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Influence of Environmental Condition, Planting Media and Scion Storage on the Success of Epicotyl Grafting of Mango (*Mangifera indica* L.) cv Kesar

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Abstract Propagation studies in mango with epicotyl grafting was carried out with three environmental conditions (poly tunnel, net house and under roof), three planting media [laterite soil + vermicompost (1 : 1), clay soil + sand + vermicompost (1 : 1 : 1) and laterite soil + cocopeat + vermicompost (1 : 1 : 1) and two scion storage conditions (0 day i. e. fresh scion and 4 days). The maximum sprouting of grafts (71.44%) was recorded in poly tunnel followed by net house. Sprouting was significantly higher with the use of 0 day stored scion (82.37%) in laterite soil + cocopeat + vermicompost (1 : 1 : 1) media (66.94%). Considering the interaction effect of factors, poly tunnel with media of laterite soil + cocopeat + vermicompost by using fresh scion was found superior for all characters in epicotyl grafting of mango cv Kesar.

Keywords Epicotyl grafting, Environment condition, Planting media, Scion storage, Mango.

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Introduction

Grafting of scion on the germinating seedling in epicotyl grafting has been successfully used as an efficient, economic and rapid method for propagation of mango. India is the largest producer of mango (151.88 lakhs MT) occupies about 2.29 million hectares of area [1]. In Gujarat, the total are under mango cultivation is 1.3 lakhs hectares with 9.11 lakhs MT production. The Valsad district ranks first in area and production among all the districts of Gujarat. The technique has been widely adopted in hot and humid climate of Maharashtra, Gujarat, Karnataka, Tamil nadu and Kerela in general and Konkan region of Maharashtra in particular.

One of the striking advantages of this mehod is that the scion shoot of desired varieties can be collected from distance places, because it can be stored

Table 1. Effect of environmental conditions, planting media and scion storage on number of grafts sprouted and sprouting percentage of grafts in mango cv Kesar.

Treatments		No. of graft sprouted	Sprouting percentage
Environmental conditions (E)			
E_1 : Poly tunnel		17.86	71.44
E_2 : Nethouse		16.79	67.17
E_3 : under roof		14.53	58.11
SEm±		0.28	1.11
CD at 5%		0.79	3.18
Planting media (M)			
M_1 : Laterite soil + Vermicompost (1 : 1)		16.42	65.67
M_2 : Clay soil + Sand + Vermi Compost (1 :1 : 1)		16.03	64.11
M_3 : Laterite soil + Cocopeat + Vermicompost (1 : 1 :1)		16.74	66.94
SEm±		0.28	1.11
CD at 5%		NS	NS
Scion storage (S)			
S_1 : 0 day stored scion		20.59	82.37
S_2 : 4 days stored scion in polythene		12.19	48.78
SEm±		0.23	0.90
CD at 5%		0.65	2.59
Interaction ExM	SEm ±	0.48	1.92
	CD at 5%	NS	NS
Interaction ExS	SEm ±	0.39	1.57
	CD at 5%	NS	NS
Interaction MxS	SEm ±	0.39	1.57
	CD at 5%	1.12	4.50
Interaction ExMxS	SEm ±	0.68	2.72
	CD at 5%	NS	NS
	CV %	7.18	7.18

up to 4 days from which we can get good result up to some days by proving favourable conditions. But in Central and North Indian condition, this method could not be popularized yet. There is need for further studies in different climatic zones before recommending it to nurserymen. The success of epicotyl grafting depends on different factors such as temperature, relative humidity, time of grafting, age of rootstock, planting media, scion storage, method of grafting and the skill of the grafter. Taking into consideration same of the vital aspects of the grafting operations, an attempt was made to study the effect of environment condition, planting media and scion storage on success of epicotyl grafting cv Kesar in South Gujarat.

Table 2. Interaction between E ×S on no. grafts sprouted and survival percentage in epicotyl grafting in mango cv Kesar.

