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Thutte AS
Assistant Professor, Shriram College of Horticulture, Paniv, Malshiras, Solapur, Maharashtra, India

Naglot UM
Assistant Professor, Department of Horticulture, College of Agriculture, Badnapur Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Kakade AR
Department of Fruit Science, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Ghorpade SB
Assistant Professor, Shriram College of Horticulture, Paniv, Malshiras, Solapur, Maharashtra, India

Corresponding Author:
Thutte AS
Assistant Professor, Shriram College of Horticulture, Paniv, Malshiras, Solapur, Maharashtra, India

Effect of different conditions for success and survival of mango grafts

Thutte AS, Naglot UM, Kakade AR and Ghorpade SB

Abstract
The presented experiment entitled effect of different conditions for success and survival of mango grafts were carried out during year 2018-2019 at Instructional Cum Research Farm, Department of Horticulture, College of Agriculture, Badnapur, with objectives to study the percent success, growth performance and survival percentage of mango grafts under different conditions. The experiment laid out in Randomized Block Design with 4 treatment i.e. polyhouse with foggers, polyhouse without foggers, shade net and open condition which replicated five times. The observations were recorded on various aspects *viz*., days taken for sprouting, Percentage graft success, number of shoots per graft, length of shoot (cm), diameter of shoot (mm), number of leaves per graft, height of grafted plants (cm), diameter of rootstock (mm), diameter of scion (mm) and final survival percentage were recorded at 90 DAG.
The results of present study indicated significant differences with all recorded observations. Significantly maximum percentage of graft success (85.50%), number of leaves per graft (19.01), height of grafted plants (26.38 cm), diameter of rootstock (6.01 mm), diameter of scion (6.11 mm) and final survival percentage (75.50%) at 90 DAG was recorded in polyhouse with foggers condition which was closely followed by shadenet condition and it was superior over rest of the treatments studied. The minimum days taken for sprouting (7.61), maximum numbers of shoots per graft (3.24), highest length of shoot (4.16 cm), maximum diameter of shoot (3.86 mm) at 90 DAG were observed in polyhouse with foggers and it was followed by polyhouse without foggers condition.
The present investigation it can be concluded that the polyhouse with foggers condition had shown significantly superior performance in relation to percentage of graft success, growth and survival percentage of mango grafts.

Keywords: Polyhouse with foggers, polyhouse without foggers, shed net, open conditions, Growth performance, success percent, survival percentage

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 (Singh 1960) [4]. Hence, there is a lot of scope for large scale planting of mango in the low rainfall areas of the country provided the temperature and soil are ideal for its growth.
The area under mango is increasing rapidly growing to great demand for fresh fruits as well as processed products in the international market. Even though the area under mango is increasing rapidly, the pace of development is not appreciable. However, the greatest bottleneck in the expansion of area under fruits is the non-availability of genuine and quality planting materials in adequate quantity from reliable nurseries. Healthy and good quality plant material is the foundation of successful fruit industry in the country. In view of growing importance of fruit crops, the demand for quality planting material has increased manifold throughout the country in the recent past.
Mango is a highly cross pollinated and 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 days the grafting technique has become commercially popular in India and generally the rootstocks are raised for common methods for vegetative propagation are veneer grafting in India. However, these methods are tedious, time-consuming and costly. Propagation of mango by epicotyl or stone grafting though tried recently has distinct advantage over other improved methods of propagation. In this method, the germinating mango stones from which epicotyls have just emerged and straightened to a height of 8-10 cm are used as root-stocks.

Non availability of quality planting materials and consequent substation of poor quality seeding have adversely affected the mango production and productivity levels. Although a large number of nurseries have been established there is an acute shortage of quality planting materials. The initial planting material is basic requirement on which the final crop depend both in quality and quantity. Now Govt. of India has given focused attention on establishing the modal nurseries for full filling the requirements genuine planting material to the Indian farmers under National Horticulture mission (NHM). Keeping in view these facts, an investigation entitled Physiological Performance of Mango Grafts under Different Conditions was undertaken.

Materials and Methods

The experiment entitled Physiological Performance of Mango Grafts under Different Conditions was carried out at Instructional cum Research Farm, Department of Horticulture, College of Agriculture, Badnapur. Tal. Badnapur Dist. Jalna. The experiments were carried out with the main objective to study the growth performance of mango grafts in different conditions.

Table 1: Treatment details

Sr. No.	Treatment	Treatment details
1.	T_1	Polyhouse with foggers
2.	T_2	Polyhouse without foggers
3.	T_3	Shade net
4.	T_4	Open condition

Climate

Geographically Badnapur is at 498 m altitude and 18°15' to 18°75' North latitude and 76°25' to 77°25' East longitude and has a sub-tropical climate. The climate of the Marathwada region on annual basis can be classified as semiarid type. The region experiences hot dry summer (March-May), cool dry winter (October-February) and wet humidity with medium rainfall in monsoon season (June- September). Most of the monsoons were received from June to September.

