

Effect of Scion on Grafting Success and Other Characteristics of Apple Fruit

¹Javed Iqbal, ²Ibadullah Jan, ²Inayat ur Rahman, ¹Sayyed Hamad Ahmad Shah, ¹Sadeed Iqbal, ¹Sana Khan, ⁴Suliman Shah, ¹Ashfaq Ahmad, ³Asif Ali Khan, ³Adil Khan and ³Waqar Karim

¹Department of Horticulture, University of Agriculture Peshawar-Pakistan

²Department of Agriculture, University of Swabi-Pakistan

³Institute of Horticultural Sciences, University of Agriculture Faisalabad-Pakistan

⁴Department of Entomology, University of Agriculture Peshawar-Pakistan

Abstract: An experiment was conducted at the Agricultural Research Station (North), Mingora Swat, Pakistan in 2014. Scion wood of five apple cultivars (Summer Red, Treco Gala, Spartan, Red Chief, Pink Lady) were bench grafted on rootstocks MM-111. Increase in graft take success (100%), plant height (114.33 cm), scion diameter (17.4 mm), number of leaves plant⁻¹ (228) and number of branches (3.66) were noted for cultivar Pink Lady. The minimum graft take success (56.33%), plant height (37.33 cm), scion diameter (8.33 mm) and number of leaves per plant (50), were noted for cultivar Red Chief. While, the minimum numbers of branches (2.33) were noted for cultivar Summer Red and Treco Gala. Therefore, it was suggested that cultivar Pink Lady must be cultivated in prevailing climatic condition to obtain maximum growth and production in apple fruit.

Key words: Graft success • Rootstocks • Scion diameter • Bench graft • Cultivar

INTRODUCTION

Apple, *Malus sylvestris*, is a deciduous fruit plant which belongs to the family Rosaceae and sub family *Pomoidea* with a basic chromosome number 17. Other sub family members are pear and quince. The botanical name of apple is used as *Pyrus malus* L, *Malus sylvestris* and *Malus malus*. But the most common name is *Pyrus malus* L. [1]. The apple is one of the most important tree fruit of the world. In Pakistan its cultivation is limited and is restricted to the northern hilly tracts of Punjab, KPK and the Quetta region of Baluchistan. In Khyber Pakhtunkhwa, the apple plantation is distributed in Swat, Dir, Mansehra, Parachinar, Chitral, Hunza, North and South Waziristan Agencies. District Swat with an area of approximately 4000 square miles with in the Malakand Division is the most important of all the apple producing districts of Khyber Pakhtunkhwa followed by the districts Mansehra, Dir, Abbottabad, Chitral and Hunza [2, 3].

Apple tree need a cooler climate than most fruits because apple buds have the longest rest period and hence require more chilling than those of other deciduous fruits. Apple can endure quite low temperature. But temperature of -30 °C and rapid fluctuation in winter

from relatively warm to extremely cold temperature is harmful. The type of climate that usually prevails at altitudes of 1700-2500 m. The quality of fruit grown at lower altitude is particularly lowered by high summer temperature. For apple tree 750 mm rainfall is best throughout the year. Apple tree grow and bear fruit in a wide range of soil but the most suitable appear to be deep, well-drained and fertile loam which permits free root developments [1].

The pruning of apple trees is often ignored by orchardists. Mainly because, they are unaware of the objectives of this practice. Both young and bearing trees are pruned to increase orchard output mostly during the dormant season. Young trees are pruned to train them to a desirable shape so that the limbs constituting the main framework are strong enough to bear heavy crops of fruit. Such trees are easily managed for spraying, thinning and picking of fruit [1].

About 69 million tons of apples were grown worldwide in 2010. China produced almost half of this total. The United States is the second-leading producer with more than 6% of world production. Turkey is third, followed by Italy, India and Poland. Apples are often eaten raw, but can also be found in many prepared foods

especially desserts) and drinks. Many beneficial health effects are thought to result from eating apples; however, two forms of allergies are seen to various proteins found in the fruit [1].

Apple trees are budded and grafted on crab apple on various East Malling types and on seedling of some commercial apple varieties. Crab apple is propagated through seed and stooling. Trees grafted on this rootstock are vigorous. In apples the vegetative propagation is done by grafting or budding. Budding is done during the active growth stage, while grafting is done during dormancy in winter or early spring. Some important methods of grafting in apples are whip or tongue grafting and cleft grafting. For budding the ring and T-budding techniques are often practiced [1]. Chip budding produced larger and more uniform one-year-old tree, with more and longer lateral branches compared with those raised by traditional shield budding using an upright T incision in the rootstock [4]. Hirsch and Ferre [5] grafted Gala and Triple Red Delicious scion onto M-9, MM-106, MM-111 and B-118 (Gala only) in a green house. It was found that root stock exerted more influence than cultivar on total growth of the tree. The main objective of this experiment is to find out the effect of scion on grafting success and other characteristics of apple plant.

MATERIALS AND METHODS

An experiment was carried out at Agricultural Research Station (North), Mingora Swat, Pakistan in 2014. The experiment was laid out in Randomized Complete Block Design (RCBD) having three replications and having 15 treatments in each replication.

