Current Horticulture **12**(3): 30–33, September–December 2024
DOI: 10.48165/chr.2024.12.3.03
Received: 19 April 2023; Accepted: 5 July 2024

Response of guava *(Psidium guajava)* genotypes to air-layering under sub-humid southern Rajasthan

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Abstract

The evaluation of genotypes of guava (*Psidium guajava* L.) for air-layering under sub- humid southern plains of Rajasthan conditions was done during July 2015-16 at RCA, MPUAT, Udaipur, Rajasthan. The study involved a diverse set of genotypes, including L-49, Allahabad Safeda, Lalit, Red Fleshed, Pant Prabhat, Safed Jam, Arka Amulya, Arka Mridula, MPUAT S-1, MPUAT S-2, Shweta, Burfkhan, Sarbati, RCGH-1, and One-Kg. The results revealed significant variation among the genotypes in terms of their rooting characteristics. The genotype Lalit stood out, exhibiting the earliest root initiation, the highest percentage of rooted air-layers, the greatest survival percentage, and the highest vigour index, while number of secondary roots was highest in L- 49 and root: shoot ratio in Shweta. On the other end of the spectrum, the genotype One-Kg showed a poor response to rooting, making it less ideal for air-layering propagation under the tested conditions. Thus, genotype Lalit is particularly well-suited for propagation through air-layering under sub-humid southern Rajasthan**.**

Key words: Chinese layering performance, Sub-humid condition, Red and white fleshed genotypes, Air-layering

Guava *(Psidium guajava* L.) is propagated by seeds and vegetative means. Seed propagated plants start bearing fruits in 6- 8 years with variation in fruit yield and quality, whereas vegetatively propagated ones are precocious in bearing (3- 4 years after planting) and produce uniform fruits (Bose *et al.,* 1986). Vegetative propagation in guava is done by layering, grafting and budding in different parts of India (ICAR-DKMA, 2001). Under Rajasthan conditions true-to- type saplings are produced through air and mound layering as well as inarching methods of propagation. The success of air-layering depends on variety, types of plant material and time of operation (Sharma *et al*., 1975, Dod *et al*., 1998 and Tomar, 2016). Since multiplication of desired genotype by air-layering under sub-humid southern plains of Rajasthan, is not done to meet the demand, an experiment was done.

Materials and Methods

The experiment was conducted during June- December at Rajasthan College of Agriculture, Udaipur, Rajasthan. The 15 genotypes, Allahabad Safeda, Arka Amulya, Arka Mridula, Burfkhan, L-49, Lalit, MPUAT S-1, MPUAT S-2, One-Kg, Pant Prabhat, RCGH-1, Red Fleshed, Safed Jam, Sarbati and Shweta were used. During July, 100 air-layering were performed on each genotype mother plant of 5-6 years old, with a total of 1,500 layers. One-year-old healthy shoots were selected and on each selected shoot a ring of bark about 1.5- 2 cm width between two nodes was removed carefully by giving two circular cuts with a sharp knife at 50-60 cm above from the tip of the shoots. This portion covered with a handful of moistened sphagnum moss which had been previously soaked in water for 2-3 hours. It was then wrapped with a piece of polyethylene sheet (150-gauges) to hold the moss in position around the operated portion and tied firmly with plastic strips at both the ends.

The layers were separated from the plant when roots were visible through the polythene sheet. After detachment of layers from plant the wrapped polythene sheet was removed and layers were then treated with COC (copper oxychloride) @ 3 g per litre and planted in polythene bag (10 cm × 15 cm) after shoot pruning. Observations were recorded on days taken for root initiation, percentage of air layers rooted, root characters (number of secondary roots, length of longest root, diameter of longest root, fresh weight and dry weight of roots), root/ shoot ratio (root: shoot ratio = averaged root length (cm)/ averaged shoot length (cm),

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vigour index {vigour index= averaged root length (cm) + averaged shoot length (cm) × survival percentage}, survival percentage after shifting in poly bags at 15 days and one month after shifting were recorded after shifting in poly bag survival percentage again recorded according to which remain 15 days after shifting.

Results and Discussion

The genotypes had a significant effect on days taken to rooting, per cent of rooting, root characters (number, length, diameter, fresh weight and dry weight of secondary roots), root: shoot ratio, survival percentage of rooted air layers and vigour index. Minimum days taken for root initiation was observed in Lalit (39 days), followed by Red Fleshed (40.60 days) and maximum days (50) taken for root initiation was in One-Kg. The probable reason might be due to genetic make-up of varieties (vigorous, dwarf and intermediate) and interaction with environmental factors (Manna *et al.,* 2001).

