Physiological performance of mango grafts under different conditions

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Abstract

The presented experiment entitled Physiological Performance Of Mango Grafts Under Different Conditions were carried out during year 2018-2019 at Instructional Cum Research Farm, Department of Horticulture, College of Agriculture, Badnapur, with objectives to study the growth performance 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, 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) were recorded at 30 days interval up to 90 days. The results of present study indicated significant differences with all observations. Significantly number of leaves per graft (19.01), height of grafted plants (26.38 cm), diameter of rootstock (6.01 mm), and diameter of scion (6.11 mm) after 90 DAG was recorded in polyhouse with foggers condition. The minimum days taken for sprouting (7.61), maximum number of shoots per graft (3.24), highest length of shoot (4.16 cm), maximum diameter of shoot (3.86 mm) after 90 DAG was observed in polyhouse with fogger’s condition and it was followed by polyhouse without fogger’s condition. The present investigation it can be concluded that the polyhouse with fogger’s condition had shown significantly superior performance in relation to growth of mango grafts.

Keywords: polyhouse with foggers, polyhouse without foggers, shed net, open conditions, growth performance

Introduction

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 substitution of poor quality seedling 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.

Results and Discussion
Physiological Performance of Mango grafts
Days taken for sprouting
The data recorded on the days taken for sprouting under different treatments and presented in Table 1

| Sr. No. | Treatment Details |
|---------|------------------|
| 1. | T₁ - Polyhouse with foggers. |
| 2. | T₂ - Polyhouse without foggers. |
| 3. | T₃ - Shade net. |
| 4. | T₄ - Open Condition. |

Results and Discussion
Physiological Performance of Mango Grafts under Different Conditions was undertaken. Keeping in view these facts, an investigation 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.

Treatment details

| Sr. No. | Treatment   | Treatment Details            |
|---------|-------------|------------------------------|
| 1.      | T₁          | Polyhouse with foggers.      |
| 2.      | T₂          | Polyhouse without foggers.   |
| 3.      | T₃          | Shade net.                   |
| 4.      | T₄          | Open Condition.              |

Results and Discussion
Physiological Performance of Mango Grafts under Different Conditions was undertaken. Keeping in view these facts, an investigation 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.

Length of shoot: (cm)
The data regarding length of shoot per graft in different treatments were recorded at 30, 60 and 90 DAG presented in Table 3.

| Sr. No. | Treatment Details |
|---------|------------------|
| 1.      | T₁ - Polyhouse with foggers. |
| 2.      | T₂ - Polyhouse without foggers. |
| 3.      | T₃ - Shade net. |
| 4.      | T₄ - Open Condition. |

The number of shoots per grafts T₁ (2.30) i.e polyhouse with foggers was maximum and significantly superior over the rest treatments T₂ (2.02) i.e. polyhouse without foggers, T₃ (1.97) i.e. shadenet and T₄ (1.85) i.e. open condition at 30 DAG. The number of shoots per grafts T₁ (3.00) i.e polyhouse with foggers was maximum and significantly superior over the rest treatments T₂ (2.58) i.e. polyhouse without foggers, T₃ (2.46) i.e. shadenet and T₄ (2.26) i.e. open condition at 60 DAG. The number of shoots per grafts T₁ (3.24) i.e polyhouse with foggers was maximum and significantly superior over the rest treatments T₂ (2.78) i.e. polyhouse without foggers, T₃ (2.61) i.e. shadenet and T₄ (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.

