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# Studies on comparative performance of various genotypes of mango for wedge grafting with polytube capping

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**Abstract**
The present investigation was conducted at Horticulture Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during the year 2016-2017 in kharif and rabi season.The treatments consisted of combinations of three genotypes of mango (Dashehari, C.G. Achar and C.G. Swarnaprabha) three duration of defoliation of scion (4, 8 and 12 days) and with covering and without covering of grafts with poly tube till sprouting. The growth observations including girth of rootstock, scion and sprout, length of sprout, number of leaves per graft, total height of grafted plant, days taken for first and last sprouting, percentage of graft sprouting, establishment and survival were recorded at 30 days interval up to 180 days of grafting. The result on individual effects indicated that genotype Dashehari significantly increased early sprouting, girth of rootstock, girth of scion, girth of sprout, sprout length, number of leaves per graft, plant height, higher establishment and survival percentage followed by genotype C.G. Achar.

**Keywords:** grafting, genotype, polytube capping

## Introduction
Mango (*Mangifera indica* L.) is one of the delicious fruits of commercial importance of family Anacardiaceae, originated in the region of India and adjoining Myanmar (Singh, 1988) [9]. In India area (million ha), production (million metric tonnes) and productivity (MT/ha) of mango is 2.26, 20.2 and 8.93 respectively (Anon., 2017) [2].

Mangos possess unique nutritional and medicinal qualities apart from being a rich source of vitamins A and C. Besides its attractive form and appearance, delicious taste and appetizing flavor; the ripe mango fruit, according to nutritional experts, is also highly invigorating, fattening, laxative and diuretic.

The major bottleneck for increasing area under mango cultivation is non-availability of quality planting material of desired variety in required quantity. Mango is propagated by both sexual and asexual methods. Being a highly heterozygous plant, seeds may not give rise true to type seedling. Different grafting methods were tried in superior varieties, of which inarching, veneer, softwood and epicotyl methods are economically feasible for commercial purposes. On the other hand, is adopted commercially, as it not only ensures inheritance of all parent qualities including productiveness and uniformity of bearing and size of fruit, but also shortens the juvenile phase *i.e.* the trees flower and sets fruit earlier. Grafted trees are relatively dwarfed in size, therefore easy to manage and more trees can be grown per unit area. Recently, a technique of rapid multiplication (wedge grafting) has been developed at Central Institute for Subtropical Horticulture (CISH), Lucknow.

## Materials and Methods
Field experiment was carried out during the year 2016-17 kharif and rabi season at the nursery, Horticulture Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.).The experiment material consisted of 3 genotypes of mango i.e., Dashehari, Chhattisgarh Achar and Chhattisgarh Swarnaprabha, 3 duration of defoliation i.e., 4, 8 and 12 days with using and without using poly tube capping. Thus, the treatment combinations were 18 and replicated three times under Factorial Complete Randomized Design. The seedling rootstocks were selected from the polythene bags already available in the nursery. The seedlings of uniform

length, thickness and size, about 1 year old were selected for grafting from the group of seedlings. The scions of Dashehari were selected from about 25 year's old mango orchard and scions of Chhattisgarh Achar and Chhattisgarh Swarnaprabha were selected from about 12 year's old mango orchard of the Horticulture Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur. The growth observations including girth of rootstock, scion and sprout, length of sprout, number of leaves per graft, total height of grafted plant, days taken for first and last sprouting, percentage of graft sprouting, establishment and survival were recorded at 30 days interval up to 180 days of grafting.

## Results and Discussions

### 1. Girth of Rootstock

In case of genotypes, significant variation was observed in girth of rootstock and girth was significantly increased. The maximum rootstock girth (9.65 mm) was found in $G_1$ (Dashehari) and minimum girth (8.165 mm) was found in $G_3$ (C.G. Swarnaprabha) in the month of February.

**Table 1:** Effect of Genotypes on Girth of Rootstock

| S No. | Treatments | Girth of Root Stock (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 30 DAG | 60 DAG | 90 DAG | 120 DAG | 150 DAG | 180 DAG |
| | | Sept | Oct | Nov | Dec | Jan | Feb |
| 1. | Genotypes | | | | | | |
| I | $G_1$ | 8.62 | 8.84 | 9.05 | 9.25 | 9.45 | 9.65 |
| II | $G_2$ | 8.05 | 8.24 | 8.45 | 8.65 | 8.83 | 9 |
| III | $G_3$ | 7.32 | 7.49 | 7.66 | 7.84 | 8 | 8.165 |
| | SEm± | 0.115 | 0.118 | 0.121 | 0.124 | 0.126 | 0.129 |
| | CD 5% | 0.331 | 0.338 | 0.347 | 0.355 | 0.363 | 0.369 |

### 2. Girth of Scion

As regards the effect of genotypes, different genotypes used were found to have significant effect on scion girth in most of the months i.e. from October to February except in the month of September. However, highest growth in the girth of scion (6.84 mm) was recorded in $G_1$ (Dashehari) in the month of February, while minimum growth in the girth of scion (6.36 mm) was recorded in $G_3$ (C.G. Swarnaprabha) in the month of February.

