-23/12	51	40.5	17.2	87	40	35.2	15.4	92	38	42.5	16.5	93	40	35.6	15.3	91	37
	24/12-31/12	52	41.1	20.3	91	46	31.4	16.2	91	45	38.9	17.8	92	50	32.8	16.2	91	45
January	1/1-7/1	1	40.6	17.9	94	43	33.3	16.5	90	52	39.6	18.6	93	46	32.3	16.8	93	37
	8/1-14/1	2	42.2	18.7	89	40	34.4	16.8	87	50	42.2	21.9	94	46	34.4	19.5	91	38
	15/1-21/1	3	40.8	18	88	47	32.6	16.3	93	41	41.9	19.3	92	40	33.7	17.3	92	35
	22/1-28/1	4	40.9	17.1	88	48	33.4	14.9	92	41	41.8	20.5	93	49	34.7	18.1	94	48
	29/1-4/2	5	41.6	18.6	89	45	33.7	16.4	93	54	41.4	20.7	92	48	34.1	18.4	92	47
February	5/2-11/2	6	41.9	21.4	89	49	34	19.9	92	61	42.7	19.9	92	49	35.6	17.9	90	33
	12/2-18/2	7	43.9	20.6	90	41	35.9	18.2	90	36	43.7	20.4	93	50	35.9	17.8	90	39
	19/2-25/2	8	44.7	20	85	37	36.4	17.9	93	40	44.5	21.5	92	48	35.8	18.9	91	43
	26/2-4/3	9	45.6	19.7	85	36	36.6	17.6	92	48	43.8	23.6	91	36	35.2	21.3	90	51
March	5/3-11/3	10	45.2	22.3	91	36	35.9	21	90	55	45.8	22.5	92	36	36.2	20.9	91	51
	12/3-18/3	11	45.1	24.1	95	37	36.4	22.4	88	55	43.8	20.7	91	39	34.8	18.7	87	47
	19/3-25/3	12	45.1	23.1	95	37	37.6	20.9	89	41	43.2	23.6	91	38	35.6	21.2	84	49
	26/3-1/4	13	46.3	22.8	93	37	35.6	20.8	86	52	47.2	24.2	91	39	36.8	22.4	82	46
April	2/4-8/4	14	46.1	24	89	41	35.3	22.7	83	51	46	24.1	91	42	36.1	22.4	88	48
	9/4-15/4	15	46.3	25	85	36	37.7	25.2	92	51	47.1	23.8	89	38	38.1	22.3	79	43
	16/4-22/4	16	46.3	25.5	85	39	36.6	24.8	90	65	47.1	25.9	87	37	36.8	24.4	82	50
	23/4-29/4	17	45.6	25.8	88	40	36.3	25.1	89	55	45.6	26.9	89	40	36.5	25.3	84	53
	30/4-6/5	18	44.8	26.6	89	38	36.3	26.7	82	57	45.2	26.5	90	41	36	24.7	85	53

Table 3: Correlation coefficient of cashew graft success with temperature and relative humidity under open space and polyshed conditions during two years

Weather parameters	Season 2001-2002		Season 2002-2003	
	Open space	*Polyshed*	*Open space*	*Polyshed*
Max. temp.	-0.113	0.230	-0.442	0.183
Min. temp.	-0.168	0.083	-0.376	0.354
R.H. I	0.174	-0.158	0.650**	-0.037
R.H. II	0.190	0.049	-0.235	0.078

** Correlation is significant at 0.01 level of significance

care was taken uniformly. The observations on graft success were recorded 15 days after grafting and percent success was worked out. Similarly, the data on temperature inside and outside the polyshed was recorded during the sprouting period. The correlation and regression analysis for graft success against variable temperature and humidity conditions was carried out to assess relationship and effectiveness of polyshed conditions for increasing graft take during unfavorable weather, especially, low temperature. Statistical analysis was done by the method described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Effect of polyshed and open space on success of grafting:

From Table 1 it is revealed that there was a wide variation in success of graft on cashew variety, Vengurla-4 due to conditions under which grafts were maintained. In general, there was a higher average grafting percentage (79%) under polyshed conditions during both the years of investigations. Under open air condition average success of grafting was 30 and 41 per cent during 2001-02 and 2002-2003, respectively. Further there was noticeable variation in grafting success according to the meteorological weeks of grafting period. This variation was more marked under open air than the closed polyshed environment. In open air it ranged between 0 (14th MW) to 75 (10th MW) per cent during year 2001-2002 and from 10 (15th MW) to 60 per cent during 2002-2003. The variation in success ranged from 30 to 100 per cent under closed polyshed condition during both years. Shingre *et al.* (2003) reported very low success of grafting in cashew if the grafting is done in July, September, October, November, December and January.

Association of climatic factors with grafting success

The correlation coefficient of grafting success with different climatic factors viz. maximum and minimum temperature as well as relative humidity (Table 2) were not significant under open air as well as closed polyshed conditions when considered separately (Table 3). However, when correlation of graft success was estimated

Table 4: Correlation coefficients of grafting success with temperature and RH ignoring open and polyshed

Sr. No.	*Particulars*	*Coefficient of correlation (r)*	
		2001-2002	*2002-2003*
1.	Graft Success Vs Max. temperature	0.735 **	0.507**
2.	Graft Success Vs. Minimum temperature	0.182	-0.120
3.	Graft success with maximum humidity	0.091	0.428**
4.	Graft success with minimum humidity (%)	-0.35	-0.258
5.	Graft success with difference in maximum and minimum temperature	0.691**	0.525**
6.	Graft success with difference in maximum and minimum humidity	0.273	0.360

** Correlation is significant at 0.01 level of significance

Table 5: Linear regression equations for predicting dependence of grafting success on climatic factors where the correlation are significant

Sr. No.	Factors	Year	Regression equation	Predicted values for	
				100 % success	0 % success
1.	Maximum temperature	2001-2002	y= 0132.156 + 4.734 X	49.04	27.91
		2002-2003	y= 5.406 + 2.836 X	53.00	18.47
2.	Difference in maximum and minimum temperature	2001-2002	y= -47.74 + 5.417 X	27.27	8.81
		2002-2003	y= -19.98 + 4.09 X	29.33	4.88

with whole data of temperature and humidity without considering whether it is open or polyshed condition, a different picture was evident (Table 4).

It is revealed from Table 4 that the success of grafting had high significant positive association with maximum daily temperature. The difference in maximum and minimum daily temperature also had highly significant positive correlation with grafting success. Hartmann and Kester (1976) have emphasized importance of high temperature for successful grafting in horticultural crops.

On the basis of strong linear association of graft success with temperature and humidity the linear regression equations were constructed (Table 5).

These equations served as heuristic models for deciding the climatic determinants of grafting success in cashew variety, Vengurla 4. From these models following points could be resolved.

1. When maximum temperature was around 18.47 °C the success of grafting was almost zero.
2. The success of grafting goes on increasing to the tune of 100 percent with the upper temperature limit of 49 to 53 °C.
3. The graft success is zero when maximum relative humidity (RH I) drops below 79 per cent, whereas with increase in RH I there is increased success to extent of 100 per cent when maximum relative humidity was 98.68 per cent.
4. The difference in maximum and minimum temperature has significant relevance with graft success. When it is 4.88 to 8.81 °C, the success of grafting was zero whereas at 27.27 to 29.33 °C the success was 100 percent.

Thus from above study it is clear that for successful grafting of cashew consistently warm and humid climate is essential component which could be achieved by using polyshed technology.

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