Diameter of shoot: (mm)
The data regarding diameter of shoot per graft in different treatments were recorded at 30, 60 and 90 DAG presented in Table 4. The diameter of shoot per grafts T₁ (2.75 mm) i.e polyhouse with foggers was recorded maximum and significantly superior over rest of treatments T₂ (2.33 mm) i.e polyhouse without foggers, T₃ (1.22 mm) i.e. shadenet and T₄ (1.86 mm) i.e. open condition at 30 DAG. The diameter of

Table 1: Days taken for sprouting

| Sr. No | Treatment | Days taken for sprouting |
|--------|-----------|--------------------------|
| 1. | T₁ | 7.61 |
| 2. | T₂ | 8.72 |
| 3. | T₃ | 9.01 |
| 4. | T₄ | 9.52 |

SEm± | 0.32 |
CD @ 5 % | 1.00 |

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 T₁ (7.61) i.e. polyhouse with fogger was significantly superior over the rest of treatments T₂ (8.72) i.e. polyhouse without foggers, T₃ (9.01) i.e shadenet and T₄ (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.

Number of shoots per graft
The data regarding number of shoots per graft in different treatments were recorded at 30, 60 and 90 DAG presented in Table 2.

| Sr. No | Treatment | Number of shoots per graft |
|--------|-----------|----------------------------|
| 1. | T₁ | 2.30 |
| 2. | T₂ | 2.02 |
| 3. | T₃ | 1.97 |
| 4. | T₄ | 1.85 |

SEm± | 0.10 |
CD @ 5 % | 0.31 |

The length of shoot per grafts T₁ (4.16cm) i.e polyhouse with foggers was recorded maximum and significantly superior over the rest treatments T₂ (3.61cm) i.e polyhouse without foggers, T₃ (1.98cm) i.e shadenet and T₄ (1.77cm) i.e. open condition at 30 DAG. The length of shoot per grafts T₁ (3.16cm) i.e polyhouse with foggers was recorded maximum and significantly superior over the rest treatments T₂ (2.61cm) i.e polyhouse without foggers, T₃ (2.30cm) i.e shadenet and T₄ (2.16cm) i.e. open condition at 60 DAG. The length of shoot per grafts T₁ (4.16cm) i.e polyhouse with foggers was recorded maximum and significantly superior over the rest treatments T₂ (3.46cm) i.e polyhouse without foggers, T₃ (3.30cm) i.e shadenet and T₄ (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.

Table 2: Number of shoots per graft (At 30, 60 and 90 DAG)

| Sr. No | Treatment | Number of shoots per graft |
|--------|-----------|----------------------------|
| 1. | T₁ | 2.30 |
| 2. | T₂ | 2.02 |
| 3. | T₃ | 1.97 |
| 4. | T₄ | 1.85 |

SEm± | 0.10 |
CD @ 5 % | 0.31 |

The length of shoot per grafts T₁ (2.49cm) i.e polyhouse with foggers was recorded maximum and significantly superior over the rest treatments T₂ (2.12cm) i.e. polyhouse without foggers, T₃ (1.98cm) i.e. shadenet and T₄ (1.77cm) i.e. open condition at 30 DAG. The length of shoot per grafts T₁ (4.16cm) i.e polyhouse with foggers was recorded maximum and significantly superior over the rest treatments T₂ (2.61cm) i.e polyhouse without foggers, T₃ (2.30cm) i.e shadenet and T₄ (2.16cm) i.e. open condition at 60 DAG. The length of shoot per grafts T₁ (4.16cm) i.e polyhouse with foggers was recorded maximum and significantly superior over the rest treatments T₂ (3.46cm) i.e polyhouse without foggers, T₃ (3.30cm) i.e shadenet and T₄ (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 data regarding diameter of shoot per graft in different treatments were recorded at 30, 60 and 90 DAG presented in Table 4. The diameter of shoot per grafts T₁ (2.75 mm) i.e polyhouse with foggers was recorded maximum and significantly superior over rest of treatments T₂ (2.33 mm) i.e polyhouse without foggers, T₃ (1.22 mm) i.e. shadenet and T₄ (1.86 mm) i.e. open condition at 30 DAG. The diameter of
shoot per grafts $T_1$ (3.12 mm) i.e. polyhouse with foggers was recorded maximum and significantly superior over rest of treatments $T_2$ (2.61 mm) i.e. polyhouse without foggers, $T_3$ (2.44 mm) i.e. shadenet and $T_4$ (2.26 mm) i.e. open condition at 60 DAG. 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 4: Diameter of shoots (mm) (At 30, 60 and 90 DAG)