	No. of graft sprouted		Sprouting percentage	
	S_1	S_2	S_1	S_2
E_1	22.51	13.22	90.00	52.89
E_2	20.41	13.16	81.67	52.67
E_3	18.86	10.19	75.44	40.78
SEm±	0.39		1.57	
CD at 5%	1.12		4.50	

Materials and Methods

An experiment was conducted at the Regional Horticultural Research Station, N.AU., Navsari during 2011-12. Grafting was done under three environmental conditions i.e. E_1 (poly tunnel), E_2 (net house) and E_3 (under roof). Three media were tested i. e. M_1 [laterite soil + vermicompost (1 : 1)], M_2 [clay soil + sand + vermicompost (1 : 1: 1)] and M_3 [laterite soil + cocopeat + vermicompost (1 : 1 : 1)].To study the effect of storage of scion, two sets of scion were used i.e. S_1 (0 day or fresh scion) and S_2 (4days stored scion). The experiment was laid out in completely randomized design with factorial concept and three repetitions. Twenty five grafts were prepared in each repetitions of all the eighteen treatment combinations.

The healthy, vigorous seedlings with straight and stout epicotyl (15—20 days) were uprooted along with seed stones without causing much injury to the roots. Healthy, mature terminal shoots of more than 3 months old with plumpy buds were selected as scion from R.H.R.S., Navsari. About 12—15 cm long, straight and pencil size bud woods were served as scion from the mother plant. Same day detached scion sticks and four days detached scion sticks were collected and utilized for epicotyl grafting . Scion sticks were stored with wet sphagnum moss in polythene bags.

The grafts were planted in polythene bags (18 ×22 cm in size) with adequate drainage and they were kept under as per treatment of environment condition. The grafts were observed for initial success (no.of sprouted grafts and sprouting percentage) after confirming that there would not be any more

sprouting. The observations on survival percentage were recorded after six month of grafting. In growth criteria, height of graft were recorded at 2nd, 4th and 6th month of grafting. Correlation of sprouting percentage with weather parameters was also worked out.

Results and Discussion

There was signification effect of environmental condition and scion storage on sprouting of grafts and sprouting percentage (Table 1). Maximum no. of sprouted grafts (17.86) and sprouting percentage (71.44) were recorded under poly tunnel condition followed by net house. The reason behind the better performance of poly tunnel is due to high percentage of humidity as well as moderate temperature under poly house which may be suitable for new parenchymatous callus proliferation between rootstock. The favourable conditions resulted in early union of stock and scion and higher growth of grafts.

Planting media was unaffected on sprouted graft and sprouting percentage. However, M_3 [Laterite soil + Cocopeat +vermicompost (1 : 1 : 1)] media was found effective for maximum no.of sprouted grafts (16.74) and sprouting percentage (66.94) followed by M_1. This is due to better aeration and drainage in M_3 media which helped in better growth.Significant effect of media was noted by Savasi [2] in mango cv Kesar.

Regarding scion storage, significantly more no. of sprouted grafts (20.59) and sprouting percentage (82.37) were recorded with using of fresh scion as compared to 4 days stored scion. The maximum sprouting of grafts due to fresh scion, which was rich in food materials and other metabolites at this stage and metabolized the food materials in required quantity for new tissue formation and helped in healing the wounds by producing parenchymatous cells in the cambial region of the graft joint and thus better union occurred. All interaction effect was found non-significant except E × S. (Table 2) . Poly tunnel with using of fresh scion (E_1 S_1) was significantly superior for no. of sprouted graft and sprouting percentage.

