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Effect of the Softwood grafting on physical characters of different grafted scion on the Rootstock of Mango (*Mangifera indica* L.) under the protected condition of Kanpur region.

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Abstract

The experiment was conducted during the year 2021-22, at Fruit Research Farm, Rama University, Kanpur. with the object to study the success and initial growth performance of grafts of some important varieties of mango under net house condition. The experiment consists of ten different varieties of mango Amrapali, Kishan Bhog, Gulab khas, Kesar, Totapuri, Dasheri ,Malgoa , himsagar ,Nisar Pasand & Bombay Green 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 Graft Diameter (23.80 mm), scion diameter **(**17.35 mm), rootstock diameter (20.06 mm), length of grafted plant (88.71 cm), survival percentage at 150 DAG (90.00%) were recorded maximum in the graft of variety Dasheri while Stionic ratio was found best in the graft of variety Gulab khas (0.90)

Keywords: Mango, Rootstock, Scion, Grafting, Monoembryonic.

Introduction

Mango is very well-adapted to tropical and subtropical climates and it thrives well in almost all regions from the sea level to an altitude of 1400 meter. The mango tree is hardy in nature and it can endure even the temperature as high as 48 °C rainfall and high humidity during flowering and fruit development reduces fruit yield. It is grown widely, and it prefer a warm frost free climate with a well-drained (soil pH = 5.5 - 7.5), winter dry season and temperature ranging from 24-27 °C and the annual rainfall 400-3600mm (16-142 inch). It does not do well beyond a pH of 7.5.

Mango grafts are typically raised on unidentified seedling rootstocks, which causes variance among the grafts. To have uniform development, high yield, good quality fruits, and dwarf stature of plants for high density planting, it is crucial to standardise the rootstocks for various mango cultivars in various agro climatic areas. This is conceivable if the rootstocks are grown asexually or using polyembryonic rootstocks, which are true types since they originated from nuclear tissues. It is also well known that rootstocks had a significant impact on most fruit crops' growth, subsequent fruit-bearing habits, and fruit quality. Therefore, it is necessary to choose the appropriate rootstocks from the available varieties locally. Since these are used

as rootstock for grafting and budding, raising of rootstocks and proper use of rootstocks is equally important.

For commercial plantations, mango is mostly grown vegetatively through side grafting and wedge grafting, which are more effective and affordable techniques than other forms of vegetative multiplication. Mango plants propagated via wedge grafting are ready for planting in around six months as opposed to a year with side grafting. The performance of a compound horticultural tree is determined by both rootstock and the scion (Bose *et al.*, 1991). The majority of mango trees are grafted trees that are typically cultivated in commercial orchards or in kitchen gardens. Each tree is made up of two parts: the rootstock, which provides the root system, and the scion, which forms the tree canopy. These two components are equally important to the survival of a tree. Grafting is a common and preferred vegetative propagation method for mango trees Bally (2006). Furthermore, proper alignment of scion and rootstock cambium tissues could determine the graft success Pina and Errea (2005).

Softwood grafting, a form of vegetative propagation that is effective, economical, quick, and can produce grafts in as little as a year, offers distinct advantages over other approaches. Therefore, softwood grafting results in better and more uniform orchard installations, initial success, and a reduced risk of death

For grafted plants to survive, graft healing and acclimation during the grafting process are crucial. Therefore, the development of callus tissue followed by the union of vascular tissues is necessary for the successful union of the scion and rootstock. Successful grafting take and subsequent growth of scion shoot and development depend on a number of factors including scion variety, rootstock materials, and prevailing environmental conditions. (Hartmann *et al.*, 1997).

Rootstocks, whether zygotic or nucellar, are always seedlings at their core. Monoembryonic non-descriptive seedlings are frequently utilised in India, in particular. Depending on where they are replicated and the environment, monoembryonic seedlings exhibit enormous variations in germination and vigour. Mango stones are only available in dry and semi-arid areas during the drier months of the year (April–June), which has a negative impact on the vigour and germination rates in these areas. According to reports, these regions have high graft-take during the month of September. The rootstocks raised during september months will not attain desirable girth and growth of grafting, thereby reducing the success of graft take and further survivability of grafted plants. (Kumar *et al.* 2008a).