Polyhouse with fogger condition

The polyhouse with foggers system was used for study and maintain relative humidity ranged between 85 to 95 percent and temperature between 25 to 28 °C.

Polyhouse without fogger condition

The polyhouse without fogger or natural ventilation system was used for the study. Mango grafts were placed in polyhouse and maintain temperature and humidity by naturally.

Shadenet condition

Green colored UV stabilized high density poly ethylene (HDPE) shade nets were used to provide 75 per cent shade allowing only 25% sunlight. So relatively, low temperature with high humidity was maintained in comparison with outside environment. It was erected using GI pipes as a support. Wire grid was provided at the top of the structure as support. To prevent insect entry, UV stabilized nylon net of 40 mesh was fitted on all four sides of the nursery.

Open condition

In open condition there was no control over environmental factors. Grafted plants were kept in fully environmental condition as normal.

Methodology

Collection of mango stone

Freshly extracted mango stones were collected from a single local mango plant having good yielding potential. Stones were collected in the month of June. The stone were given pre-sowing treatment of Bavistine @ 2g in 1 lit of water.

Rising of rootstocks on raised bed

Stones were sown in raised beds at 10cm×5cm spacing in vertical position. These stones were germinated in 2-3 weeks and after germination, these seedlings along with stones were ready to grafting after 15 days when their leaves are brown in colour (Sukhjit Kaur 2017).

Selection of rootstock

The rootstocks which are uniform in size, vigorously growing seedlings of specified age were used in different months for grafting. 15 days old germinating healthy and straight seedlings of uniform height, thickness and growth were used as rootstock for the grafting.

Selection and defoliation of scion

The scions from healthy and high yielding mother plants were used. One season old, pencil thickness, free from pest and diseases were selected for grafting. The selected scion shoots were defoliated 7 days leaving one fourth of the petiole before the detachment. After 7 days of defoliation, the defoliated scion sticks were detached from the mother plant with help of sharp secateurs. (Chaudhary *et al*. 2017).

Collection of scion

The scion will be utilized about 3 to 4 months old from Kesar mango orchard. Defoliated scion sticks around 10-15 cm will be utilized for grafting. The cut was made according to the length and grafting was done on the same day.

Procedure of grafting

The mango seedling will be selected of 15 days old, when it leaves remain coppery in colour is used for grafting. The seedling is deheaded at 10 cm height from ground level. A vertical slit of 2.5 to 4 cm length is given on deheaded portion of rootstock. The scion having 2 to 3 months age having pencil thickness is used. After the uniting rootstock and scion, it is wrapped using polythene tape of 300 gauge. After the procedure of grafting grafts are transplanted in polythene bags (10cm×25cm) thickness which contain potting mixture comprises of sand, soil and compost (1:1:1) in equal proportion (Shivaram *et al.* 2018) [11].

Results and Discussion

Table 2: Days taken for sprouting, Percentage of graft success, Number of shoots per graft, Length of shoots (cm) and Diameter of shoots (mm)

Treatments	Days taken for sprouting	Percentage of graft success % (30 DAG)	Number of shoots per graft 90 DAG	Length of shoots (cm) 90 DAG	Diameter of shoots (mm) 90 DAG
T_1	7.61	85.50	3.24	4.16	3.86
T_2	8.72	75.50	2.78	3.46	3.21
T_3	9.01	82.50	2.61	3.30	2.85
T_4	9.52	71.50	2.38	2.74	2.52
S.Em±	0.32	1.50	0.13	0.15	0.13
CD @ 5%	1.00	4.64	0.40	0.46	0.40

Days taken for sprouting

It is clear from data that, the significant variations in respect of days taken for sprouting in different treatments were observed. The minimum days taken for sprouting T_1 (7.61) i.e. polyhouse with fogger was significantly superior over the rest of treatments T_2 (8.72) i.e. polyhouse without foggers, T_3 (9.01) i.e. shadenet and T_4 (9.52) i.e. open condition. These results are also similar with Gurjar *et al.,* (2012) [4] and Shivaram Bairwa (2018) [11]. Optimum temperature plays an important role in photosynthetic activity and also in bud sprouting. Optimum temperature and water availability increase the rate of photosynthesis leading to production of more food material that facilitate improved growth and development of grafts.

Percentage of graft success

The data revealed significant variation observed in percentage of graft success in different treatments. The treatment T_1 (85.50%) i.e. polyhouse with foggers followed by T_3 (82.50%) i.e. shadenet are at par with each other and significantly superior over T_2 (75.50%) i.e. polyhouse without foggers and T_4 (71.50%) i.e. open condition at 30 DAG.

The success of grafting in polyhouse with foggers due to optimum temperature and relative humidity prevailing during this period resulting in early contact of cambium layers of stock and scion, early callus formation and initiation of subsequent growth. These results are also similar with Sagvekar *et al*., (2005), Syamal *et al.,* (2012) and Patel *et al*., (2010) [8, 10].