The results revealed that the environment condition was found significant for survival of grafts and survival percentage at 6 MAG in mango cv Kesar (Table 3 and Fig. 1). Among three environmental conditions, poly tunnel gave better results for more no. of survival grafts (16.06) and survival percentage (64.22). This is due to higher humidity under poly tunnel resulted into escaping of buds from drying , minimum percentage of survival was noted in under roof condition (E_3), it could be attributed to greater variation in temperature and humidity. This findings are also confirmity with earlier [3—4]. The effect of planting media was found significant for survival of grafts and survival percentage. The maximum number of survival of grafts (15.12) and survival percentage (60.48) was found under laterite soil + cocopeat + vermicompost (1 : 1 : 1) (M_3) media . This might be due to better aeration, humidity, drainage and porosity in M_3 media for growth which is

Table 3. Effect of environmental condition, planting media and scion storage on number of grafts survival and survival percentage of epicotyl grafting of mango cv Kesar at 180 DAG.

Treatments		No. of graft survival	Survival percentage
Environmental conditions (E)			
E_1 : Poly tunnel		16.06	64.22
E_2 : Nethouse		14.60	58.41
E_3 : under roof		12.30	49.21
SEm±		0.21	0.82
CD at 5%		0.59	2.36
Planting media (M)			
M_1 : Laterite soil + Vermicompost (1 : 1)		14.97	59.87
M_2 : Clay soil + Sand + Vermicompost (1 : 1 : 1)		12.87	51.49
M_3 : Laterite soil + Cocopeat + Vermicompost (1 : 1 :1)		15.12	60.48
SEm±		0.21	0.82
CD at 5%		0.59	2.36
Scion storage (S)			
S_1 : 0 day stored scion		16.85	67.43
S_2 : 4 days stored scion in polythene		11.78	47.13
SEm±		0.17	0.67
CD at 5%		0.48	1.92
Interaction E × M	SEm ±	0.36	1.42
	CD at 5%	1.02	4.07
Interaction E × S	SEm ±	0.29	1.16
	CD at 5%	0.83	3.33
Interaction M × S	SEm ±	0.29	1.19
	CD at 5%	0.83	3.33
Interaction E × M × S	SEm ±	0.50	2.01
	CD at 5%	NS	NS
	CV %	6.08	6.08

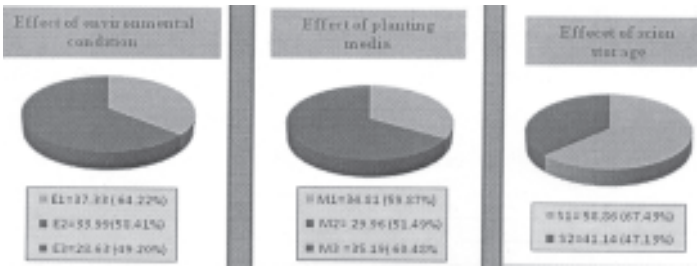

Fig. 1. Effect of environment condition, planting media and scion storage on survival percentage in epicotyl grafting of mango cv Kesar after 180 days of grafting.

responsible for higher success and survival of grafts. Regarding scion storage, the S_1 (fresh scion) was found significant for highest no. of survival grafts (16.85) and survival percentage (67.43) as compared to S_2 scion (4 days stored scion). This might be due to higher reserves of food substances along with abundant supply of carbohydrates, increased the rate of photosynthesis and resulted in luxuriant vegetative growth, leading to maximum survival and success of grafts. Regarding interaction, first order interaction (E × M, E × S and M × S) was found significant for number of graft survival and survival percentage 6 MAG in mango (Table 4). The treatment combination of E_1M_3, E_1S_1 and M_3S_1 were found better for both the parameters in interaction of E × M, E × S and M × S, respectively.

