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Effect of months and varieties on success percentage of air layering and root characteristics of air layers of guava (*Psidium guajava* L.) under Raipur region of Chhattisgarh plain

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Abstract

The present experiment entitled “Effect of months and varieties on success percentage of air layering and root characteristics of air layers of guava (*Psidium guajava* L.) under Raipur region of Chhattisgarh Plain” was conducted at research farm of Precision Farming Development Centre (PFDC), Department of Fruit Science, College of Agriculture, I.G.K.V., Raipur (C.G.) during the year of 2021-22. The success percent of air layering was recorded 86.34 percent in treatment T₁₁ (LM₂V₄) when, air layering was done during the month of August with Lucknow-49 variety of guava while, the minimum success percent of air layering was observed 64.29 percent in treatment T₁₅ (LM₃V₅) during September month. The maximum number of primary roots (13.36), number of secondary roots (43.56), fresh weight of primary roots (3.75g) and dry weight of roots (1.32g) were recorded under the treatment T₅ (LM₂V₂) respectively when, air layering was done during the month of August with Lalit variety of guava. The maximum length of primary roots (8.55 cm) and length of secondary roots (4.93 cm) were recorded under the treatment T₄ (LM₁V₂) respectively when, air layering was done during the month of July with Lalit variety of guava. The maximum diameter of primary roots (1.99 mm) and diameter of secondary roots (0.94 mm) were recorded under the treatment T₂ (LM₂V₁) respectively when, air layering was done during the month of August with Shweta variety of guava.

Keywords: Guava, months, roots, air layer and varieties

Introduction

Guava (*Psidium guajava* L.) is one of the most promising, popular and commercial fruit crop of tropical and subtropical regions of India and the ideal fruit crop for nutritional security in our country. It is the fourth largest economical fruit after mango, banana, and citrus so far as area and production of major fruits are considered. Guava is a prolific bearer with highly remunerative even without much care. In India it is locally known as Bihi, Jaam and Amrud etc. Guava originated in Tropical America and grew from Mexico to Peru and belongs to the Myrtaceae family. It was introduced by the Portuguese during the 17th century in India (Muthukumar and Selvakumar, 2017) [7]. The commercially cultivated cultivars are diploid *i.e.* the number of the chromosome is 2n=22 while, seedless cultivars are found triploid and shy bearers in nature. Guava is hardy, drought tolerant, has high yield potential, regular bearer crop.

The major growing countries of guava are located in South Asia, the Hawaiian Islands, Cuba, Pakistan, and also India. The plant is hardy in nature and has found higher adaptability to different soils and agro-climatic conditions, although it is successfully grown all over India (Chattopadhyay, 2012) [3]. At recently, the major guava-producing States are Madhya Pradesh, Uttar Pradesh, Bihar, Karnataka, Chhattisgarh, Maharashtra, West Bengal, Orissa, Haryana, and Andhra Pradesh. The success rate was observed at 80 per cent in air layers of guava cv. L-49 during the months of July and August, more number of primary (24.21) and secondary (32.57) roots, longest primary (11.15) and secondary (5.83) roots for rooting characters, the highest number of leaves (48.17), sprouts (8.48) and branches (7.92) in case of growth parameters of the air layers (Parmar *et al.*, 2018) [8].

Materials and Methods

The present experiment entitled “Effect of months and varieties on success percentage of

air layering and root characteristics of air layers of guava (*Psidium guajava* L.) under Raipur region of Chhattisgarh Plain” was conducted at research farm of Precision Farming Development Centre (PFDC), Department of Fruit Science, College of Agriculture, I.G.K.V., Raipur (C.G.) during the year of 2021-22.

The experiment was consisted of fifteenth treatments with three replications under factorial randomized block design (FRBD) with two factorial arrangements. The first factor of propagation months with three levels like July (M_1), August (M_2) and September (M_3) while second factor of varieties with five levels like Shweta (V_1), Lalit (V_2), Allahabad safeda (V_3), Lucknow-49 (V_4) and VNR bihi (V_5). The treatment combinations of present investigation are T_1 - LM_1V_1 , T_2 - LM_2V_1 , T_3 - LM_3V_1 , T_4 - LM_1V_2 , T_5 - LM_2V_2 , T_6 - LM_3V_2 , T_7 - LM_1V_3 , T_8 - LM_2V_3 , T_9 - LM_3V_3 , T_{10} - LM_1V_4 , T_{11} - LM_2V_4 , T_{12} - LM_3V_4 , T_{13} - LM_1V_5 , T_{14} - LM_2V_5 , and T_{15} - LM_3V_5 .

