

GRAFTING TECHNIQUES IN GUAVA (*PSIDIUM GUAJAVA*)

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ABSTRACT

Nursery experiments were conducted at Horticultural Research Institute, AARI, Faisalabad, Pakistan during the year 2009-2011 to standardize asexual propagation methods in guava (*Psidium guajava* L.) by different grafting techniques i.e. T-budding, T-grafting and cleft grafting. Maximum success percentage (59.26) was achieved in plants budded by T-grafting followed by T-budding (22.58%). The plants in T-grafting sprouted in 35.9 days and produced 26.47 cm sprouting length and 16.75 number of leaves as compared to the plants grafted via cleft grafting (7.54% success). Cleft grafting technique showed minimum performance in other parameters also. The study provided useful information on clonal multiplication of elite germplasm of guava under protected environment for developing commercial nurseries.

KEYWORDS: *Psidium guajava*; T-budding; T-grafting; cleft grafting; callusing; asexual propagation; pedigree plants; Pakistan.

Guava (*Psidium guajava*) is commercially cultivated in Punjab and also thrives well in the wild. It is a delicious fruit which is very nutritious and exceptionally rich in ascorbic acid and several minerals useful for human health (20). Besides its high nutritional value, it bears heavy crop every year and gives good economic returns (13). This has prompted several farmers to grow guava orchards on a commercial scale. Guava propagation through seed does not produce true-to-type plants while clonal propagation has assured true-to-type plants. Maqbool and Khan (8) reported that guava is commercially propagated from seeds in Pakistan.

Guava is usually propagated from seed and the species is highly cross pollinated in nature (17). Guava, if propagated through seed, exhibits a great variation due to inevitable heterozygosity. Moreover, seed propagated plants

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come into bearing much later than vegetatively propagated plants. Through seed propagation, unique characters of a certain variety cannot be preserved or multiplied. Seed propagation does not permit the utilization of superior important characters of a certain rootstock such as disease tolerance (viral fungal or bacterial), adaptability to varying agro-ecological conditions, manipulation of tree growth (dwarfness) and better influence of certain rootstock. Vegetative propagation is, therefore, inevitable in guava (19).

In fruit trees, several vegetative propagation techniques as air layering, root cuttings and stooling, etc. have been tried with varying success rate to increase productivity and gains by clonal propagation and selection (9, 10). However, these techniques are still not commercially viable due to varying rate of success, absence of tap root system and cumbersome process.

In Punjab, guava is generally propagated from seeds and the seedlings are variable in both plant and fruit characteristics. Establishment of orchard through seedlings is not recommended at the present time; most of these seedlings will not be like the parental type in yield, taste and fruit flesh colour.

Establishment of guava nursery is a good source of income for nursery producers. Healthy planting material is essential to achieve good yield and quality produce. A well established commercial nursery must improve the way of producing planting material by using new planting techniques with modern technology as there is the potential to produce true-to-type guava nursery plants with soft wood cuttings (1). The hottest issue in guava plantation is discriminate multiplication of plants from unreliable sources by nurserymen (. Non-availability of quality planting materials and consequently substitution of poor quality seedlings have adversely affected the guava production and productivity. Trust worthy initial planting material is the basic requirement on which the final crop depends both for quality and quantity (14). In the present context, rapid methods of propagation become very important when planting materials are limited due to the scarcity of a clone or varieties or due to sudden expansion in acreage.

The present research work was initiated to standardize the technologies for producing true-to-type plants of guava in short period of time via grafting.

MATERIALS AND METHODS

Different grafting methods (T-budding, T-grafting and cleft grafting) were evaluated in nursery at Horticultural Research Institute, AARI, Faisalabad,

Pakistan during the year 2009-2011. The study was initiated in the month of October because the temperature becomes mild and RH remains in the range of 70-80 percent (16). Land was well cultivated and leveled and flat beds were prepared. To enhance fertility, texture and drainage FYM @ 60-80 kg/marla (272.25 sq.feet) was applied and uniformly mixed in the soil one month prior to sowing of seeds. The seeds of Pear Guava (Bangladesh selection free from the diseases, insect and pest attack) were collected, thoroughly washed to free pulpy material and then treated with a fungicide to prevent fungal diseases. The seeds were sown in 2-3 cm apart furrows and lightly covered with soil 0.5 to 1.0 cm deep and watered. The seedlings attaining the size of 4-6 cm were shifted in the nursery beds for easy handling in 25 to 30 cm apart rows. After four lines, distance of 70-80 cm was left for sitting of bud. The seedlings were protected against insect pests and diseases by spraying insecticide (Triazophos @ 2.5 ml/l of water) and fungicides (Topsin-M "Thiophinate Methyl" @ 2 g/l of water). The plants became ready for grafting after 6 to 9 months. When the plants attained the girth equal to pencil, these were grafted with scions of guava variety Gola with T-budding, T-grafting and cleft grafting techniques.

Experiment was laid out in RCBD replicated four times. In each treatment 20 plants of rootstock were budded and grafted according to the layout of experiment. Data on success percentage, days taken to sprout, shoot-length after 60 days and number of leaves were collected and analyzed statistically using Fishers analysis of variance and treatments were compared using least significant difference (LSD) test at 0.05 probability level (18).

RESULTS AND DISCUSSION

The data (Table 1) revealed that T-grafting in guava propagation gave maximum success percentage (59.26%) than other grafting methods followed by T-budding (22.58%). Minimum success percentage (7.54%) was recorded in plants budded via cleft grafting. These results are in line with those of Khattak *et al.* (6) who reported 93.33 percent success via T-grafting. Shashi *et al.* (12) also reported that among different curing treatments maximum graft success (84%) and graft survival (88.09%) were recorded with nine days cured scions via T-grafting, against minimum in control (52.00 and 76.92%). However, these results do not agree to those of Khattak *et al.* (7) who reported maximum sprouting (81%) in T-budding. The deviation may be due to variety, soil or climatic conditions. However, some workers (2, 4) have found that in guava, grafting is more successful than budding and commented that patch and shield budding had been ineffective (7). The

success of grafting/budding in guava depends upon appropriate preparation of scion shoots involving defoliation (2).

