

Original Research Article

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Varietal Effect on Morphological Characters and Success Rate of Mango (*Mangifera indica* L.) Grafts

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ABSTRACT

An experiment was conducted during 2019-20 at INS farm -1, SOADU, Bhubaneswar in order to study the variation regarding morphological parameters, plant physiological condition, and survival of the grafts, when different varieties were used as scion material. The experiment consists of five different popular mango varieties namely cv. Mallika, cv. Arka Neelachal Kesari, cv. Arka Puneet, cv. Amrapalli, and cv. Dussehri as scion varieties. One local cv. "Ganga" cultivar was used as rootstock for all the scion varieties and was also used as one of the scion (control). The total six combinations taken as six different treatments replicated four times in a complete randomized design. The soft wood grafting was carried out in the month of August under polyhouse condition and the grafts were maintained at the protected structure for entire observation period. The results of the investigation indicated that grafting with different varieties had significant effect on the grafts when the rootstock remained common. Among various important morphological parameters observed, the grafts with cv. Arka Neelachal Kesari was superior in terms of earliest bud emergence (15.4 DAG), maximum scion (3.63) and root stock diameter (4.11). The grafts with cv. Arka Puneet as scion has the longest taproot, lowest stionic ratio and maximum survival percentage among all and has recommended as the best combiner for the local rootstock cv. Ganga.

Keywords

Environmental parameters, Age of rootstock, Method of grafting and cultivar

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Introduction

Mango (*Mangifera indica* L.) is an important member of family anacardiaceae, grows both in tropical and subtropical climatic condition of the world. It was originated in south East Asia confiding largely Indian sub-continent

during the pre-historic times (Mukherjee 1998). Mango is highly heterozygous and cross pollinated. It can be propagated by both sexual and asexual methods but the vegetative methods are desirable because it enables to retain the characteristics of the mother plant to get flower and fruit earlier

and grafting is one of them. Grafting is a critical physiological process with distinct developmental phases, there is certainly great influence of environmental parameters, age of rootstock, method of grafting and cultivar used (Sharangi *et al.*, 2002). Other factors such as time of grafting operation, growing conditions of grafts, defoliation period of scion, age of the scion, leaf and node retention on root stock etc has a great influence on the success of grafting in mango (Ahmad, 1974). Now a day's softwood grafting is commercially important method in the mango producing states of the country because it is easy to handle and quite efficient as well as grafts can normally raised within a year, thus reducing cost of raising grafts considerably with high success percentage. So, softwood grafting gives an excellence response in initial success with least possibility of mortality, better and uniform orchard establishment (Ram and Pathak, 2006). In Odisha a large number of local races are grown in the back yards of households which are prolific bearer. The same can be used as rootstock purpose, provided the compatibility of the particular types are verified with the popular commercial varieties. The present study was undertaken to investigate the most suitable variety scion resulting the maximum success rate which supporting the increase of mango production in the study area and other similar climatic area.

Materials and Methods

The present investigation entitled "Varietal Effect on Morphological Characters and Success Rate of Mango (*Mangifera indica* L.) Grafts" was conducted at net house of Instructional farm, Faculty Of Agricultural Sciences, SOA Deemed to be university, Bhubaneswar during the year 2019-2020. The experiment was carried out to study the effect of grafting of different varieties on a

particular rootstock on morphological characters and survival rate of mango grafts. Among different mango varieties growing in Odisha, five popular varieties were chosen for the experiment named cv. Mallika, Arka Neelachal Kesari, Arka Puneet, Amrapalli, Dussehri as scion and local cultivar from Keonjhar named cv. "Ganga" was used as both rootstock and one of the scion.

Stones were collected from the local one and were raised in poly bags. Four months old seedlings were taken as rootstock. The local cultivar "Ganga" was also taken as one of the scion. The experiment was laid out in Complete Randomized Design with six treatments replicated four times. T1= Local cv. Ganga + Local cv. Ganga*; T2= Mallika + Local cv. Ganga*; T3= Arka Neelachal Kesari + Local cv. Ganga*; T4= Arka Puneet + Local cv. Ganga*; T5= Amrapalli + Local cv. Ganga*; T6= Dussehri + Local cv. Ganga*.

*The local cv. Ganga is used as rootstock for all the scion.

Results and Discussion

The result of present investigation revealed that the earliest bud emergence was seen in the grafts with scion cv. Arka Neelachal Kesari, which took only 15.4 days (Fig. 1) to show the new green growth. The results are in conformity with the results of Razzaque (2005), who has reported the minimum required time for bud emergence was (17.00 days) in case of June grafted mango cv. Amrapalli by cleft grafting technique.