The following observations were recorded during research *i.e.* success percentages of air layering, number of primary roots per air layer, secondary roots per air layer, length of primary roots, length of secondary roots, diameter of primary roots, diameter of secondary roots, fresh weight of roots and dry weight of roots.

Result and Discussion

Success percentage of air layering

The results revealed that the data on success percentage of air layering as influenced by different months and varieties of guava is presented for the year 2021-2022 and also in table 1. It was shown significantly effect on success percent of various treatments with interaction of both factors *i.e.* propagation months (M) and varieties (V). Out of whole treatments, August month (M_2) was significantly showed the success percent of air layering.

As per the data concerned, the maximum success percent was observed 81.46 percent under the month of August (M_2) followed by month of July (M_1) was recorded 77.75 percent while, the minimum success percent of air layering was recorded 68.21 percent under the month of September (M_3) during the year of 2021-22.

Among the different varieties, the maximum success percent of air layering was observed 80.36, percent under the variety of Lucknow-49 (V_4) during the year of 2021-22. The minimum success percent of air layering was recorded 71.57 percent under VNR Bihi (V_5) variety of guava during the year of 2021-22

Interaction effect between different months (July, August, and September) and varieties (Shweta, Lalit, Allahabad Safeda, Lucknow-49 and VNR Bihi) on success percent of air layering was significantly influenced. The maximum success percentage of air layering was observed 86.34 percent in the treatment T_{11} (LM_2V_4) during the years 2021-22. The minimum success percent of air layering was observed 64.29, under treatment T_{15} (LM_3V_5) when air layering was done during the month of September in the year of 2021-22. The results showed in table 1 indicated that, significantly the maximum success percent of air layering was recorded in the variety of Lucknow-49 when air layering was done during the month of August as compared to other varieties. The maximum rooting percent (100%) was observed when air layering was done during August month in guava reported by Awasthi, *et al.*, (2021)^[1].

Number of primary roots per

The highest number of primary roots per air layer was observed 12.18 under the month of August (M_2) followed by month of July (M_1) was recorded 10.27 during the year of 2021-22 their effect on number of primary roots per air layer were significantly different. However, the minimum number of primary roots per air layer was recorded 9.05 under the month of September (M_3) during the year of 2021-22. The highest number of primary roots per air layer was observed 11.77 under the variety of Lalit (V_2) followed by variety of Lucknow-49 (V_4) were observed 10.81 during the year of 2021-22.

Interaction effect between different months (July, August, and September) and varieties (Shweta, Lalit, Allahabad Safeda, Lucknow-49 and VNR Bihi) on number of primary roots per air layer was significantly influenced. The highest number of primary roots per air layer was observed 13.36 in the treatment T_5 (LM_2V_2) followed by treatment T_2 (LM_2V_1) 13.12 during the years 2021-22. These results were also in agreement with findings of Rymbai and Reddy (2011)^[9], Manga *et al.* (2017)^[6] and Diwan (2021)^[4].

Number of secondary roots per

The maximum number of secondary roots per air layer was observed 35.67 under the month of August (M_2) followed by month of July (M_1) was recorded 28.55 while the minimum number of secondary roots per air layer was recorded 22.23 in the month of September (M_3) during the both year of 2021-22. Among the different varieties, the maximum number of secondary roots per air layer was observed 35.23 under the variety of Lalit (V_2) followed by Shweta (V_1) was recorded 31.35 while, the minimum number of secondary roots per air layer was recorded 23.01 under VNR Bihi (V_5) during the both year of 2021-22. Interaction effect between different months (July, August, and September) and varieties (Shweta, Lalit, Allahabad Safeda, Lucknow-49 and VNR Bihi) for the maximum number of secondary roots per air layer was significantly influenced. The maximum number of secondary roots per air layer was observed 43.56 in the treatment T_5 (LM_2V_2) during the years 2021-22. Similar results were also reported by Rymbai *et al.* (2012)^[10], Kumar (2013)^[5], Parmar *et al.* (2018)^[8] and Saroj and Singh (2021)^[11].