Similar findings were also obtained by Alam *et al.* (2006) [1]. Gurudutta *et al.* (2004) [4] also recorded the highest scion girth was found in Mallika compared with the other cultivars on epicotyl grafting.

**Table 2:** Effect of Genotypes on Girth of Scion

| S No. | Treatments | Girth of Scion (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 30 DAG | 60 DAG | 90 DAG | 120 DAG | 150 DAG | 180 DAG |
| | | Sept | Oct | Nov | Dec | Jan | Feb |
| 1. | Genotypes | | | | | | |
| I | $G_1$ | 6.04 | 6.161 | 6.33 | 6.486 | 6.638 | 6.84 |
| II | $G_2$ | 5.85 | 5.938 | 6.148 | 6.286 | 6.416 | 6.543 |
| III | $G_3$ | 5.775 | 5.86 | 6 | 6.12 | 6.238 | 6.36 |
| | SEm± | 0.084 | 0.086 | 0.088 | 0.090 | 0.092 | 0.094 |
| | CD 5% | NS | 0.245 | 0.252 | 0.259 | 0.265 | 0.270 |

### 3. Length of Sprout

After grafting, the length of sprouts was significantly increased in different genotypes. The treatment $G_1$ (Dashehari) was found significantly superior as compared to other genotypes. At 30, 60, 90, 120,150 and 180 days after grafting, maximum length of sprout was recorded in genotype $G_1$ (Dashehari) (5.735 cm, 7.76 cm, 9.898 cm, 11.838 cm, 13.652 cm, and 14.825 cm respectively) and minimum (4.88 cm, 6.705 cm, 8.232 cm, 9.737 cm, 11.174 cm, 12.568 cm) was noted under the genotype $G_3$ (C.G. Swarnaprabha) at 30, 60, 90,120,150 and 180 days after grafting respectively.

Similar result was also obtained by Brahmachari *et al.* (1997) [3] in mango cv. Amrapali grafted by veneer grafting.

**Table 3:** Effect of Genotypes on Length of Sprouts

| S No. | Treatments | Length of Sprout (cm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 30 DAG | 60 DAG | 90 DAG | 120 DAG | 150 DAG | 180 DAG |
| | | Sept | Oct | Nov | Dec | Jan | Feb |
| 1. | Genotypes | | | | | | |
| I | $G_1$ | 5.735 | 7.76 | 9.898 | 11.838 | 13.652 | 14.825 |
| II | $G_2$ | 5.136 | 7.148 | 8.806 | 10.693 | 12.152 | 14.033 |
| III | $G_3$ | 4.88 | 6.705 | 8.232 | 9.737 | 11.174 | 12.568 |
| | SEm± | 0.075 | 0.103 | 0.128 | 0.153 | 0.176 | 0.193 |
| | CD 5% | 0.215 | 0.294 | 0.368 | 0.440 | 0.505 | 0.554 |

### 4. Girth of Sprout

After 180 days of grafting, the maximum (4.245 mm) shoot girth was observed in the treatment G1 (Dashehari), while it was recorded minimum (3.588 mm) in the treatment G3 (C.G. Swarnaprabha).

**Table 4:** Effect of Genotypes on Girth of Sprouts

| S No. | Treatments | Girth of Sprout (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 30 DAG | 60 DAG | 90 DAG | 120 DAG | 150 DAG | 180 DAG |
| | | Sept | Oct | Nov | Dec | Jan | Feb |
| 1. | Genotypes | | | | | | |
| I | $G_1$ | 2.544 | 3.051 | 3.277 | 3.735 | 4.028 | 4.245 |
| II | $G_2$ | 2.302 | 2.808 | 3.042 | 3.37 | 3.573 | 3.758 |
| III | $G_3$ | 2.077 | 2.578 | 2.793 | 3.148 | 3.387 | 3.588 |
| | SEm± | 0.033 | 0.040 | 0.043 | 0.049 | 0.053 | 0.056 |
| | CD 5% | 0.09 | 0.115 | 0.124 | 0.141 | 0.152 | 0.16 |

**5. Number of Leaves per Graft**

Significant difference was observed on the number of leaves among the grafts of different genotypes, duration of defoliation and use of poly tube (Table 4.5.a). After grafting, the maximum (5.833, 7.833, 9.25, 10.183, 10.967, 11.65) number of leaves per graft was noted in genotype $G_1$ (Dashehari) while, it was recorded minimum (3.883, 5.717, 6.934, 7.683, 8.33, 9.067) in genotype $G_3$ (C.G. Swarnaprabha). It might be due to the genetic as well as environmental effect which influence the emergence of the leaves higher in genotype $G_1$ (Dashehari) and lower in genotype $G_3$ (C.G. Swarnaprabha), respectively.