| Treatments | Diameter of shoots (mm) |
|------------|-------------------------|
|            | 30 DAG | 60 DAG | 90 DAG |
| $T_1$      | 2.75   | 3.12   | 3.86   |
| $T_2$      | 2.33   | 2.61   | 3.21   |
| $T_3$      | 1.22   | 2.44   | 2.85   |
| $T_4$      | 1.86   | 2.26   | 2.52   |
| $\text{SEM}^\pm$ | 0.12   | 0.14   | 0.13   |
| CD @ 5%    | 0.37   | 0.43   | 0.40   |

### Number of leaves per graft:
The data regarding number of leaves per graft in different treatments were recorded at 30, 60 and 90 DAG presented in Table 5.

### Table 5: Number of leaves per graft (At 30, 60 and 90 DAG)

| Treatments | Number of leaves per graft |
|------------|---------------------------|
|            | 30 DAG | 60 DAG | 90 DAG |
| $T_1$      | 11.90  | 16.02  | 19.01  |
| $T_2$      | 10.21  | 13.13  | 15.66  |
| $T_3$      | 10.40  | 14.31  | 17.16  |
| $T_4$      | 9.94   | 12.24  | 14.89  |
| $\text{SEM}^\pm$ | 0.34   | 0.40   | 0.41   |
| CD @ 5%    | 1.06   | 1.24   | 1.27   |

The number of leaves per grafts $T_1$ (11.90) i.e. polyhouse with foggers was recorded maximum and significantly superior over rest of treatments $T_2$ (10.40) i.e. shadenet, $T_3$ (10.21) i.e. polyhouse without foggers and $T_4$ (9.94) i.e. open condition at 30 DAG. The number of leaves per grafts $T_1$ (16.02) i.e. polyhouse with foggers was recorded maximum and significantly superior over rest of treatments $T_3$ (14.31) i.e. shadenet, $T_3$ (13.13) i.e. polyhouse without foggers and $T_4$ (12.24) i.e. open condition at 60 DAG. 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) [8] and Anushma et al. (2017) [2] recorded similar results in jamun.

### Height of grafted plants: (cm)
The data regarding height of grafted plants in different treatments were recorded at 30, 60 and 90 DAG presented in Table 6.

### Table 6: Height of grafted plants (cm) (At 30, 60 and 90 DAG)

| Treatments | Height of grafted plants (cm) |
|------------|-----------------------------|
|            | 30 DAG | 60 DAG | 90 DAG |
| $T_1$      | 27.55  | 24.86  | 26.38  |
| $T_2$      | 19.92  | 22.71  | 24.45  |
| $T_3$      | 20.47  | 23.12  | 25.24  |
| $T_4$      | 17.52  | 20.30  | 22.74  |
| $\text{SEM}^\pm$ | 0.60   | 0.60   | 0.61   |
| CD @ 5%    | 1.85   | 1.85   | 1.89   |

### Diameter of rootstock: (mm)
The data regarding diameter of rootstock (below union) in different treatments were recorded at 30, 60 and 90 DAG presented in Table 7.

The treatment $T_1$ (5.64 mm) i.e polyhouse with foggers followed by $T_3$ (5.55 mm) i.e. shadenet and $T_2$ (5.30 mm) i.e. polyhouse without foggers which was statistically at par with each other and significantly superior over $T_4$ (4.47mm) i.e. open condition at 30 DAG. The treatment $T_1$ (5.85 mm) i.e polyhouse with foggers followed by $T_3$ (5.69 mm) i.e. shadenet and $T_2$ (5.51 mm) i.e. polyhouse without foggers which was statistically at par with each other and significantly superior over $T_4$ (5.12mm) i.e. open condition at 60 DAG. 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 Padhia (2010) [7] and Shivaram et al. (2018) [11].