Length of primary roots

The maximum length of primary roots was observed 7.40 cm under the month of July (M_1) followed by month of August (M_2) was recorded 6.79cm while the minimum length of primary roots was recorded 5.86 cm in the month of September (M_3) during the year of 2021-22. The maximum length of primary roots were observed 7.58 cm under the variety of Lalit (V_2) followed by variety of Lucknow-49 (V_4) was observed 7.05 cm while the minimum length of primary roots were recorded 5.94 cm in under VNR Bihi (V_5) during the year of 2021-22. Interaction effect between different months (July, August, and September) and varieties (Shweta, Lalit, Allahabad Safeda, Lucknow-49 and VNR Bihi) on length of primary roots were significantly influenced. The maximum length of primary roots was observed 8.55 cm in the treatment T_4 (LM_1V_2) during both the years 2021-22. These results were in accordance with the findings of Kumar, (2013)^[5] and Baghel *et al.*, (2016)^[2].

Length of secondary roots

The maximum length of secondary roots was observed 4.38 cm under the month of July (M_1) followed by month of August (M_2) was recorded 3.69 cm while the minimum length of secondary roots was recorded 3.02 cm in the month of September (M_3) during the both year of 2021-22. The maximum length of secondary roots were observed 4.23 cm under the variety of Lalit (V_2) followed by variety of Shweta (V_1) was observed 4.03 cm, while the minimum length of secondary roots were recorded 3.14 cm under VNR Bihi (V_5) during the year of 2021-22. Interaction effect between different months (July, August, and September) and varieties (Shweta, Lalit, Allahabad Safeda, Lucknow-49 and VNR Bihi) on length of secondary roots were significantly influenced. The maximum length of secondary roots were observed 4.93 cm in the treatment T_4 (LM_1V_2) followed T_{10} (LM_1V_4) 4.79 cm, while the minimum length of secondary roots were observed 2.19 cm under treatment T_{15} (LM_3V_5) during the year of 2021-22. These results were in accordance with the findings of Baghel *et al.* (2016)^[2].

The maximum diameter of primary roots was observed 1.77cm under the month of August (M_2) followed by month of July (M_1) was recorded 1.53 mm while the minimum diameter of primary roots was recorded 1.38 mm in the month of September (M_3) during the year of 2021-22.

Diameter of primary roots

The maximum diameter of primary roots were observed 1.77 mm under the variety of Shweta (V_1) followed by variety of Lucknow-49 (V_4) 1.68 mm while the minimum diameter of primary roots were recorded 1.34mm in under VNR Bihi (V_5) during the year of 2021-22. An interaction effect between different months (July, August, and September) and varieties (Shweta, Lalit, Allahabad Safeda, Lucknow-49 and VNR Bihi) of air layering were found to be non-significant to diameter of primary roots of air layers. The result might be due to effect time of air layering and conducive environment *i.e.* growth nature of mother plants, optimum temperature and rainfall. The maximum diameter of primary roots of air layers was recorded 1.99 mm under treatment T_2 (LM_2V_1) followed by T_{11} (LM_2V_4), while the minimum diameter of primary roots were observed 1.13 mm under treatment T_{15} (LM_3V_5) when air layering was done during the month of September in the year of 2021-22. A result of current finding was supported by Taki (2013)^[13].

Diameter of secondary roots

The highest diameter of secondary roots was observed 0.84mm under the month of August (M_2) followed by month of July (M_1) was recorded 0.72 mm. However the minimum diameter of secondary roots was recorded 0.62 mm under the month of September (M_3) during the both year of 2021-22. The highest diameter of secondary roots was observed 0.87 mm under the variety of Shweta (V_1) followed by Lalit 0.76 mm while the lowest diameter of secondary roots was recorded 0.62 mm under VNR Bihi (V_5) variety of guava

during the year of 2021-22.