There was significant variation in height of graft at 2nd, 4th and 6th month of grafting in each individual factor (Table 5). The maximum height of graft was found under poly tunnel condition during six months. This might be due to favourable condition for shoot growth and enrichment of CO_2 level that helps to build up maximum photosynthetics. The poly tunnel provides comparatively higher relative humidity as well as moderate temperature. These favorale conditions resulted in faster growth of grafts. The findings of present studies are in consonance with those of Savani [2]. Maximum value of height of grafts was found under laterite soil + cocopeat + vermicompost (1 : 1 : 1) (M_3) media. The maximum growth of grafts due to better drainage aeration in M_3 media. Moreever, the vermicompost release the nutrients

Table 4. Interaction between E × M and E × S on number of graft survival and survival percentage in epicotyl grafting in mango cv Kesar at 180 DAG

	No. of graft survival			Survival percentage			No. of graft survival		Survival percentage	
	M_1	M_2	M_3	M_1	M_2	M_3	S_1	S_2	S_1	S_2
E_1	16.24	14.36	17.57	64.95	57.43	70.29	19.03	13.07	76.13	52.32
E_2	15.26	13.26	15.24	61.05	53.24	60.95	17.22	11.98	68.89	47.94
E_3	13.40	10.95	12.05	53.62	43.81	50.19	14.31	10.29	57.27	41.14
SEm ±		0.36			1.42			0.29		1.16
CD at 5%		1.02			4.07			0.83		3.33

	No. of graft survival		Survival percentage	
	S_1	S_2	S_1	S_2
M_1	17.15	12.78	68.63	51.11
M_2	15.00	10.74	60.00	42.98
M_3	18.41	11.82	73.65	47.30
SEm ±	0.29		1.16	
CD at 5%	0.83		3.33	

Table 5. Effect of environmental conditions, planting media and scion storage on height of graft at 2nd 4th and 6 th MAG in mango cv Kesar. MAG – Month after grafting.

Treatments	Height of graft (cm) 2 MAG	4 MAG	6 MAG
Environmental conditions (E)			
E_1 : Poly tunnel	19.55	24.78	29.05
E_2 : Nethouse	19.00	23.78	28.06
E_3 : under roof	18.77	23.61	26.33
SEm±	0.21	0.29	0.33
CD at 5%	0.61	0.82	0.95
Planting media (M)			
M_1 : Laterite soil +Vemicompost (1 : 1)	19.33	24.00	27.39
M_2 : Clay soil + Sand + Vermicompost (1 : 1 :1)	18.55	23.17	26.72
M_3 : Laterite soil + Cocopeat + Vermicompost (1 : 1 : 1)	19.44	25.00	29.33
SE m ±	0.21	0.82	0.95
CD at 5%	0.61	0.82	0.95
Scion storage (S)			
S_1 : 0 day stored scion	21.30	25.93	29.07
S_2 : 4 Days stored scion in polythene	16.93	22.19	26.56
SEm ±	0.17	0.23	0.27
CD at 5%	0.49	0.67	0.78
Interaction E × M SEm ±	0.36	0.49	0.57
CD at 5%	NS	NS	NS
Interaction E × S SEm ±	0.30	0.40	0.46
CD at 5%	NS	NS	NS
Interaction M × S SEm +	0.30	0.40	0.46
CD at 5%	NS	NS	NS
Interaction E × M × S SEm ±	0.52	0.70	0.81
CD at 5%	NS	NS	NS
CV%	4.72	5.06	5.06

uptake and cocopeat provides the porosity to the soil and improved the physical status of soil. The results are in line with [2] in mango cv Kesar. Among the scion storage, fresh scion was found significant for maximum height of graft. This might be due to higher reserve food material ample supply of carbohydrate for proper completion of graft union which controls the metabolic activities and encouraged faster growth of sprouted grafts. All interactions were found non significant with respect to height of grafts during six months.

Conclusion

An experiment was under taken to study the effect of environmental condition, planting media and scion storage on epicotyl grafting of mango cv Kesar. Poly tunnel condition was found better with respect to sprouting percentage. Whereas, in scion storage period, fresh scion was found superior than 4 days stored scion. From the point of greater success and good growth the treatment combination of poly tunnel with planting media of laterite soil + cocopeat + vermicompost (1 :1 :1) by using fresh scion in grafting was the best of all.

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