Maximum percentage of air layers rooted was recorded in Lalit (74.76 %), followed by Allahabad Safeda (71.19 %) and One-Kg (50.19 %). Lalit responded higher to air-layering due to genetic and physiological behaviour, better rooting occurs in layers when shoot is physiologically mature and is in active sap flow stage that varies with genotypes (Table 1). The results were found to be analogous with those of Sarkar and Ghosh (2006). Maximum number of secondary roots was recorded in L-49 (11.20), length of longest root in Lalit (7.12 cm), diameter of longest root in Pant Prabhat (1.11 mm), fresh weight (1508 mg) and dry weight (395 mg) in Lalit and minimum number of secondary roots (4.20), fresh weight (914 mg), dry weight (196 mg) in One-Kg, length of longest root (3.50 cm) in Sarbati and diameter (0.54 mm) in RCGH-1 (Table 2, Figs 1 and 2).

The possible reason for better root characters is due to difference in genetic make-up of genotypes either alone or in combination with environmental factors, that might contributed to higher carbohydrate supply to root, resulting in better vegetative growth as evident from our study. Similar results were also reported by Ramteke *et al.* (1998) and Tripathi *et al.* (2018).

Root: shoot ratio was significantly different among varieties. The maximum root: shoot ratio was noticed in Shweta (1.24), followed by Lalit (1.19) and One-Kg (0.97). The greater root: shoot ratio might be due to that Shweta recorded higher root growth that indirectly improved the root: shoot ratio. The study was close to that of Vaghela and Sharma (2015).

Table 1. Root initiation (days), rooted layers (%), secondary roots numbers and root: shoot of air-layers in genotypes.

Treatment	Genotypes	Days taken for root initiation	Air-layers rooted (%)	Number of secondary roots	Root: shoot ratio
T_1	L-49	42.40	67.20	11.20	1.12
T_2	Allahabad Safeda	41.40	71.19	8.80	1.10
T_3	Lalit	39.00	74.76	10.60	1.19
T_4	Red Fleshed	40.60	64.05	7.60	1.07
T_5	Pant Prabhat	42.20	64.05	7.20	1.13
T_6	Safed Jam	49.80	52.50	7.00	1.00
T_7	Arka Amulya	47.20	60.69	5.80	1.03
T_8	Arka mridula	44.20	61.53	6.40	1.07
T_9	MPUAT S-1	42.20	63.00	7.00	1.06
T_{10}	MPUAT S-2	49.80	55.65	4.80	1.03
T_{11}	Shweta	40.80	64.26	10.20	1.24
T_{12}	Burfkhan	42.80	62.37	5.20	1.03
T_{13}	Sarbati	43.80	61.95	6.60	1.02
T_{14}	RCGH-1	42.00	69.93	6.40	1.01
T_{15}	One Kg	50.00	50.19	4.20	0.97
SEm±		0.590	0.815	0.097	0.014
CD at 5%		1.706	2.353	0.280	0.041

each genotype 100 layers were attempted during 5-15 July and root: shoot was recorded after (15 days) shifting layers in poly bags.