An interaction effect, the highest diameter of secondary roots was observed 0.94 mm in the treatment T_2 (LM_2V_1) followed by treatment T_5 (LM_2V_2) 0.87 mm during. The minimum diameter of secondary roots was observed 0.52mm under treatment T_{15} (LM_3V_5) when air layering was done during the month of September in the year of 2021-22. A result of current finding was supported by Awasthi *et al.* (2021)^[11].

It was shown significantly effect on fresh weight of roots per layer (g) of various treatments with interaction of both factors *i.e.* propagation months (M) and varieties (V). The month of August (M_2) was shown superior from whole treatments in fresh weight of roots per layer (g). The maximum fresh weight of roots per layer were observed 3.19g under the month of August (M_2) followed by month of July (M_1) was recorded 2.73. However the minimum fresh weight of roots per layer was recorded 2.46g under the month of September (M_3) during the both year of 2021-22.

Fresh weight of roots

The maximum fresh weight of roots per layer was observed 3.12 g under the variety of Lalit while, the minimum fresh weight of roots per layer were recorded 2.28g under VNR Bihi (V_5) variety of guava. An interaction effect between different months (July, August, and September) and varieties (Shweta, Lalit, Allahabad Safeda, Lucknow-49 and VNR Bihi) on fresh weight of roots per layer were significantly influenced. The maximum fresh weight of roots per layer was observed 3.75 g in the treatment T_5 (LM_2V_2) followed by treatment T_2 (LM_2V_1) 3.37g during both the years 2021-22. The minimum fresh weight of roots per layer was observed 2.11g under treatment T_{15} (LM_3V_5) when air layering was done during the month of September. A result of current finding was supported by Kumar *et al.* (2013)^[5].

Dry weight of roots

The maximum dry weight of roots per air layer was observed 1.20 g under the month of August (M_2) followed by month of July (M_1) was recorded 0.95 g during the year of 2021-22, their effect on dry weight of roots per layer was significantly different. However the minimum dry weight of roots per layer was recorded 0.85 g under the month of September (M_3) during the both year of 2021-22. The maximum dry weight of roots per layer was observed 1.16g under the variety of Lalit followed by Shweta (1.04 g) while, the minimum dry weight of roots per layer were recorded 0.86 g under VNR Bihi (V_5) variety of guava. An interaction effect between different months (July, August, and September) and varieties (Shweta, Lalit, Allahabad Safeda, Lucknow-49 and VNR Bihi) on dry weight of roots per layer were significantly influenced. The maximum dry weight of roots per layer were observed 1.32 in the treatment T_5 (LM_2V_2) while, The minimum dry weight of roots per layer was observed 0.73g under treatment T_{15} (LM_3V_5) when air layering was done during the month of September in the year of 2021-22. A result of current finding was supported by Parmar *et al.* (2018)^[8].

Table 1: Effect of months and varieties on success percentage of air layering and root characteristics of air layers of guava

Treatments		Success percentage	Number of primary roots	Number of secondary roots	Length of primary roots	Length of secondary roots
Propagation Months (M)						
M ₁	July	77.75	10.27	28.55	7.40	4.38
M ₂	August	81.46	12.18	35.67	6.79	3.69
M ₃	September	68.21	9.05	22.23	5.86	3.02
SE(m)±		0.118	0.143	0.250	0.116	0.108
C.D. at 5%		0.343	0.413	0.724	0.337	0.314
Varieties (V)						
V ₁	Shweta	75.80	10.78	31.35	6.98	4.03
V ₂	Lalit	78.41	11.77	35.23	7.58	4.25
V ₃	Allahabad Safeda	72.91	9.94	29.02	5.87	3.14
V ₄	Lucknow -49	80.36	10.81	25.49	7.05	3.73
V ₅	VNR Bihi	71.57	9.20	23.01	5.94	3.34
SE(m)±		0.153	0.184	0.323	0.150	0.140
C.D. at 5%		0.443	0.533	0.935	0.435	0.405
Interaction effect (MxV)						
T ₁	LM ₁ V ₁	77.24	10.74	32.08	7.87	4.39
T ₂	LM ₂ V ₁	81.63	13.12	38.20	7.42	4.22
T ₃	LM ₃ V ₁	68.53	8.48	23.76	5.65	3.47
T ₄	LM ₁ V ₂	80.19	11.34	36.08	8.55	4.93
T ₅	LM ₂ V ₂	84.13	13.36	43.56	7.58	4.41
T ₆	LM ₃ V ₂	70.89	10.62	26.05	6.61	3.39
T ₇	LM ₁ V ₃	75.37	10.04	27.40	6.26	3.92
T ₈	LM ₂ V ₃	78.47	11.78	35.61	5.94	2.59
T ₉	LM ₃ V ₃	64.88	7.99	24.04	5.42	2.92
T ₁₀	LM ₁ V ₄	82.26	9.53	25.32	7.36	4.79
T ₁₁	LM ₂ V ₄	86.34	12.33	31.41	7.09	3.24
T ₁₂	LM ₃ V ₄	72.47	10.56	19.74	6.71	3.15
T ₁₃	LM ₁ V ₅	73.68	9.69	21.87	6.98	3.86
T ₁₄	LM ₂ V ₅	76.74	10.32	29.58	5.94	3.97
T ₁₅	LM ₃ V ₅	64.29	7.57	17.59	4.91	2.19
SE(m)±		0.265	0.319	0.559	0.260	0.242
C.D. at 5%		0.767	0.924	1.619	0.753	0.702