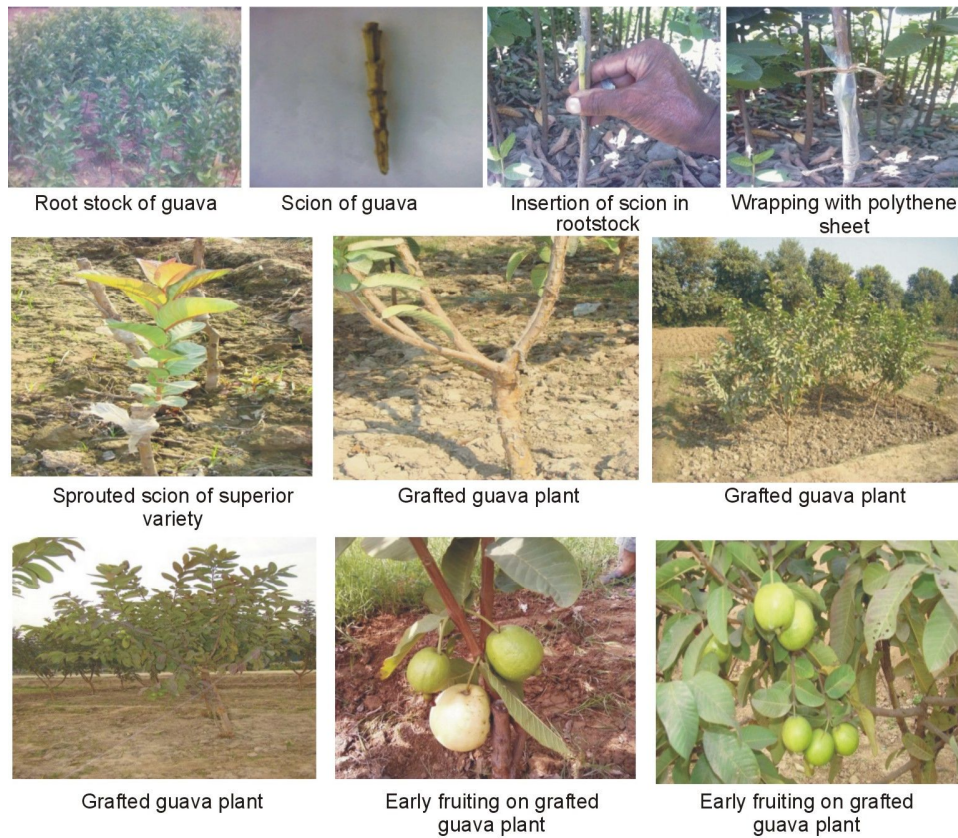
Table 1. Performance of different grafting techniques in guava.

Treatments	Success percentage	Days taken to sprout	Shoot length (cm) after 60 days	No. of leaves
T ₁ (T-budding)	22.58 b	26.8 c	13.39 b	8.75 b
T ₂ (T-grafting)	59.26 a	35.9 b	26.47 a	16.75 a
T ₃ (Cleft grafting)	7.54 c	46.5 a	10.41 b	4.83 c
LSD value	3.8365	6.7675	3.7511	2.7987

The data further showed that maximum days to sprout (46.5) were noted in the plants grafted by cleft grafting followed by T-grafting (35.9). Minimum days for sprouting (26.8) were taken by the plants in T-budding technique. These results are not in line with the findings of Singh *et al.* (15), who reported that overall, plants grafted in open field conditions took maximum time (17-23 days) to sprout as compared to greenhouse. The less number of days taken to sprout may be due to controlled conditions in green house or due to varietal response.

The results also revealed that maximum shoot length (26.47 cm) was measured in the plants grafted by T-grafting. The plants budded by T-budding gave 13.39 cm branch length. Minimum branch length (10.41 cm) was noted in the plants grafted by cleft grafting. Khattak *et al.* (5) also reported similar findings where maximum shoot length (18.66 and 17.22 cm) was noted on 15th April and 15th May. In another study (3) under open condition on 15th day after graft success, maximum length of sprout (1.93 cm) was observed during September and minimum (0.89cm) during November followed by December and January.

Similarly, maximum number of leaves (16.75) were observed in the plants grafted by T-grafting followed by T-budding technique (8.75). Minimum number of leaves (4.83) were noted in plants grafted via cleft grafting. These results confirm the findings of Raghavendra (19) who reported maximum (3.4) number of leaves and sprout length (2.7 cm) in eight months old rootstock (A4) on 30th day in T-grafting method. In another study (3), 9.33 and 12.48 leaves were noted on 15th and 30th day after graft success in the month of June under open condition. Minimum number of leaves (3.19 and 3.15) were noted in the month of August and November.



Photographs showing the grafting technique in guava.

CONCLUSION

T-grafting is found to be the best for production of pedigree plants in field for rapid multiplication of guava true-to-type plants in a short period of time. This technique proved as useful as compared to conventional method of guava propagation through seeds.

Significant results can be achieved if the guava nursery is produced via T-grafting during the month of October. The plants produced by this technique will be short stature, true-to-type and identical to the parents. Also farmers can fetch more income with more number of plants planted in high density. The growth habit of the plants produced by this technique will also be ideal for high density plane and will bear earlier than the seedling ones. The unique characters of a variety can also be preserved by this technique.

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