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Original Research Article

Effect of Different Scion Varieties of Mango on Growth and Biomass Production per Formance of Stone Grafts (*Mangifera indica* L.)

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A B S T R A C T

The experiment was conducted during the year 2011-12, at Department of Horticulture, College of Agriculture, Latur, with the object to study the success and initial growth performance of stone grafts of some important varieties of mango under net house condition. The experiment consists of nine different varieties of mango namely Totapuri, Pairi, Neelum, Mallika, ParbhaniHapus, Hur, Kesar, Dashehari and Amrapali as treatments and replicated thrice in Completely Randomized Design (CRD). The results of present investigation clearly showed that, grafts of different mango varieties studied had a significant influence on the maximum values of growth parameters like height of sprout (6.02 cm), length of shoot (27.97 cm), length of tap root (35.30 cm), length of secondary roots (23.73 cm), fresh (8.41 g) and dry (4.94 g) weight of root were also observed in grafts of variety Mallika and it was closely followed by grafts of variety Kesar. The other growth parameters like graft diameter (0.81 cm), fresh (16.29 g) and dry (8.75 g) weight of shoot and shoot: root ratio were found maximum in grafts of variety Kesar. However, the highest leaf area (423.84 cm^2) was recorded in variety Dashehari and it was at par with variety Kesar (418.66 cm^2) and Amrapali (404.34 cm^2). The maximum value of stionic ratio (0.93) was recorded in grafts of variety Pairi and it was at par with variety Amrapali (0.91) and it was minimum in grafts of variety Dashehari (0.79).

Keywords

Mango, Rootstock, Scion, Grafting

Introduction

Mango (*Mangifera indica* L.) belongs to family Anacardiaceae, originated in South East Asia. It is tropical fruit crop largely grown in tropical regions of the world. It is one of the choicest fruit of India, grown in almost all states occupying more than 50 per cent of total area under fruit crops in the country. Mango is a highly cross pollinated heterozygous plant. In ancient time, mango was mostly propagated by stones. The stone propagated plants have long juvenile phase and poor quality performance. Therefore, it needs to be propagated vegetatively to produce true to type progeny. Now a days, the grafting technique has become commercially popular in India and generally the rootstocks are produced from the stone of monoembryonic non-descriptive local trees used. In arid and semi–arid regions, the mango stones are available during the drier parts of the year (April-June) because of which the germination percentage and vigour in these localities is very low. It is reported that graft-take is high during September month in these areas. In order to get genetically uniform, true to type quality

planting material, mango should be propagated vegetatively, which would be the greatest single step for increasing mango production. Although there are various methods of grafting and budding, only some of them give a high percentage of success. In recent years mango has been propagated by several methods with varying degree of success. The main methods being used are inarching, veneer grafting, side grafting, stone grafting and soft wood grafting etc. Among these methods the soft wood grafting is one of the best methods being used for large scale multiplication of plants (Gaur 1985). However, this method required rootstocks of one year old, hence it becomes difficult for the nurseryman to maintain the rootstock for long period. Hence, through the stone grafting gives comparative less success but it coincides the ideal period of grafting i.e. August-September month, this method popular among the nurseryman's as it requires less time, labour and cost of production of grafts. The comparative performance of trees propagated by different methods was also studied by Ram and Sirohi (1988) showed that, the trees propagated by stone grafting produced maximum cumulative growth and yield as compared to trees produced by inarching and veneer grafting. During last few years, the interest of the growers is increasing towards the cultivation of fruit crops in general and mango in particular because of intensives ssbeing given by the Government for the same. This has resulted in an increased demand for planting material. In order to meet this demand in different fruit crops, the production of large quantity and good quality planting material has become the need of the day. Stone or Epicotyl grafting of mango has draw the attention of horticultural scientists and farmers during last decade, as it has several advantages over other methods. There is need of studying the success of this method under different agro climatic conditions in various commercially grown cultivars of mango. The information about the success of stone grafting in different varieties of mango under Marathwada condition is lacking. Hence the experiment was conducted "Studies on growth performance of stone grafts of different scion varieties in mango (*Mangifera indica* L.)", under Marathwada condition.

Materials and Methods

An investigation was conducted during the year 2011-12, at Department of Horticulture, College of Agriculture, Latur, with the object to study the effect of different scion varieties of mango on growth per formance of stone grafts (*Mangifera indica* L.) under net house condition. The experiment consists of nine different varieties of mango namely Totapuri, Pairi, Neelum, Mallika, Parbhani Hapus, Hur, Kesar, Dashehari and Amrapali as treatments and replicated thrice in Completely Randomized Design (CRD).