The present study indicates a higher number of days to sprouting of bud in the grafts with that particular variety (27.5 days). This variation might be due to the variation in climate and effect of rootstock.

The results regarding number of leaves revealed that during 30, 45, 60 and 75 days after grafting the highest number of leaves was found in graft with cv. Arka Neelachal Kesari i.e 4.6, 5.1, 8.3 and 12.4 respectively (Table 1). Number of leaves on a graft is dependent on two factors i.e the number of buds present on the scion stick and the amount of nutrients supplied to fulfil the requirement of a bud to burst. The amount of carbohydrate reserved in a scion stick has a greater effect on the shooting of a bud. Similar study was conducted by Sivudu *et al.*, (2014) in mango cv. Banganpalli.

During 30, 45, 60 and 75 days after grafting highest girth of rootstock was found in graft with cv. Arka Neelachal Kesari i.e 3.62, 3.81, 3.92 and 4.11cm respectively (Table 2). In the present study the increment of stock diameter in 15 days (30-45 DAG) was varied from 0.11-0.22 cm.

The rate of increment was found higher in the control than any other varieties used as scion. The current results are parallel with the results of Razzaque (2005) reported an increment of 0.16-0.26 cm in the stock diameter during the study with Amrapalli.

During 30, 45, 60 and 75 days after grafting was presented in table highest girth of scion was found in graft with cv. Arka Neelachal Kesari i.e 3.43, 3.49, 3.57 and 3.63 cm respectively (Table 3). The grafting technique, time of grafting and the varieties used for scion as well as rootstock has considerable effect on the growth of grafts (Beshir *et al.*, 2019).

In the present study the increment in the scion girth was varied from 0.05-0.1 cm during the 15 days interval (30 DAG-45 DAG) and ranged from 0.13-0.25 during the 45 days interval (30-75 DAG). The finding corroborates with the findings of Razzaque

(2015) who reported that grafting with cv. Amrapalli in the month of July gave rate of increment 0.3 cm in the scion diameter. However, the grafting conducted in December gave the lowest increment in the scion. The slight variation is due to the cultivars used as scion and rootstock.

Highest plant height was recorded in graft with cv. Dussehri during 30, 45, 60 and 75 days after grafting i.e. 46.19, 46.27, 46.53, 46.83 respectively (Table 4).

During 30, 45, 60 and 75 days after grafting stionic ratio value was found minimum in graft with cv. Arka Puneet i.e 1.02, 1.04, 1.05 and 1.05 respectively (Table 5).

The stionic ratio shows the ratio between the rootstock portion to the scion portion of a composite plant. (Bobade *et al.*, 2018). The lower the stionic ratio, the better the union. When there is any type of incompatibility reaction occur between the scion and rootstock, the stock plant become thicker taking the stionic ratio to the higher value.

The cv. Arka puneet showed lowest stionic ratio to higher value. The cv. Arka Puneet showed lowest stionic ratio which is directly corelated to the plant survival.

The grafts performed by taking the local cultivar at scion and rootstock also found to have lower stionic ratio and a better survival rate. The phenomenon is might be due to the least incompatibility prevailed between the two vascular system.

Among all the cultivars, highest survival percentage was found in graft with cv. Arka Puneet i.e 82.61 (Fig. 2). The present results are in line with the findings of Sivadu *et al.*, (2014) who reported maximum 80.91 per cent success rate in grafting using Banganpalli variety as scion.

Table.1 Effect of different varieties on number of leaves of mango grafts

Treatment	30 DAG	45 DAG	60 DAG	75 DAG
T₁(Control) (Local cv. Ganga)	2.7	3.9	5.8	7.4
T₂(Mallika)	3.3	4.3	7.2	11.2
T₃ (Arka Neelachal kesari)	4.6	5.1	8.3	12.4
T₄(Arka Puneet)	2.3	3.1	6.1	9.7
T₅(Amrapalli)	2.2	3.0	5.4	8.9
T₆(Dussehri)	2.2	2.2	3.8	6.2
CD	NS	1.16	1.70	2.58

Table.2 Effect of different varieties on rootstock diameter of mango grafts

Treatment	30 DAG	45 DAG	60 DAG	75 DAG
T₁(Control) (Local cv. Ganga)	2.7	3.9	5.8	7.4
T₂(Mallika)	3.3	4.3	7.2	11.2
T₃ (Arka Neelachal kesari)	4.6	5.1	8.3	12.4
T₄(Arka Puneet)	2.3	3.1	6.1	9.7
T₅(Amrapalli)	2.2	3.0	5.4	8.9
T₆(Dussehri)	2.2	2.2	3.8	6.2
CD	NS	1.16	1.70	2.58

