

EFFECTS OF TIME AND ROOTING MEDIA ON SUCCESS OF AIR LAYERING IN GUAVA

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Abstract

An experiment was conducted to study the effect of time of operation and rooting media on the rooting success of air-layering in guava at the Germplasm Centre, Fruit Tree Improvement Project, Bangladesh Agricultural University, Mymensingh during March to August, 2011. The experiment comprised of five operation times (March, April, May, June and July 2011) and 11 rooting media (50% cow dung + 50% loamy soil), (50% cow dung + 50% saw dust), (50% compost + 50% loamy soil), (50% cow dung + 50% coconut coir), 100% cow dung, 100% loamy soil, 100% compost, 100% moss, (25% cow dung + 75% loamy soil), (25% loamy soil + 75% cow dung) and 100% saw dust. The result of the experiment indicates that the effect of time and rooting media on percent rooting success, root number and root length was significant. The highest percentage of rooting success (96.97%), number of roots/layer (7.76) and length of longest root (6.17 cm) was recorded in June and lowest percentage of rooting success (58.78%), number of roots/layer (1.25) and length of longest root (1.99 cm) in July. The highest percentage of rooting success (85.33%), number of roots/layer (6.04) and length of longest root (5.43 cm) was obtained from compost and lowest percentage of rooting success (65.33%), number of roots/layer (2.29) and length of longest root (1.96 cm) was obtained from saw dust. In case of combined effect of time and rooting media the maximum rooting success (100%) was observed in the combinations of May × compost, May × moss, June × compost and June × moss and lowest (46.670%) in the combinations of July × saw dust and April × saw dust. The highest number of roots/layer (9.930) and length of longest root (9.000 cm) was obtained from June × compost and lowest number of roots/layer (1.000) and length of longest root (0.970 cm) was obtained from July × saw dust combination.

Key words: Time of operation, rooting media, rooting success, air layering, guava

Introduction

Guava (*Psidium guajava* L.) is one of the most common and popular fruits of Bangladesh which belongs to the family Myrtaceae. At present, only 35g of fruit is available for a person in Bangladesh against the daily requirement of 85g (Rahman, 2005). Guava is a rich and main source of vitamin C, vitamin A, calcium, phosphorus and iron (Mamun, 2001). It claims to be the most important fruit in area and production after mango, banana, jackfruit and pineapple. The area and production of guava vary from year to year in Bangladesh. However, reports indicate that in the year 2007-2008, nearly 1,51,549 m tons of guava was produced from an area of 14,885 hectares of land (BBS, 2009). It is commonly cultivated in Barisal, Swarupkathi, Pirozpur, Jhalakati, Gazipur, Jessore, Sylhet and Chittagong. Processed foods such as jam, jelly, cheese, ketchup, juice etc. are prepared commercially from guava. 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. To maintain true-to-type cultivar, it is necessary to go through the vegetative method of propagation for guava, which can be ensured successfully by air-layering. One can expect average yield of 80 to 90 kg per grown up seedling tree and 150-200 kg per grown up tree raised from vegetative method such as layered tree (Bose *et al.* 1986). Propagation of guava by air-layering is done during summer of the year i.e. from February to August with varying success and survivability. It is found that certain percentage of layers die in the nursery due to untimely layering, detachment shock of layers and other factors particularly low atmospheric humidity, soil moisture stress, low night temperature, and scorching sun light of the day etc. Akhter (2002) reported that time of operation, shoot position, rooting media etc. also play an important role on the success of air-layering. Very few reports are available on guava air-layering in Bangladesh. The best rooting and survivability were obtained in July and August in Bangladesh (Akhter, 2002). Kanwar and Khalon (1986) reported that layering was successful

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when carried out between mid-July and early October in India. Rooting media is another important factor for successful air-layering. Different rooting media are used for air-layering such as compost, cow dung, loamy soil, saw dust, coconut coir etc. All of the above works were not substantial and conclusive. Keeping all stated facts in mind, the present piece of experiment was undertaken to find out the effects of time operation and rooting media on the success of air-layering in guava with a view to determine the optimum time of air-layering to observe the performance of rooting media and to find out the combined effect of time of air layering and rooting media on rooting success.