Results and Discussion

The results regarding diameter of graft indicated that in Table 1, the highest graft diameter (0.81cm) was recorded in variety Kesar followed by variety Mallika (0.77 cm). While, the minimum graft diameter (0.69cm) was recorded in variety Hur. The performance of scion depends upon stionic compatibility with rootstock and the perfectness of union. These results are in accordance with the report of Madalageri *et al.,* (1989) who reported that, the maximum graft diameter (4.1 mm) was in variety Allamour Baneshan. While, the minimum (3.3 mm) in variety Alphanso and Dashehari.

The results of present investigation revealed significant variation with respect to stionic

ratio (Table 2) which varied from (0.79 to 0.93). The highest stionic ratio was recorded in variety Pairi. While, the lowest was recorded in Dashehari. The maximum stock: scion ratio might be due to better compatibility of stock and scion. The results regarding survival percentage of grafts after 180 days of grafting showed significant differences among scion varieties tried. The maximum graft survivability (76.95 per cent) was recorded in variety Mallika. While, the minimum graft survivability (37.84%) was recorded in variety Pairi. The results on similar line are also reported by Somkumar (2009) and Deshmukh (2011) in grapes.

The result of present study revealed significant variations with respect to total length of grafted plant (Table 3) among the different varieties tried. The maximum length of grafted plant (63.27 cm) was recorded in variety Mallika. While, the minimum length (36.74 cm) was observed in variety Neelum. The maximum length of grafted plants of variety Mallika might be due to higher length of tap root and more shoot length.

The result of present investigation revealed that, the significant variations with respect to length of shoot of graft (Table 3) among the different varieties tried. The maximum length of shoot (27.97 cm) was observed in variety Mallika. While, the minimum length of shoot (18.33 cm) was observed in Parbhani Hapus. The variation in shoot length in stone grafts of different varieties of mango was also reported by Alam *et al.*, (2000) under Bangladesh conditions.

The results regarding different biomass characters of grafts presented in (Table 4, 5 and 6) like length of root, weight of root, weight of shoot and shoot: root ratio has also shown significant differences. The maximum length of tap root (35.30 cm) was observed in grafts of variety Mallika and it was followed by Pairi. The minimum length of tap root (15.70 cm) was observed in grafts of variety Dashehari. The length of secondary roots was maximum (23.73 cm) in variety Mallika followed by Kesar (23.63 cm) while, the minimum (9.63 cm) was recorded in grafts of variety Amrapali. The number of secondary roots were maximum (39.33) in grafts of variety Pairi which was followed by Mallika (35) while, the lowest (14) were recorded in grafts of variety Parbhani Hapus. Significantly maximum fresh weight (8.41 g) and dry weight of roots (4.92 g) was recorded in variety Mallika and it was minimum in variety Totapuri. Significantly maximum fresh weight (16.29 g) and dry weight (8.75 g) of shoot was recorded in grafts of variety Kesar. While it was minimum in grafts of variety Totapuri.

The maximum shoot: root ratio on fresh (2.64) as well as dry (2.85) weight basis was recorded in grafts of variety Kesar. However, the lowest values of these parameters were observed in grafts of variety Pairi. The highest shoot: root ratio (2.85) on dry weight basis was recorded in variety Kesar. While, the lowest shoot: root ratio was (1.43) in Pairi. The highest shoot: root ratio in variety Kesar could be attributed to its high dry weight of shoot and comparatively lower dry weight of roots which intern leads to higher shoot: root ratio. Lowest shoot: root ratio in variety Pairi might be due to more dry weight of roots with moderate dry weight of shoot.

Graft diameter (cm)

Graft diameter depend on the performance of scion depends upon stionic compatibility with rootstock and the perfectness of union. The variation might be due to the early healing of graft union, which influences the

faster physiological development of the plant that might have accelerated meristematic activities near the graft union leading to the accumulation of stored metabolites at the graft union.

Stionic ratio

The highest stionic ratio was recorded in variety Pairi. While, the lowest was recorded in Dashehari. The maximum stock: scion ratio might be due to better compatibility of stock and scion. The good stock-scion compatibility helps in better transfer of food material from leaf to other plant parts.

Survival percentage of graft (%)

The maximum graft survivability (76.95 per cent) was recorded in variety Mallika. While, the minimum graft survivability (37.84%) was recorded in variety Pairi.

The maximum survival in variety Mallika could be attributed to early healing of graft union, more number of leaves, maximum leaf area and strong vegetative growth on account of better root development in the grafts of this variety as different root parameters like length of tap root, secondary roots were also maximum in the grafts of this variety. Better root growth might have supplied required quantum of water and nutrients needed for strong vegetative growth of the grafts, which might have resulted in the higher survival percentage in grafts of this variety.

Root studies

The maximum length of grafted plants of variety Mallika might be due to higher length of tap root and more shoot length.