Singh *et al.* (1992) [8] observed that Dashehari gave maximum number of leaves among different cultivars of mango by cleft grafting.

**Table 5:** Effect of Genotypes on Number of Leaves per graft

| S No. | Treatments | No. of Leaves per Graft | | | | | |
|---|---|---|---|---|---|---|---|
| | | 30 DAG | 60 DAG | 90 DAG | 120 DAG | 150 DAG | 180 DAG |
| | | Sept | Oct | Nov | Dec | Jan | Feb |
| 1. | Genotypes | | | | | | |
| I | $G_1$ | 5.833 | 7.833 | 9.25 | 10.183 | 10.967 | 11.65 |
| II | $G_2$ | 4.167 | 6 | 7.251 | 8.083 | 8.7 | 9.317 |
| III | $G_3$ | 3.883 | 5.717 | 6.934 | 7.683 | 8.33 | 9.067 |
| | SEm± | 0.068 | 0.094 | 0.113 | 0.125 | 0.134 | 0.144 |
| | CD 5% | 0.194 | 0.27 | 0.324 | 0.358 | 0.386 | 0.414 |

**6. Total Height of Grafted plant**

In respect of the effect of genotypes, significant variation was found in total height of graft after wedge grafting at various stages of growth observations. Genotype $G_1$ (Dashehari) produced maximum height (56.838 cm), while genotype $G_3$ (C.G. Swarnaprabha) produced minimum height (47.423 cm) at the end month of February. It might be due to the better compatibility between the stock and scion of genotype $G_1$ (Dashehari) than the genotype $G_3$ (C.G. Swarnaprabha).

Similar result was also found by Radha *et al.* (2000) [6] among different varieties of mango by cleft grafting. Gurudutta *et al.* (2004) [4] also found that in case of height of grafted plant cultivar Dashehari show highest height of grafted plant compared with the other cultivars on epicotyl grafting.

**Table 6:** Effect of Genotypes on Total height of grafted plant

| S. No. | Treatments | Total Height of Grafted Plant (cm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 30 DAG | 60 DAG | 90 DAG | 120 DAG | 150 DAG | 180 DAG |
| | | Sept | Oct | Nov | Dec | Jan | Feb |
| 1. | Genotypes | | | | | | |
| I | $G_1$ | 47.552 | 49.59 | 51.962 | 53.943 | 55.64 | 56.838 |
| II | $G_2$ | 44.181 | 46.206 | 48.062 | 49.86 | 51.293 | 52.338 |
| III | $G_3$ | 40.22 | 41.926 | 43.626 | 45.146 | 46.478 | 47.423 |
| | SEm± | 0.624 | 0.652 | 0.68 | 0.704 | 0.726 | 0.741 |
| | CD 5% | 1.790 | 1.869 | 1.95 | 2.021 | 2.082 | 2.126 |

**7. Percentage of Grafts sprouted**

After grafting, the highest percentage of graft sprouted (74.91%) was recorded from the grafts of $G_1$ (Dashehari) and minimum (58.61%) was recorded from the grafts of $G_3$ (C.G. Swarnaprabha).

Similar results were also obtained by Shankara *et al.* (1987) [7]. They found that highest sprouting percentage (75.55%) was obtained by cultivar Mallika among different varieties of mango by wedge grafting. Singh *et al.* (1992) [8] assessed different mango cultivars and observed that Dashehari gave significantly higher average sprouting success (65-90%) through cleft grafting.

**Table 7:** Effect of genotypes on Percentage of Graft Sprouted

| S No. | Treatments | Percentage of Graft Sprouted |
|---|---|---|
| 1. | Genotypes | |
| I | $G_1$ | 74.911 (8.71) |
| II | $G_2$ | 62.732 (7.79) |
| III | $G_3$ | 58.618 (7.718) |
| | SEm± | 0.923 |
| | CD 5% | 2.648 |

(Figure in parentheses shows transformed value)

**8. Days taken for first and last sprouting**

In case of genotypes, maximum days (19.2) required for sprouting was observed in the grafts of genotype $G_3$ (C.G. Swarnaprabha). Whereas, earlier sprouting 14.76 days was observed in genotype $G_1$ (Dashehari) followed by 16.29 days in genotype $G_2$ (C.G. Achar). However, genotype $G_3$ (C.G. Swarnaprabha) took the longest period (25.83 days) for completion of sprouting and shortest duration (22.667 days) for last sprouting was recorded in genotype $G_1$ (Dashehari). Similar result was also found by Jacob *et al*. (2001) among different cultivars of mango by softwood grafting which is found similar to our result.