Table.3 Effect of different varieties on scion diameter of mango grafts

Treatment	30 DAG	45 DAG	60 DAG	75 DAG
T₁(Control) (Local cv. Ganga)	3.28	3.37	3.42	3.51
T₂(Mallika)	3.32	3.42	3.52	3.57
T₃ (Arka Neelachal kesari)	3.43	3.49	3.57	3.63
T₄(Arka Puneet)	3.13	3.21	3.29	3.38
T₅(Amrapalli)	3.22	3.28	3.34	3.39
T₆(Dussehri)	3.3	3.35	3.38	3.43
CD	NS	0.109	0.129	0.125

Table.4 Effect of different varieties on plant height of mango grafts

Treatment	30 DAG	45 DAG	60 DAG	75 DAG
T₁(Control) (Local cv. Ganga)	44.62	45.12	45.54	45.91
T₂(Mallika)	40.98	41.43	41.74	42.15
T₃ (Arka Neelachal kesari)	42.26	42.72	43.12	43.44
T₄(Arka Puneet)	43.36	43.73	44.02	44.43
T₅(Amrapalli)	42.52	42.75	43.02	43.32
T₆(Dussehri)	46.19	46.27	46.53	46.83
CD	2.135	2.037	2.030	2.013

Table.5 Effect of different varieties on stionic ratio of mango grafts

Treatment	30 DAG	45 DAG	60 DAG	75 DAG
T₁(Control) (Local cv. Ganga)	1.03	1.07	1.08	1.11
T₂(Mallika)	1.06	1.08	1.08	1.12
T₃ (Arka Neelachal kesari)	1.05	1.09	1.09	1.13
T₄(Arka Puneef)	1.02	1.04	1.05	1.05
T₅(Amrapalli)	1.05	1.07	1.06	1.07
T₆(Dussehri)	1.05	1.06	1.07	1.09
CD	0.018	0.023	0.020	0.030

Fig.1 Effect of different varieties on number of days to bud emergence after grafting