Materials and Methods

Guava trees of the variety BAU-5 were selected for performing air layering. The experiment comprised two factors viz. time of air layering (A) and rooting media (B). There were 5 levels of the factor A viz. March, 2011 (T₁), April, 2011 (T₂), May, 2011 (T₃), June, 2011 (T₄) and July, 2011 (T₅) and 11 levels of factor B viz. 50% cow dung + 50% loamy soil (M₁), 50% cow dung + 50% saw dust (M₂), 50% compost + 50% loamy soil (M₃), 50% cow dung + 50% coconut coir (M₄), 100% cow dung (M₅), 100% loamy soil (M₆), 100% compost (M₇), 100% moss (M₈), 25% cow dung + 75% loamy soil (M₉), 25% loamy soil + 75% cow dung (M₁₀) and 100% saw dust (M₁₁). The two factor experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. In the experiment 165 shoots were used for layering operation. For air layering healthy, disease free, lateral shoots of green to deep brown coloured branch with approximate diameter from 0.847 to 2.54 cm as juvenile shoot were selected according to Li and Li (1949). In case of old shoot approximately more than 1 year old mature light brown to grayish coloured branch were selected according to Hartmann and Kestar (1959). Careful observations were also made to ensure that the selected branches had sufficient leaves on them. In the 1st week of March, April, May, June and July, 2011 air layering were done by removing 3 cm long bark in the form of ring just below a node and about 50 cm away from shoot tip and then scrapping of the exposed wood to remove the cambium layer from them was done with the help of knife. The exposed wood was then covered with moistened rooting medium. To cover the mixture completely a piece of clear polythene sheet (size: 20 cm × 15 cm) was wrapped. The two ends of the wrapping material were carefully tied up thoroughly with thin rope and left for rooting. The layers were separated from the mother plant after 45 days of operation when the outer surface of rooting medium within the wrapped polyethylene sheet was full of newly formed roots. Data on percentage of success in rooting, number of roots per layers and length of the longest root was recorded after detachment of the layers from the mother plant. The mean for all the treatments were calculated and analyses of variances of parameters under study were performed by F variance test. The mean differences were compared by Least Significant Difference (LSD) test at 5% level of probability.

Results and Discussion

Effect of time of air layering

The effect of time of air layering on percent rooting success, root number and root length was significant (Table 1). The highest percentage of rooting success (96.97%) was recorded in June operation and the lowest percentage (58.78%) in July operation. The highest number of roots/layer (7.76) and length of the longest root (6.17 cm) was also recorded in June operation whereas the lowest number of roots/layer (1.25) and length of the longest root (1.99 cm) in July operation. It may be due to favourable weather condition existed for growth and development of root. Akhter (2002) reported that the maximum root length was obtained from June operation and the root length decreased with early (before June) operation, which agreed the present experimental results.

Effect of rooting media

The effect of rooting media on percent rooting success, root number and root length was also significant (Table 2). The highest percentage of rooting success (85.33%) was obtained from 100% compost and the lowest percentage (65.33%) from 100% saw dust. The highest number of roots/layer (6.04) and length of the longest root (5.43 cm) was obtained from 100% compost and the lowest number of roots/layer (2.29) and length of the longest root (1.96 cm) from 100% saw dust.

Table 1. Main effect of time of operation on percent rooting success, number of roots and root length of guava air layer

Time of air layering	% of rooting success	No. of roots per layer	Length of longest root (cm)
T ₁	78.18	4.47	4.47
T ₂	64.06	1.64	2.36
T ₃	96.36	7.37	4.72
T ₄	96.97	7.76	6.17
T ₅	58.78	1.25	1.99
LSD _{0.05}	2.501	0.051	0.086
LSD _{0.01}	3.306	0.068	0.114
Level of sign.	**	**	**
CV%	6.50	2.33	4.45

T₁= March, 2011; T₂= April, 2011; T₃= May, 2011; T₄= June, 2011; T₅= July, 2011

LSD_{0.05} = Significant at 5% level, LSD_{0.01}= Significant at 1% level;

** indicate significant at 1% level of probability

Table 2. Main effect of rooting media on percent rooting success, number of roots and root length of guava air layer

Rooting media	% of rooting success	No. of roots per layer	Length of longest root (cm)
M ₁	80.00	3.92	4.15
M ₂	82.66	5.10	3.80
M ₃	79.60	5.48	4.22
M ₄	82.66	5.02	4.28
M ₅	81.33	4.83	3.84
M ₆	81.33	4.29	4.32
M ₇	85.33	6.04	5.43
M ₈	84.00	5.77	5.01
M ₉	77.33	3.85	3.03
M ₁₀	68.00	2.90	3.35
M ₁₁	65.33	2.29	1.96
LSD _{0.05}	3.707	0.076	0.127
LSD _{0.01}	4.911	0.101	0.169
Level of sign.	**	**	**
CV%	6.50	2.33	4.45