### Diameter of scion: (mm)
The data regarding diameter of scion (above union) in different treatments were recorded at 30, 60 and 90 DAG presented in Table 8.

The treatment $T_1$ (5.66 mm) i.e polyhouse with foggers followed by $T_3$ (5.53 mm) i.e. shadenet and $T_2$ (5.50 mm) i.e. polyhouse without foggers which was statistically at par with each other and significantly superior over $T_4$ (4.44mm) i.e. open condition at 30 DAG. The treatment $T_1$ (5.85 mm) i.e polyhouse with foggers followed by $T_3$ (5.66 mm) i.e. shadenet and $T_2$ (5.50 mm) i.e. polyhouse without foggers which was statistically at par with each other and significantly

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superior over T₄ (5.10mm) i.e. open condition at 60 DAG.
The treatment T₁ (6.06 mm) i.e polyhouse with foggers
followed by T₃ (5.83 mm) i.e. shadenet and T₂ (5.65 mm) i.e.
polyhouse without foggers which was statistically at par with
each other and significantly superior over T₄ (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].

References
1. Alam MA, Islam MS, Uddin MZ, Barman JC, Quamruzzaman AKM. Effect of age of seedling and
varity of scion in stone grafting of mango. Int. J Sustain. Crop. Prod. 2006; 1(2):27-32.
2. Anushma PL, Swamy GSK, Gangadhara K. Effect ogf colored shade nets on softwood grafting success in jamun
(syzigium cumini skills). Plant Archives. 2014; 14(1):293-295.
3. Chander, Kumar S, Kavino M, Lokesh Bora. Effect of seasonal variation on softwood grafting under different
environmental conditions in jamun (Syzygium cumini L.). Res. on Crops. 2016; 17(3):524-528.
4. Gurjar PS, Singh R. Performance wedge grafting in aonla
at polyhouse and open field conditions. Environ. and
Ecol. 2012; 30(3):531-536.
5. Ghojage AH, Swamy GSK, Kanamadi VC, Jagdeesh RC,
Kumar P, Patil CP et al. Effect of season on softwood
grafting in jamun. Acta Hort. 2011; 890:123-127.
6. Mulla BR, Angadi SG, Mathad JC, Mummigatti V. Studies on softwood grafting in jamun. Karnataka J
Agric. Sci. 2011; 24(3):366-368.
7. Nalage NA, Magar SD, Bhosale SS, Mhetre DA. Effect
of height of rootstock on success of epicotyl grafting in mango (Mangifera indica L.) cv. Kesar. Inte. J Agril. Sci.
2010; 6(1):124-128.
8. Patel RK, Babu KD, Yadav AS. Softwood grafting in
mandarin - A novel vegetative propagation technique. Int.
J Fruit Sci. 2010; 10(1):54-64.
9. Praveena kumar R, Chandfre Gowda M, Mounashree S,
Vidya A. Impact of season, growing condition and
growth parameter of softwood grafting in Jamun
(Syzygium cumini Skeel). J Pharmacognosy and
Phytochemistry. 2018; 1:1173-1176.
10. Poonam M, Sharma GL, Patel KL, Tirkey T, Dikshit SN.
Effect of scion length, duration of defoliation and poly
tube capping on success of wedge grafting in mango c. v.
Dashehari. J Soil and Crops. 2017; 27(21):6-11.
11. Shivaram B, Virendra S, Mahawer LN, Arjun Lal Regar.
Effect of media and age of rootstock on epicotyl grafting
of mango (Mangifera indica L.) cv. Amrapali. Inter. J.
Chemical Studies. 2018; 6(3):3239-3243.
12. Sivudu BV, Reddy MLN, Baburatan P, Dorajeerao AVD.
Effect of structural conditions on veneer grafting success
and survival of mango grafts. Plant Arch. 2014; 14(1):71-75.