

## Impact of different Vegetative Propagation Techniques in Guava (*Psidium guajava* L.) cv. Dhawal under Western U.P. conditions

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**ABSTRACT:** An Investigation entitled “Studies to identify suitable vegetative propagation technique in Guava (*Psidium guajava* L.) cv. Dhawal, under western U. P. conditions” was conducted at Horticulture Research Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, to study the impact of different vegetative propagation techniques in Guava (*Psidium guajava* L.) cv. Dhawal. The present experiment comprising three treatments *i.e.*, Inarching, Air Layering and Stooling were laid out in Randomized Block Design (RBD) with three replications. The experimental results revealed that the maximum Number of branches (10), Number of leaves (68), Shoot length (42 cm), Shoot diameter (7 cm), Leaf area (68 cm), Plant spread (22 cm), Canopy height (25 cm) and Survival per cent (81 %) was observed with Inarching method. So, it is concluded that the inarching significantly influenced the survival percent and growth parameter of guava among layering and stooling.

**Keywords:** Guava, Dhawal, Inarching, Air Layering and Stooling.

### INTRODUCTION

Guava (*Psidium guajava* L.) is a native of Tropical America (from Mexico to Peru) and belongs to the family Myrtaceae. In guava, most of the commercial cultivars are diploid ( $2n=2x=22$ ). However, *Psidium guajava* is the common guava cultivated commercially in India as well as in other countries. Plants are mostly small trees or shrubs. The short trunk produces branches near ground and gets suckers from roots near the base of trunk. The bark is smooth, scaly, greenish brown to brown in color and peeling off in flakes. Leaves are opposite in pairs, elliptical to oblong in shape and are evergreen becoming slightly reddish or purplish in winter. Upper surface of the leaves is glabrous and lower surface is finely pubescent. Flowers are produced in axils on the branches in current season growth and are white in color. Fruit type is berry, globose and pyriform. Fruit skin is pale green to bright yellow. Flesh is white, yellow, pink or red with embedded numerous small seeds. Besides its high nutritional value, it bears heavy crop every year and

gives good economic returns. This has prompted several farmers to take up guava orcharding on a commercial scale (Singh *et al.*, 2007).

In recent years, guava is getting popularity in the international trade due to its nutritional value and processed products (Singh, 2005). In view of the high return and potential for processing there is tremendous scope for bringing substantial additional area under this crop in India.

Due to its delightful taste, flavor and availability for a longer period, guava is a popular fruit crop of India. Guava is the fourth important fruit crop after mango, banana and citrus. Guava is considered as “the apple of tropics”. Its cost of production is low because its irrigation, fertilization and plant protection requirements are very less. Further, its nutritive value is very high. This fruit crop is a rich source of vitamin C (ranges from 75-250 mg per 100g fresh fruits) and is approximately four times greater in winter than in rainy season. It also a good source of vitamin-A and B. The proximate composition of the seeds of white and pink fleshed varieties of guava fruits suggest that they are

good sources of carbohydrates (11 to 13 %), fat (0.5 %), protein (0.71 %) and other minerals such as calcium; 29 mg, iron; 0.5 mg and phosphorus; 10 mg per 100 g fresh fruits. Dhawal variety of guava is developed by half-sib selection from Allahabad Safeda variety. Dhawal is high yielding variety of guava with large attractive fruits, sweet white pulp and seeds are soft and moderate in number.

At present besides India, the major guava growing countries in the world are Brazil, U.S.A., Mexico, Hawaii islands and Cuba. Brazil leads in area and production of guava in the world. Guava occupies nearly 255 thousand hectares area with 4048 thousand metric tons production in India.

It is widely grown in several states viz., Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu, West Bengal, Assam, Orissa, Karnataka, Kerala, Rajasthan and Gujarat. Uttar Pradesh is one of the leading states where total area is 49.53 thousand hectares under guava cultivation with production of 928.44 thousand metric tons (Anonymous, 2018).

Uttar Pradesh is by far the most important guava growing state in India and Allahabad has earned the reputation of producing the best quality of guava in the country as well as in the world.

Guava is a very popular fruit crop, yet its cultivation in our country has remained in a state of negligence. The non-availability of the quality planting materials and lack of efficient propagation techniques and other information on the performance of cultivars under different agro-climatic conditions of tropical and subtropical regions are the major constraints in the expansion of guava cultivation in India. In guava no systematic work has so far been done on their survivability and morphological performance in relation to propagation method

Guava is propagated by both, sexual (seeds) and asexual (vegetative parts) methods of propagation. The propagation of guava through seeds should not be encouraged because the seedlings have long juvenile phase, give lower yields and bear poor quality fruits.