Five apple cultivar namely Treco Gala, Red Chief, Pink Lady, Sparton and Summer Red are bench grafted on root stock MM-111. The Scion woods were obtained from healthy plants. The rootstocks and cultivars were used of the same size. The rootstocks were bench grafted with the selected cultivars in open field. The culture practises are same for the all experiment.

Parameters: Data were recorded on the following parameters.

Graft Takes Success: After complete sprouting and successful growth of scion the percent graft takes success were calculated at the end of the growing season by the following formula and their mean were calculated.

$$\text{Graft take success (\%)} = \frac{\text{Number of grafted plants survived}}{\text{Total number of plants}} \times 100$$

Number of Leaves Plant⁻¹: For the determination of number of leaves/plant five plants were randomly selected in each treatment and then mean were calculated.

Scion Diameter: Scion diameter was calculated with the help of Vanier calliper in (mm) for each treatment in each replication of five randomly selected plants and the mean were calculated.

Number of Branches Plant⁻¹: Numbers of branches plant⁻¹ of five randomly selected plants were counted in each treatment and then their mean were calculated.

Plant Height: For each treatment plant heights of five randomly selected plants were determined in (cm) and then their mean were calculated.

Statistical Procedure: The data were collected on different parameters was subjected to analysis of variance (ANOVA) technology to observe the difference between different treatments. Statistical computer software statistix were used for computing ANOVA [6].

RESULTS AND DISCUSSION

Graft Take Success (%): Mean values pertaining graft take success is presented in Table 1. Analysis of variance shows that grafts take success were significantly affected by different apple cultivars. Mean value showed that the maximum graft success were obtained for apple cultivar Summer Red and Pink Lady (100%) followed by Treco Gala (94%) and Sparton (86%). However, the minimum graft successes were obtained for cultivar Red Chief (56%). Karamursel and Kalyoncu [7] also reported similar result that cultivars show significant effect for graft take success.

Number of Leaves Plant⁻¹: Mean data regarding number of leaves plant⁻¹ as shown in Table 1 shows that cultivar and rootstock significantly affected number of leaves plant⁻¹. Data in Table 1 also showed that the maximum number of leaves were obtained for cultivar Pink Lady (228) followed by Sparton (118), Treco Gala (96) and Summer Red (64.33), while the minimum numbers of leaves were obtained for cultivar Red Chief (50). Also, Rabi *et al.* [8] reported similar result that cultivars show significant effect for number of leaves plant⁻¹.

Table 1: Mean table for graft take success, number of leaves plant⁻¹ and scion diameter (mm), plant height and branches plant⁻¹ of apple cultivars

Variety	Graft success	Leaves plant ⁻¹	Scion diameter (mm)	Plant height (cm)	Branches plant ⁻¹
Red Cheaf	56.33 c	50.00 d	8.33 d	37.33 c	2.66 b
Summer Red	100.00 a	64.33 c	12.13 bc	75.33 b	2.33 b
Sparton	86.00 b	118.00 b	12.70 b	87.00 b	3.00 a
Pink Lady	100.00 a	228.00 a	17.40 a	114.33 a	3.66 a
Treco Gala	94.00 a	96.00 bc	9.40 cd	83.00 b	2.33 b
LSD (P ≤ 0.05)	5.58	39.57	1.45	8.94	0.67

Scion Diameter (mm): Data presented in Table 1 regarding scion diameter mean shows that cultivars and rootstock had a significant effect on scion diameter. Also data in Table 1 showed that the maximum scion diameter were obtained for cultivar Pink Lady (17.4 mm) followed by Sparton(12.7 mm), Summer Red (12.13 mm) and Treco Gala (9.4 mm), while the minimum scion diameter were obtained for cultivar Red Chief (8.33mm). Similar results were reported by Rabi *et al.* [8].

Plant Height (cm): Mean values pertaining to plant height are presented in Table 1. Analysis of variance showed that cultivars significantly affected plant height. Mean value in Table 1 showed that the maximum plant height was obtained for cultivar Pink Lady (114.33 cm) followed by Sparton (87 cm), Treco Gala (83 cm) and Summer Red (75.33 cm), while the minimum plant height were obtained for cultivar Red Chief. Similar results were obtained by Karamursel and Kalyoncu [7], who reported that cultivars show significant effect for plant height.

Number of Branches plant⁻¹: Mean values relating to number of branches per plant are shown in Table 1 that shows that scion cultivar had non-significant effect on number of branches. The maximum number of branches was obtained for cultivar Pink Lady (3.66) followed by Sparton (3.00) and Red Chief (2.66), while the minimum plant height was obtained for cultivars Summer Red and Treco Gala (2.33).

CONCLUSION

It can be concluded that Cultivar Pink Lady showed significantly high grafting success, number of leaves plant⁻¹, scion diameter, plant height and number of branches plant⁻¹. Whereas, the minimum number of leaves plant⁻¹, scion diameter, plant height and grafting success were observed in cultivar Red Chief.

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