Number of shoots per graft

The number of shoots per grafts T_1 (3.24) i.e. polyhouse with foggers was maximum and significantly superior over the rest treatments T_2 (2.78) i.e. polyhouse without foggers, T_3 (2.61) i.e. shadenet and T_4 (2.38) i.e. open condition at 90 DAG. These results are also similar with Subhash *et al.,* (2016), Praveena *et al.,* (2018) [9] due to graft union of the cambium cells got activated and the new callus tissue arising out of the cambial region were composed of thin walled turgid cells which could easily desiccate and die under unfavorable environmental conditions. The treatment polyhouse with foggers results significantly influenced the number of sprouts.

Length of shoot (cm)

The length of shoot per grafts T_1 (4.16cm) i.e. polyhouse with foggers was recorded maximum and significantly superior over the rest treatments T_2 (3.46cm) i.e. polyhouse without foggers, T_3 (3.30cm) i.e. shadenet and T_4 (2.74cm) i.e. open condition at 90 DAG. These results are also similar with Mulla *et al.,* (2011) [6], Chandar *et al.,* (2016) due to the graft union of cambium cells got activated and the new callus tissue arising out of the cambial region were composed of thin walled turgid cells which could easily desiccate and die under unfavourable environmental conditions. Foggers condition significantly influenced all the growth parameters of grafted plants like the sprouts length.

Diameter of shoot (mm)

The diameter of shoot per grafts T_1 (3.86 mm) i.e. polyhouse with foggers was recorded maximum and significantly superior over rest of treatments T_2 (3.21 mm) i.e. polyhouse without foggers, T_3 (2.85 mm) i.e. shadenet and T_4 (2.52 mm) i.e. open condition at 90 DAG. These results are also similar with Poonam *et al*., (2017) [10] and Alam *et al*., (2006) [1].

Table 3: Number of leaves per graft, Height of grafted plants (cm), Diameter of rootstock (mm), Diameter of scion (mm) and final survival percentage

Treatments	Number of leaves per graft 90 DAG	Height of grafted plants (cm) 90 DAG	Diameter of rootstock (mm) 90 DAG	Diameter of scion (mm) 90 DAG	Final survival percentage % (90 DAG)
T_1	19.01	26.38	6.01	6.06	75.50
T_2	15.66	24.45	5.67	5.65	61.00
T_3	17.16	25.24	5.84	5.83	68.50
T_4	14.89	22.74	5.26	5.25	55.00
S.Em±	0.41	0.61	0.17	0.17	1.52
CD @ 5%	1.27	1.89	0.52	0.52	4.68

Number of leaves per graft

The number of leaves per grafts T_1 (19.01) i.e. polyhouse with foggers was recorded maximum and significantly superior over rest of treatments T_3 (17.16) i.e. shadenet, T_2 (15.16) i.e. polyhouse without foggers and T_4 (14.89) i.e. open condition at 90 DAG. Due to impact of season, growing conditions and growth parameter of softwood grafting under low cost polyhouse and shade net conditions the highest number of leaves in shade net condition reported by Praveena *et al.,* (2018) [9] could also be correlated to higher cell activity and active growth of both stock and scion in the prevailing favourable climatic condition. Ghojage *et al.,* (2011) [5] and Anushma *et al.,* (2017) [2] recorded similar results in jamun.

Height of grafted plants (cm)

The height of grafted plants T_1 (26.38 cm) i.e. polyhouse with foggers was recorded maximum and significantly superior over rest of treatments T_3 (25.24 cm) i.e. shadenet, T_2 (24.45 cm) i.e. polyhouse without foggers and T_4 (22.74 cm) i.e. open condition at 90 DAG. These results are also similar with Patel *et al*., (2010) [8, 10] and Praveena *et al.,* (2018) [9] in polyhouse, Sivudu *et al*., (2014) [12] in shade net.

Diameter of rootstock (mm)

The treatment T_1 (6.01 mm) i.e. polyhouse with foggers followed by T_3 (5.84 mm) i.e. shadenet and T_2 (5.67 mm) i.e. polyhouse without foggers which was statistically at par with each other and significantly superior over T_4 (5.26 mm) i.e. open condition at 90 DAG. These results are also similar with Nalage and Padhiar (2010) [7] and Shivaram *et al.,* (2018) [11].

Diameter of scion (mm)

The treatment T_1 (6.06 mm) i.e. polyhouse with foggers followed by T_3 (5.83 mm) i.e. shadenet and T_2 (5.65 mm) i.e. polyhouse without foggers which was statistically at par with each other and significantly superior over T_4 (5.25mm) i.e. open condition at 90 DAG. These results are also similar with Nalage and Padhiar (2010) [7] and Shivaram *et al.* (2018) [11].

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