The maximum length of shoot in variety Mallika could be attributed to early healing of graft union and more number of leaves with maximum leaf area which might have resulted into higher production of carbohydrates required for the growth and developmental activities of shoot.

The higher length of tap root in variety Mallika may be due to need of more water and nutrients for faster vegetative growth which might have forced the higher root activity that might have resulted into better root growth in grafts of this variety.

The maximum length of secondary roots might be in Mallika due to good compatibility in between stock and scion which resulted into strong development of tap root and to absorbed more quantum of water and nutrients needed for strong vegetative growth might have resulted into production of more length of secondary roots.

Biomass study

The production of maximum fresh weight of shoot in variety Kesar might be due to high diameter of graft indicating better compatibility to the rootstock which has helped for better movement of solutes from roots to shoot and from shoot to roots resulting in optimum growth of the grafts and higher accumulation of carbohydrates in plant body which might have contributed to higher shoot weight.

The maximum fresh weight of roots was recorded in variety Mallika. The minimum fresh weight of roots was recorded in Parbhani Hapus. The higher fresh weight of roots in variety Mallika could be attributed to more length of tap root and maximum number of secondary roots which might resulted in development of strong root system leading to more fresh weight of roots in the grafts of this variety.

Table.1 Graft diameter (cm) of different varieties of mango at different growth stages

T. No.	Varieties	Graft Diameter (cm)					
		30 DAG	60 DAG	90 DAG	120 DAG	150 DAG	180 DAG
T_1	Totapuri	0.62	0.64	0.67	0.69	0.71	0.74
T_2	Pairi	0.60	0.63	0.65	0.68	0.70	0.73
T_3	Neelum	0.62	0.65	0.67	0.70	0.72	0.75
T_4	Mallika	0.60	0.63	0.65	0.68	0.71	0.77
T_5	Parbhani Hapus	0.62	0.63	0.68	0.71	0.72	0.75
T_6	Hur	0.60	0.62	0.63	0.64	0.66	0.69
T_7	Kesar	0.63	0.65	0.72	0.75	0.77	0.81
T_8	Dashehari	0.61	0.63	0.66	0.69	0.71	0.74
T_9	Amrapali	0.59	0.60	0.63	0.65	0.68	0.71
	S.E.±	0.01	0.01	0.01	0.01	0.01	0.01
	CD at 5 %	NS	0.03	0.03	0.04	0.03	0.04

Table.2 Stionic ratio and survival percentage of grafts of different mango varieties at 180 days

T. No.	Varieties	Diameter of rootstock (cm)	Diameter of scion (cm)	Stionic ratio	Survival Percentage (%) at 180 DAG
T_1	Totapuri	0.65	0.74	0.88	40.26
T_2	Pairi	0.68	0.73	0.93	37.84
T_3	Neelum	0.62	0.75	0.83	56.24
T_4	Mallika	0.62	0.77	0.81	76.95
T_5	Parbhani Hapus	0.60	0.75	0.80	66.96
T_6	Hur	0.59	0.69	0.86	43.87
T_7	Kesar	0.67	0.81	0.83	75.62
T_8	Dashehari	0.59	0.74	0.79	71.58
T_9	Amrapali	0.65	0.71	0.91	68.99
	SE+_	0.09	0.01	0.01	1.38
	CD at 5 %	NS	0.03	0.04	4.20

Table.3 Total length of grafted plant (cm) and Length of shoot (cm) in different varieties of Mango

T. No.	Varieties	Total length of grafted plant (cm)	Length of shoot (cm)
T_1	Totapuri	38.1	19.2
T_2	Pairi	52.77	22.37
T_3	Neelum	36.74	20.53
T_4	Mallika	63.27	27.97
T_5	Parbhani Hapus	38.20	18.33
T_6	Hur	39.97	21.9
T_7	Kesar	48.86	27.33
T_8	Dashehari	39.40	23.7
T_9	Amrapali	45.47	20.67
	S.E.±	0.64	0.56
	CD at 5 %	1.94	1.69

Table.4 Variations in root parameters of grafts of different varieties of mango

T. No.	Varieties	length of tap root (cm)	Length of Secondary root (cm)	Number of secondary roots (no.)
T_1	Totapuri	18.9	13.6	21.33
T_2	Pairi	30.4	21.5	39.33
T_3	Neelum	16.20	13.0	20.67
T_4	Mallika	35.30	23.73	35.00
T_5	Parbhani Hapus	28.46	11.93	14.00
T_6	Hur	17.46	16.16	19.67
T_7	Kesar	21.53	23.63	14.33
T_8	Dashehari	15.70	13.5	30.33
T_9	Amrapali	24.8	9.63	25.66
	SE± CD at 5 %	0.46 1.40	0.14 0.42	1.40 4.23