**Table 8:** Effect of genotypes, duration of defoliation and poly tube capping on Days taken for first and last sprouting

| S No. | Treatments | Days taken for first sprouting | Days taken for last sprouting |
|---|---|---|---|
| **1.** | **Genotypes** | | |
| I | $G_1$ | 14.76 | 22.667 |
| II | $G_2$ | 16.29 | 25.5 |
| III | $G_3$ | 19.2 | 25.83 |
| | SEm± | 0.244 | 0.354 |
| | CD 5% | 0.699 | 1.016 |

**9. Percentage of Grafts Established (after one month)**

After one month of grafting, the highest percentage of graft establishment (63.448%) was recorded from the grafts of $G_1$ (Dashehari) and minimum (60.238%) was recorded from the grafts of $G_3$ (C.G. Swarnaprabha). It might be due to better union between rootstock and scion of graft of genotype $G_1$ (Dashehari) and poor union between the rootstock and scion of graft of genotype $G_3$ (C.G. Swarnaprabha), respectively.

**Table 9:** Effect of genotypes on Percentage of Graft Establishme

| S No. | Treatments | Percentage of Graft Establishment |
|---|---|---|
| **1.** | **Genotypes** | |
| I | $G_1$ | 63.448 (8.025) |
| II | $G_2$ | 61.655 (7.912) |
| III | $G_3$ | 60.238 (7.822) |
| | SEm± | 0.876 |
| | CD 5% | 2.514 |

(Figure in parentheses shows transformed value)

**10. Percentage of grafts survived (after six month)**

Genotype $G_1$ (Dashehari) was observed significantly superior as compared to other cultivars and it was recorded highest (57.308%) survival percentage followed by $G_2$ (C.G. Achar) with (55.083%). While, lowest (50.943%) graft survival percentage was observed in $G_3$ (C.G. Swarnaprabha).

Shankara *et al.* (1987) [7] were obtained graft-take (57.10%) in the cultivar Mallika which was found close conformity with our findings. Singh *et al.* (1992) [8] found similar result in case of cleft grafting in different cultivars of mango. Radha *et al.* (2000) [6] recorded that the survival percentage six months after grafting among several cultivars of mango by cleft grafting.

**Table 10:** Effect of genotypes on Percentage of Graft Survival

| S No. | Treatments | Percentage of Graft Survival |
|---|---|---|
| **1.** | **Genotypes** | |
| I | $G_1$ | 57.308 (7.633) |
| II | $G_2$ | 55.083 (7.486) |
| III | $G_3$ | 50.943 (7.204) |
| | SEm± | 0.774 |
| | CD 5% | 2.219 |

(Figure in parentheses shows transformed value)

**Conclusions**

Amongst all the genotypes used, Dashehari was found to be the most suitable followed by C.G. Achar for better plant height, earliness in sprouting, girth of scion, rootstock and sprouts, and number of leaves per graft.

**References**


1. Alam MA, Islam MS, Uddin MZ, Barman JC, Quamruzzaman AKM. Effect of age of seedling and variety of scion in stone grafting of mango. Int. J Sustainable Crop Production. 2006; 1(2):27-32.
2. Anonymous. Area and Production of Horticulture Crops - All India, (Third Advance Est.) DAC&FW, 2017.
3. Brahmachari VS, Kumar N, Kumar R. Seasonal effect on success of veneer grafting in mango cv. Amrapali. Horticultural Journal, 1997; 10(2):1-5.
4. Gurudutta PS, Jain V, Singh PN. Response of mango cultivars to epicotyl grafting. Indian J Hort. 2004; 61(3):267.
5. Jacob S, Ray DP, Sahu GS, Chandra A. Studies on the success of soft wood grafting in some commercial hybrid mango (*Mangifera indica* L.). Orissa J Hort. 2001; 29(2):6-9.
6. Radha T, Aravindakshan K. Differential response of mango varieties to epicotyl grafting on commercial scale. Acta Horticulturae, 2000; (509):265-268.
7. Shankara S. Effect of time and method of grafting in some varieties of mango under Dharwad conditions. M.Sc. (Agri.) Thesis, Uni. Agri. Sci. Dharwad, (India), 1987.
8. Singh AR, Panday SP, Singh RK, Singh ND. Influence of cultivar and period of operation on the success of veneer grafting in mango. Adv. Hort. Forestry. 1992; 19(2):17-23.
9. Singh R. Fruits. National Book Trust, New Delhi. 1988, 18-48.