Vegetative propagation technique of guava is one of the most important practices that influence the vigor,

productivity and quality of the fruits. Asexually guava can be successfully propagated by stooling, inarching, layering, cutting, grafting and budding. These methods have their own merits and demerits. Inarching is usually cumbersome and requires time and labour. It's cutting, rooting and survival is very low. Budding has also been used to a limited extent, but air layering remains the best methods of propagation for this crop. On account of its safety, cheaper cost, rapid, simple and more convenient method with higher success and survival percentage, air layering is becoming more and more popular in India. It does not require any special technique as in the case of grafting and budding.

## MATERIALS AND METHODS

The present field experiment was carried out during the year 2021-22 in rainy season at Horticulture Research Centre, College of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh. Geographically Meerut is located at latitude of 29° 40' North and longitude of 77° 42' East and at an altitude of 237 meter above mean sea level (MSL). The mean annual rainfall of the Meerut is about 840 mm, of which nearly 85 percent is received in the monsoon period from June to September and the remaining in the period between October to May. The uniform sizes, healthy and vigorous growth of seven years old mother plants of *Psidium guajava* cv. 'Dhawal' grown at Horticulture Research Centre were selected to check best mode of propagation for the cultivated variety Dhawal. The average length of branch was 60 cm with total 3 treatment combinations, each treatment having 25 inarching, air layering and stooling mode of propagation were applied based on the performance. Total 5 plants were selected from each treatment and average was taken based on the performance of each plant

**Experimental Design and Treatments.** The experiment was conducted in Randomized Block Design (RBD) with three, treatment combination consisting three treatments *i.e.*, Inarching, Air Layering and Stooling which were replicated three times.

Sr. No.	Notation of Treatments	Method of Propagation
1.	T <sub>1</sub>	Inarching
2.	T <sub>2</sub>	Air layering
3.	T <sub>3</sub>	Stooling

**Selection of Plants and Branches.** The uniform sizes, healthy and vigorous growth of seven years old mother plants of *Psidium guajava* cv. 'Dhawal' grown at Horticulture Research Centre were selected to check best mode of propagation for the cultivated variety Dhawal. The selected mother plants were grown under similar soil and environmental conditions. On these plants, all the horticultural practices were done and different modes of propagation were applied as per the propagation rules using well matured and healthy. The

average length of branch was 60 cm with total 3 treatment combinations, each treatment having 25 inarching, stooling and air layering mode of propagation were applied based on the performance. Total 5 plants were selected from each treatment and average were taken based on the performance of each plant.

**Ringling.** A ring of bark about 5 cm in length was removed from selected shoot of guava just below the bud without injuring the inner wood.

**Wrapping.** Transparent polythene, 200 gauge of thickness was used as wrapping material.

**Covering for air layering.** For both years in the month of July and August, the treated exposed portion of shoots was covered with rooting medias *i.e.*, Soil: Sphagnum moss: Coco peat (1:1:1) and then wrapped with transparent polythene and tied with the help of gunny string. Control branches were layered without applying growth regulator.

**Separation of Layers from Mother Plant.** After 60 days from the date of operation, air layers were detached from the mother plants. When roots were visible from the transparent polythene covers, a cut was made just below the lowest end of the ringed portion with the help of sharp secateurs. After detachment of air layers, the twigs were brought under the shade of trees and their polythene wrapping was removed gently. Care was taken that the roots may not be injured while removing the polythene cover. For well establishment of air layers were transplanted into a polybag containing Soil, FYM and sand in the ratio of 2:1:1 and kept under for further observation.

#### Parameters of Study

##### Number of Branches:

Number of branches was counted based on the number of best branches which were developed healthy.

**Number of Leaves.** Numbers of leaves were counted based on per plants of the replications of different modes of propagation.

**Shoot Length (cm).** Shoot lengths of randomly selected five plants were taken with the help of scale from each replication where all the plants shoot length were measured to the tip of the shoot and average was found.

**Shoot Diameter (mm).** The width of Shoot in each treatment was measured in millimetres with the help of Digital Vermeer Calliper.

**Leaf Area (cm).** Leaf area was taken in millimetre through using (Li-3000 portable area meter, Lincoln NE, United states by randomly selected plant sample. Total number of secondary roots per rooted layer was counted. While, the mean number of secondary roots per rooted layer was found from the concerned observation.

##### Plant Spread (cm):

The plant spread was counted based on the 5 randomly plants taken from each replication. Where plant spread was measured at the widest part from leaf tip.

**Canopy Height (cm):** Randomly from each selected replication from each treatment the height of different canopies was measured using meter scale.