MATERIALS AND METHODS

This chapter contains the details of methodology and materials used during the experimentation. The investigation entitled “Effect of the Softwood grafting on physical characters of different grafted scion on the Rootstock of Mango (*Mangifera indica* L.) under the protected condition of Kanpur region was conducted during 2021-2022 at the Fruit Research Farm, Rama University, Kanpur

3.3 Materials:

The Scion has been arranged from Central Institute of Subtropical Horticulture (CISH), Lucknow and the rootstock from local Nursery in Kanpur. There will be 10 varieties of Scion (each 30 in number) and will be grafted on the polyembryony rootstock of Mango.

3.4 Selection of scion material:

The mother plant used were selected which was disease free and 6 months to 12 months old, The scion shoots of 25-30 cm length with 3 – 4 healthy buds were used for grafting. Selected scion shoots were

defoliated on the mother plant about 5 – 7 days prior to detachment and at the same time, the apical growing portion of selected shoots were also beheaded which helped in forcing the dormant buds to swell.

3.5 Raising of rootstock

To raise the rootstock nursery, fully riped desi mango fruits/stones were collected from disease free, healthy, well managed and actively growing mango trees. One of the area's well-known model farmers provided the native rootstocks, and he managed them according to suggested cultural practises. Local types are typically favoured as rootstocks due to their disease resistance and environmental adaptation. Stones were collected, cleaned with fresh water, and treated with 10 grammes of carbendazim in 10 litres of water. In the month of August, stones were sowed in elevated beds with a 10 cm 5 cm spacing, vertically. The stones germinated in two to three weeks, and following germination, the seedlings and stones were moved to the nursery beds after the leaves had turned brown and had grown to a quarter of their original size. At the time of transplanting, the tap roots of these seedlings were pruned by retaining most of the fibrous roots. These transplanted seedlings were regularly watered and protected from the frost during winter season. Seedlings resumed growth in the end of February or beginning of March and became graftable from March onwards.

Softwood grafting technique

The top fresh growth (Bronze coloured shoots) developed on the rootstock was decapitated with sharp knife. After this, a longitudinal cut of 5 cm in length was given on the terminal trimmed shoot. The top of the rootstock appeared like the letter 'V'. The leaves below the 'V' cut were kept intact. A scion that was around the same thickness as the rootstock's severed shoot was chosen. The utilised scion was about 12 cm long. By shaving off the bark and a small amount of wood from the two opposing sides, the bottom end of the scion was transformed into a gently sloping wedge measuring about 5 cm. On the remaining two sides, care was taken to preserve the bark. A 1.5 cm wide by 45 cm long, 200 gauge thickness white translucent polythene tape was used to tightly fasten the wedge-shaped scion that had been manufactured in the manner described above. The scion on newly made graft were covered with small transparent polythene covers to avoid the desiccation of scions, by creating humidity near and above the graft union region.

After care of the graft

The polythene bags holding the grafted mango plants were kept in some shade. Regular watering of the plants was done with care made to ensure that water did not reach the graft union area. When sprouts began to emerge on the scion, the translucent polythene covers that had been placed on it after grafting were removed. When observed, sprouts that appeared on the rootstock beneath the graft union were routinely removed. Regular prophylactic pesticide spraying was also applied to control pest attacks.

RESULTS AND DISCUSSION

The results of the investigation regarding the influence of scion varieties and rootstock on growth of mango have been presented in tables, graphically illustrated through bar-diagrams, wherever required, and discussed in the light of the findings reported by earlier researchers. The findings have been divided into the following sub-headings:

Graft diameter

The maximum graft diameter was recorded in Dasheri (23.80 mm) followed by Amarpali, Totapuri, Malgoa, NisarPasand and Himsagar, whereas the minimum graft diameter was found in Kesar (15.80 mm).. Similar trend of increase in girth of plant was recorded by Mukherjee and Mujumdar (1964) and Mane *et al.,* (2020) .