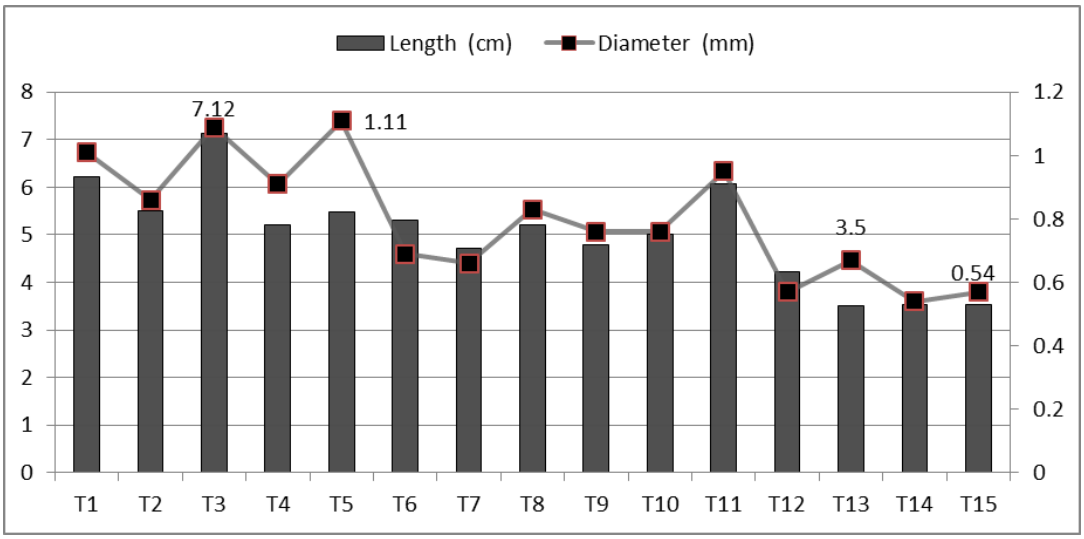

Fig. 1: Air-layer's secondary root length and diameter in different genotypes

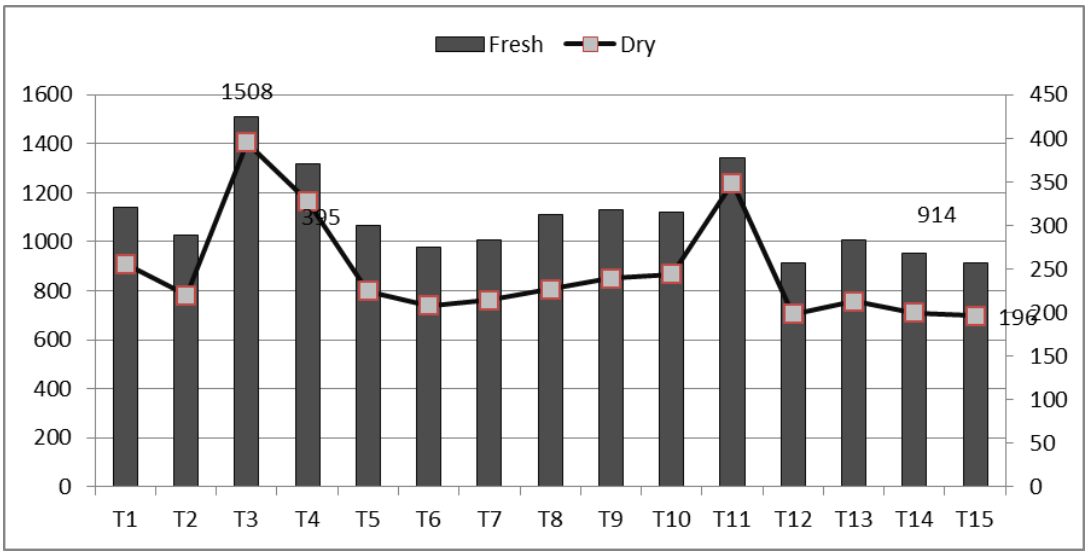

Fig. 2: Air-layer's root weight (mg) in different genotypes

The survival percentage of rooted air layers was maximum in Lalit (81.40 %), followed by Shweta (78.40 %) and One-Kg (47.80). Variety Lalit air layers had higher survivability which might be due to that healthy, stout and more number of secondary feeder roots production of layers not only support in uptake of water and nutrients from media but also more survival per cent (Table 2). Rehman *et al.* (2018) and Chand *et al.* (2018) also supported these findings. Genotypes Lalit recorded higher vigour index (838.42), followed closely by Red Fleshed (697.37). It might be due to difference in nature of varieties with respect to growth, development, survivability, root: shoot ratio and uptake of moisture play key role in enhancement of vigour index of poly bag shifted layers. This is in line with those of Ram and Majumdar (2000) and Tripathi *et al.* (2018).

Maximum success was observed in Lalit (91.00 %), followed by Shweta (88.00 %) and One-Kg (58.00 %). Direct reference is not available to support the present result, but probably due to Lalit recorded early root initiation, higher percentage of rooted air layers, higher root: shoot ratio and vigour index provides higher survival percentage of rooted air layers after shifting. Chand *et al.* (2018) and Rehman *et al.* (2013) supported our findings.

Table 2. Survival of rooted air layers (%), vigour index and success of layers in poly bag (%) of air layers.

Treatment	Genotypes	Survival of rooted air layers (%)	Vigour index	Success of layers in poly bag (one month after shifting) (%)
T_1	L-49	74.00	582.13	83.55
T_2	Allahabad Safeda	71.20	581.47	82.46
T_3	Lalit	81.40	838.42	91.00
T_4	Red Fleshed	77.20	697.37	86.00
T_5	Pant Prabhat	70.40	570.24	81.00
T_6	Safed Jam	50.80	318.35	61.00
T_7	Arka Amulya	53.80	394.53	64.00
T_8	Arka mridula	62.80	412.39	73.00
T_9	MPUAT S-1	66.20	494.29	76.00
T_{10}	MPUAT S-2	53.20	393.68	63.00
T_{11}	Shweta	78.40	663.79	88.00
T_{12}	Burfkhan	55.80	344.10	66.00
T_{13}	Sarbati	57.80	321.75	67.00
T_{14}	RCGH-1	58.40	336.77	68.00
T_{15}	One Kg	47.80	262.90	58.00
SEm±		0.881	9.347	0.933
CD at 5%		2.547	26.998	2.695

Survivability was recorded after (15 days) shifting of layers in poly bags

Conclusion

The early root initiation, percentage of rooted air layers, survival percentage and vigour index were maximum in Lalit, number of secondary roots highest in L- 49, root: shoot ratio maximum in Shweta and poor response observed in One-Kg. Response of guava genotypes to air layering exhibited overall trend, viz Lalit (better) > Red Fleshed> Shweta> L-49> Allahabad Safeda> Pant Prabhat> MPUAT S-1> Arka Mridula> Sarbati> RCGH-1> Burfkhan>Arka Amulya> MPUAT S-2> Safed Jam> One-Kg (poor).

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