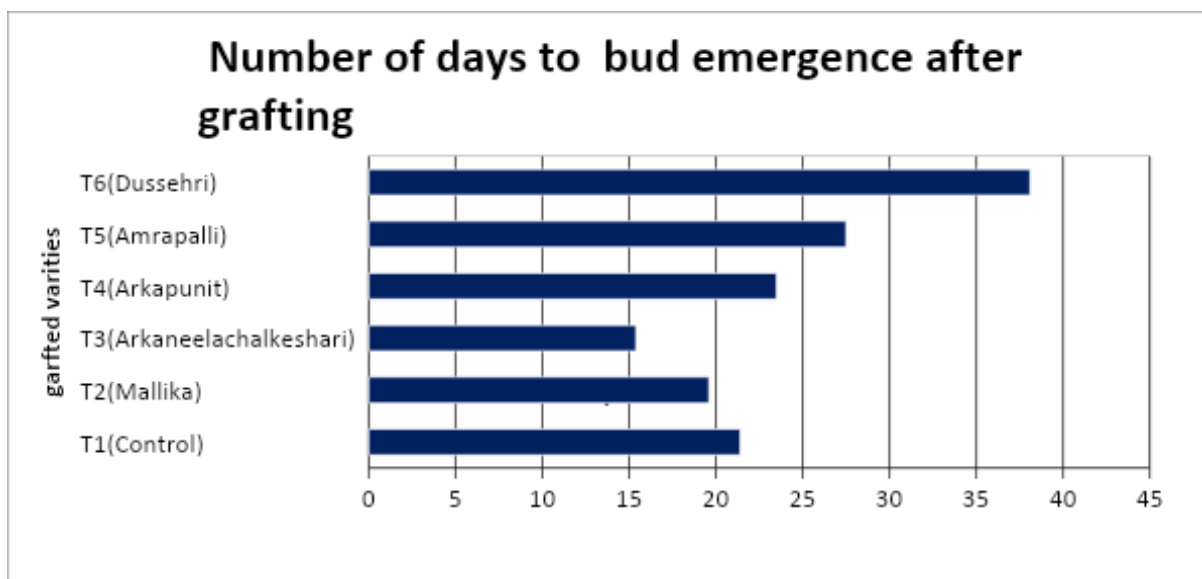


Fig.2 Effect of different varieties on survival percentage of mango grafts

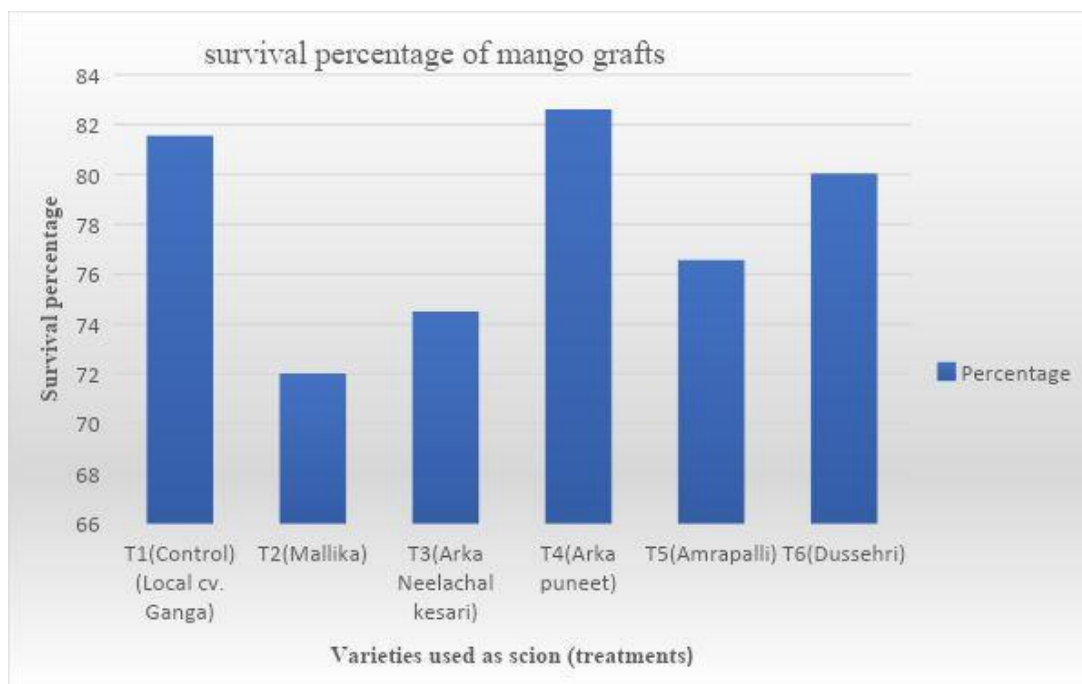
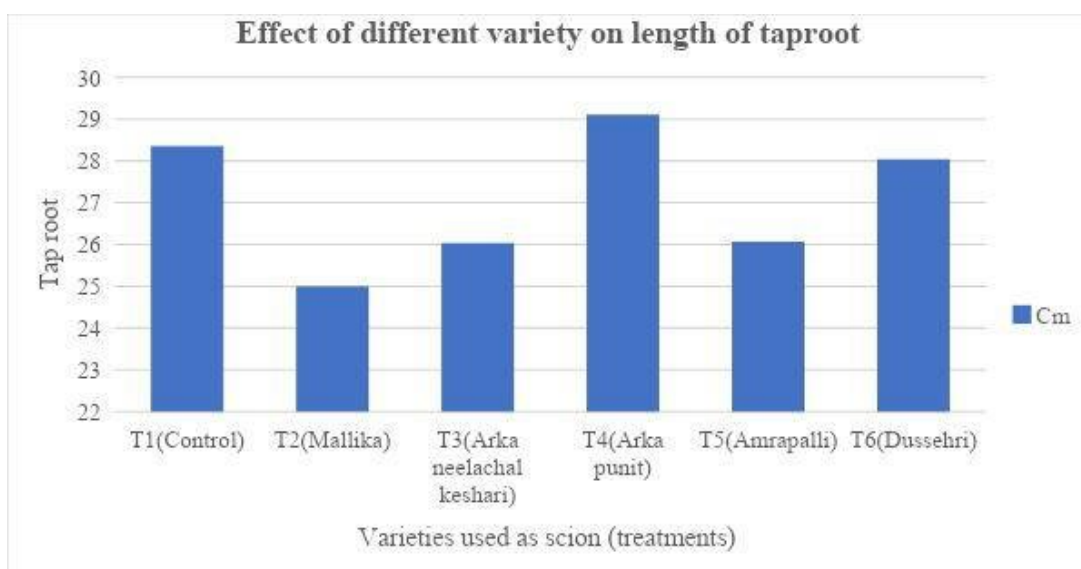


Fig.3 Effect of different varieties on survival percentage of mango grafts



The length of taproot was taken after the experiment. Among all the grafts observed, the one having scion Arka Puneet (29.11) was found to have longer tap root than the other (Fig. 3). Longest tap root system is the most crucial character for the plant with higher survival rate. At the end of experiment, The grafts with cv. Arka Puneet as scion has the longest taproot, lowest stionic ratio and maximum survival percentage among all and has recommended as the best combiner for the local cv. Ganga.

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