**Total survival percentage (%).** The survival of propagated plants from mother plants was done after 60 days of different operation. The total number of successful layers under each treatment/mode of propagation was noted after 30 days of transplanting

and survival and mortality percentage of layers was calculated by following formula:

Total survival (%) = Number of survival plants (best) / Total number of Plants propagated × 100

## RESULTS AND DISCUSSION

In present investigation, a significant difference has been observed among all the treatments and presented in Table 1. **Number of Branches:** Regarding the effects of various propagation of Inarching, air layering and Stooling was significant. The best results were observed under Inarching method(10) because of best compatibility towards the stock of the plant and hence for the variety Dhawal this method is best. Whereas, the number of branches were found minimum (30) in Stooling These findings also are in close conformity with earlier findings of Kakon *et al.* (2005).

**Number of leaves:** The number of leaves (68) was found significantly effective in respect with inarching. However, the number of leaves were found minimum (30) in Stooling. Similar results were also reported by several investigators such as Geoffery and Sani (2017); Raut *et al.* (2015).

**Shoot Length (cm):** Various propagation techniques of the inarching shows maximum (42 cm) shoot length which was found significant. Moreover, the minimum (24 cm) shoot length was found in stooling during the experimentation. These results were very closely related to Tyagi and Patel (2004); Geoffery and Sani (2017); Raut *et al.* (2015); Mandloi *et al.* (2019).

**Shoot Diameter (mm):** The results indicated that the maximum (7mm) shoot diameter was found in air layering with minimum(5mm) shoot diameter in stooling. Similar results were also indicated to support the study with earlier findings of Gohil and Lele (2014); Raut *et al.* (2015); Mandloi *et al.* (2019).

**Leaf Area (cm):** The significant difference were found in different propagation technique were maximum (68 cm) leaf area was found in Inarching. Moreover, the minimum (59 cm) leaf area was found in stooling. These findings also are in close conformity with earlier findings of Raut *et al.* (2015); Mandloi *et al.* (2019).

**Plant Spread (cm):** The maximum (22 cm) plant spread was found in Inarching significant. However, the minimum (19 cm) results in plant spread were found in stooling. Similar results were also indicated to support the study with earlier findings of Raut *et al.* (2015); Mandloi *et al.* (2019).

**Canopy Height (cm):** The maximum (25 cm) canopy height was found in Inarching significant. Whereas, the minimum (19 cm) results in canopy height were found in stooling. These findings also are in close conformity with earlier findings of Verma *et al.* (2019); Mandloi *et al.* (2019).

**Total survival percentage (%):** Results indicate that from different propagation techniques the better survival per cent (81 %) was found best in Inarching. However, the lowest survival per cent (65 %) was

found in stooling in guava. Similar results were also indicated to support the study with earlier findings of Similar results were also indicated to support the study

with earlier findings of Trymbake and Patil (2002); Tomar (2011).

**Table 1: Effect of different vegetative propagation techniques in Guava.**

Modes of Propagation	Number of Branches	Number of leaves	Shoot length (cm)	Shoot diameter (mm)	Leaf area (cm)	Plant spread (cm)	Canopy height (cm)	Survival (%)
INARCHING	9.18±0.89	66.10±1.47	40.99±1.21	6.77±0.16	67.22±0.73	21.01±0.96	23.47±0.62	79.86±0.31
AIR LAYRING	5.86±0.94	37.99±0.72	37.48±0.66	6.85±0.16	58.49±0.54	20.21±0.65	19.56±0.52	71.78±0.33
STOOLING	4.08±0.69	28.31±0.73	22.96±0.92	4.67±0.08	57.95±0.92	18.32±0.51	18.42±0.51	64.69±0.23
SEM (±)	0.152	0.458	1.134	0.169	0.918	0.481	0.518	0.195
C.D. at 5 % of level	0.612	1.845	4.573	0.683	3.700	1.941	2.086	0.786

## CONCLUSION

On the basis of results summarized above, it can be concluded that the inarching was found to be most superior in terms of the number of branches, number of leaves, shoot length (cm), Shoot diameter (mm), leaf area (cm), Plant spread (cm), canopy height (cm) and survival (%). However, the minimum was shown in stooling. So, this study concluded that the inarching is significantly influenced the survival percent and growth parameter of guava among layering and stooling. Thus, inarching is recommended as successful commercial propagation of guava under Western conditions of Uttar Pradesh.

## FUTURE SCOPE

Guava was best grown in an ecologically friendly manner with the different methods of propagation viz. Inarching, Air layering and stooling. Among all these methods of propagation all methods are benefited to the farmers in terms of growth and development of guava.

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**Conflict of Interest.** None.

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