Scion diameter

The maximum scion diameter was recorded in Dasheri (17.35 mm) followed by Amarpali, Gulabkhas, Totapuri, Malgoa, Himsagar and NisarPasand, whereas the minimum scion diameterwas found in Kesar (11.98 mm.). These results are also similar with Nalage and Padhiar (2010) and Shivaram *et al.* (2018).

Rootstock Diameter

The maximum rootstock diameter (20.06 mm) was recorded in Dasheri followed by Amarpali, Gulabkhas, Totapuri, Malgoa, Himsagar and NisarPasand, whereas the minimum scion diameter (14.00 mm) was found in Kesar. These results are also similar with Nalage and Padhiar (2010) and Shivaram *et al.* (2018).

Stionic Ratio

The maximum stionic ratio (0.90) was recorded in Gulabkash followed by Kishanbhog, Kesar, NisarPasand and Bombay Green, whereas the minimum stionic ratio (0.73) was found in Totapuri . The highest stock to scion ratio may be a result of stock and scion's improved compatibility. Better food material movement from leaves to other plant components is made possible by the stock-scion compatibility Bobade *et al.,* (2018).

Length of grafted plant

At 150 DAG, the maximum total length grafted plant 88.71 cm) was recorded in Dasheri followed by Malgoa, Himsagar, NisarPasand and Gulabkhas, whereas the minimum total length grafted plant (69.24 cm) was found in Totapuri .. These results are also similar with Patel *et al*., (2010) and Praveena *et al.*, (2018) in polyhouse, Sivudu *et al*., (2014) in shade net.

Survival % at 150 DAG

The maximum survival percent of grafted plant at 150 DAG (90.00) was recorded in Dasheri followed by Totapuri, Amarpali, NisarPasand, Bombay Green and Malgoa, whereas the minimum survival percent of grafted plant at 150 DAG (20.00) was found in Kishanbogh .

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Table 1. Effect of the Softwood grafting on physical characters of different grafted scion on the Rootstock of Mango (*Mangifera indica* L.) under the protected condition of Kanpur region

Varieties	Varieties name	Graft Diameter	Scion diameter	Rootstock Diameter	Stionic Ratio	Length of grafted plant	Survival % at 150 DAG
V_1	**Amarpali**	20.79	15.05	18.75	0.80	76.94	58.33
V_2	**Kishanbhog**	17.04	13.02	15.16	0.86	69.24	31.67
V_3	**Gulabkhas**	19.00	15.11	16.86	0.90	78.51	55.00
V_4	**Kesar**	15.80	11.98	14.00	0.86	73.42	20.00
V_5	**Totapuri**	18.03	14.00	19.31	0.73	77.26	61.67
V_6	**Dasheri**	23.80	17.35	20.06	0.87	88.71	90.00
V_7	**Malgoa**	20.83	13.90	18.37	0.76	86.25	63.33
V_8	**Himsagar**	19.93	13.41	17.89	0.75	82.34	58.34
V_9	**NisarPasand**	18.87	13.60	17.57	0.78	76.83	63.33
V_{10}	**Bombay Green**	19.99	13.23	17.30	0.76	80.22	58.33
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**
	C.D. 0.5%	**0.16**	**0.32**	**0.44**	**0.02**	**1.51**	**28.34**
	S.Ed (+)	**0.07**	**0.15**	**0.21**	**0.01**	**0.71**	**13.49**

CONCLUSION

The present investigation, concluded that the performance of grafts of Dasheri, Malgoa Nisar Pasand & Amrapali varieties was found superior at nursery stage as grafts of these varieties have required comparatively well survival percentage. The growth parameters like graft diameter, scion & rootstock diameter, Length of grafted plant and survival percentage were found maximum in these varieties.. Hence, It can be suggested that, for large scale multiplication of mango plants through wedge grafting, the scion wood of Dasheri, Malgoa, Amrapali & Nisar Pasand varieties may be used, as grafts of these varieties have recorded maximum success and higher values of growth parameters.

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