Table.5 Fresh weight of root, fresh weight of shoot and shoot: root ratio in grafts of different varieties of mango

T. No.	Variety	Fresh weight of shoot (g)	fresh weight of root (g)	Shoot: root ratio
T_1	Totapuri	9.65	5.99	1.61
T_2	Pairi	10.53	7.80	1.35
T_3	Neelum	9.79	6.39	1.53
T_4	Mallika	15.85	8.41	1.88
T_5	Parbhani Hapus	11.19	5.33	2.09
T_6	Hur	13.31	6.88	1.93
T_7	Kesar	16.29	6.17	2.64
T_8	Dashehari	14.36	7.22	1.99
T_9	Amrapali	12.02	7.12	1.69
	SE± CD at 5 %	0.09 0.28	0.04 0.13	0.03 0.10

Table.6 Dry weight of root, dry weight of shoot and shoot: root ratio in grafts of different varieties of mango

T. No.	Variety	Dry weight of shoot (g)	Dry weight of root (g)	Shoot: root ratio
T_1	Totapuri	4.78	2.76	1.73
T_2	Pairi	5.66	3.95	1.43
T_3	Neelum	5.12	3.21	1.59
T_4	Mallika	7.87	4.92	1.60
T_5	Parbhani Hapus	5.82	2.77	2.10
T_6	Hur	6.93	3.50	1.98
T_7	Kesar	8.75	3.07	2.85
T_8	Dashehari	7.04	3.74	1.88
T_9	Amrapali	6.17	4.2	1.47
	SE± CD at 5 %	0.02 0.06	0.02 0.06	0.01 0.04

The high shoot: root ratio on fresh weight basis in variety Kesar indicating the strong vegetative growth and better adaptability of that variety for the given environmental conditions. As the Kesar variety has acclimatized well under semi-arid conditions of Marathwada might have resulted in production of high shoot: root ratio of grafts and shown promising performance under these conditions.

The production of maximum fresh weight of shoot in variety Mallika has resulted in production of maximum dry weight of shoot in grafts of this variety. The higher dry weight of roots in grafts of variety Mallika may be due its high fresh weight of roots.

The highest shoot: root ratio (2.85) on dry weight basis was recorded in variety Kesar. While, the lowest shoot: root ratio was (1.43) in Pairi. The highest shoot: root ratio on dry weight basis in variety Kesar could be attributed to its high dry weight of shoot and comparatively lower dry weight of roots which intern leads to higher shoot: root ratio. Lowest shoot: root ratio in variety Pairi might be due to more dry weight of roots with moderate dry weight of shoot, as dry weight of plants gives the idea of accumulation of carbohydrates in the plant body. The results of present studies clearly showed that the maximum dry matter was produced in grafts of variety Mallika and which was closely followed by grafts of Kesar variety indicating better root and shoot growth leading to vigorous growth of the grafts under a given climatic conditions. However, scanning of available literature could not throw any light on these aspects of the present study.

It is clear from the results and discussions of the present investigation, that the performance of grafts of Mallika and Kesar varieties was found superior at nursery stage as grafts of these varieties have required comparatively well survival percentage. The growth parameters like graft diameter and shoot: root ratio were found maximum in these varieties. The root and biomass characters were also significantly superior in grafts of said varieties. Hence, it can be concluded that, for large scale multiplication of mango plants through stone grafting, the scion wood of Mallika and Kesar varieties may be used, as grafts of these varieties have recorded maximum success and higher values of growth parameters.

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References

Alam, M.N. Islam, M.S., Uddin, M.Z., Barman, J.C. and Quamruzzaman 2000. Effect of age of seedling and variety of scion in stone grafting of mango. *Indian J. Sustain. Crop. Prod.,* 1(2): 27-32.

Deshmukh. S. 2011. Performance of clones of wine grape varieties grafted on various rootstocks. M.Sc. (Horti.) Thesis submitted to Marathwada Krishi Vidyapeeth, Parbhani.

Gaur, N.V.S. 1985. Comparative evaluation of selected methods of mango propagation *Punjab J. Horti.,* 25:1-8.

Madalageri, M.B., Huamani, N.G. and Patil, V.R. 1989. Response of mango varieties and hybrids to epicotyl grafting. *Prog. Horti,* 20 (3-4): 173-175.

Ram, S. and Sirohi, C. 1988. Performance of Dashehari mango trees propagated by different vegetative methods. 1988. *Acta Horticulture,* 231:210-215.

Somkuwar, R. G., Satisha, J. and Ramteke, S. D. 2009. Graft performance of Thompson seedless grape though wedge grafting on different rootstocks. *Indian J. Hort*., 66 (3): 383-38.