Table 2: Effect of months and varieties on diameter of roots, fresh and dry weight of roots of air layers of guava

Treatments		Diameter of primary roots (mm)	Diameter of secondary roots (mm)	Fresh weight of roots (g)	Dry weight of roots (g)
Propagation Months (M)					
M ₁	July	1.53	0.72	2.73	0.95
M ₂	August	1.77	0.84	3.19	1.20
M ₃	September	1.38	0.66	2.46	0.85
SE(m)±		0.064	0.010	0.044	0.016
C.D. at 5%		0.187	0.028	0.129	0.045
Varieties (V)					
V ₁	Shweta	1.77	0.87	2.92	1.04
V ₂	Lalit	1.53	0.76	3.12	1.16
V ₃	Allahabad Safeda	1.48	0.71	2.86	0.98
V ₄	Lucknow -49	1.68	0.74	2.79	0.97
V ₅	VNR Bihi	1.34	0.62	2.28	0.86
SE(m)±		0.083	0.013	0.057	0.020
C.D. at 5%		0.242	0.036	0.166	0.058
Interaction effect (MxV)					
T ₁	LM ₁ V ₁	1.69	0.85	2.83	0.97
T ₂	LM ₂ V ₁	1.99	0.94	3.37	1.29
T ₃	LM ₃ V ₁	1.63	0.82	2.56	0.86
T ₄	LM ₁ V ₂	1.54	0.76	2.99	1.11
T ₅	LM ₂ V ₂	1.62	0.87	3.75	1.32
T ₆	LM ₃ V ₂	1.44	0.65	2.63	1.05
T ₇	LM ₁ V ₃	1.46	0.72	2.74	0.92
T ₈	LM ₂ V ₃	1.74	0.79	3.19	1.16
T ₉	LM ₃ V ₃	1.24	0.63	2.65	0.84
T ₁₀	LM ₁ V ₄	1.65	0.68	2.79	0.94
T ₁₁	LM ₂ V ₄	1.93	0.84	3.26	1.22
T ₁₂	LM ₃ V ₄	1.48	0.70	2.34	0.76
T ₁₃	LM ₁ V ₅	1.33	0.59	2.33	0.81

T ₁₄	LM ₂ V ₅	1.58	0.75	2.39	1.03
T ₁₅	LM ₃ V ₅	1.13	0.52	2.11	0.73
	S.E(m)±	0.144	0.022	0.099	0.035
	C.D. at 5%	NS	0.063	0.287	0.101

Conclusion

The success percent of air layering was in treatment T₁₁ (LM₂V₄) when, air layering was done during the month of August with Lucknow-49 variety of guava while, the maximum number of primary roots, number of secondary roots, fresh weight of primary roots and dry weight of roots were recorded in August month with Lalit variety as compared to other varieties and month while, the maximum length of primary roots and length of secondary roots were recorded July month with Lalit variety. The maximum diameter of primary roots and diameter of secondary roots were recorded in Shweta variety of guava when, air layering was done during the month of August.

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