M₁→50% cow dung + 50% loamy soil

M₂→50% cow dung + 50% saw dust

M₃→50% compost + 50% loamy soil

M₄→50% cow dung + 50% coconut coir

M₅→100% cow dung

M₆→100% loamy soil

M₇→100% compost

M₈→100% moss

M₉→25% cow dung + 75% loamy soil

M₁₀→25% loamy soil + 75% cow dung

M₁₁→100% saw dust

Combined effect of time of air layering and rooting media:

The combined effect of time of air layering and rooting media on percent rooting success, root number and length of the longest root was also found to be significant (Table 3). The maximum rooting success (100%) of detached air layers was observed in the treatment combinations of May × compost, May × moss, June × compost and June × moss and the lowest (46.670%) in the combinations of July × saw dust and April × saw dust. The highest number of roots/layer (9.930) and length of the longest root (9.000 cm) was also obtained from the combination of June × compost whereas the lowest number of roots/layer (1.000) and length of the longest root (0.970 cm) was from the combination of July × saw dust.

Table 3. Combined effect of time of operation and rooting media on percent rooting success, number of roots and root length of guava air layers

Treatment combination (Time × Rooting media)	% of rooting success	No. of roots per layer	Length of longest root (cm)
T ₁ M ₁	73.330	3.070	6.470
T ₁ M ₂	80.000	5.000	2.770
T ₁ M ₃	80.000	5.800	4.470
T ₁ M ₄	80.000	4.930	6.100
T ₁ M ₅	80.000	4.930	4.930
T ₁ M ₆	80.000	3.400	6.970
T ₁ M ₇	86.670	6.800	5.870
T ₁ M ₈	80.000	6.530	5.070
T ₁ M ₉	73.330	3.070	1.630
T ₁ M ₁₀	73.330	2.930	3.830
T ₁ M ₁₁	73.330	2.800	1.163
T ₂ M ₁	66.670	1.470	2.670
T ₂ M ₂	73.330	1.730	2.500
T ₂ M ₃	51.330	1.800	2.030
T ₂ M ₄	73.330	1.670	2.170
T ₂ M ₅	66.670	1.600	1.800
T ₂ M ₆	66.670	1.530	2.300
T ₂ M ₇	73.330	2.200	3.270
T ₂ M ₈	73.330	2.200	3.470
T ₂ M ₉	60.000	1.400	2.330
T ₂ M ₁₀	53.330	1.330	2.000
T ₂ M ₁₁	46.670	1.130	1.470
T ₃ M ₁	90.00	6.600	4.330
T ₃ M ₂	90.00	8.400	5.170
T ₃ M ₃	90.00	9.070	5.170
T ₃ M ₄	90.00	8.330	5.100
T ₃ M ₅	90.00	8.130	4.570
T ₃ M ₆	90.00	7.730	4.500
T ₃ M ₇	100.000	9.600	6.000
T ₃ M ₈	100.000	9.130	5.830
T ₃ M ₉	90.00	6.400	4.170
T ₃ M ₁₀	80.000	4.870	4.070
T ₃ M ₁₁	80.000	2.870	3.070
T ₄ M ₁	90.00	7.330	5.530
T ₄ M ₂	90.00	8.870	6.500
T ₄ M ₃	90.00	8.870	6.930
T ₄ M ₄	90.00	8.870	6.200
T ₄ M ₅	90.00	8.330	6.100
T ₄ M ₆	90.00	7.670	6.070
T ₄ M ₇	100.000	9.930	9.000
T ₄ M ₈	100.000	9.470	7.700
T ₄ M ₉	90.00	7.330	5.370
T ₄ M ₁₀	86.670	4.400	5.300
T ₄ M ₁₁	80.000	3.670	3.170
T ₅ M ₁	60.000	1.130	1.770
T ₅ M ₂	60.000	1.330	2.070
T ₅ M ₃	66.670	1.400	2.500
T ₅ M ₄	60.000	1.330	1.830
T ₅ M ₅	60.000	1.200	1.800
T ₅ M ₆	60.000	1.130	1.770
T ₅ M ₇	66.670	1.670	3.030
T ₅ M ₈	66.670	1.530	3.000
T ₅ M ₉	53.330	1.530	1.670
T ₅ M ₁₀	50.330	1.070	1.570
T ₅ M ₁₁	46.670	1.000	0.970
LSD _{0.05}	8.289	0.170	0.285
LSD _{0.01}	10.975	0.225	0.377
Level of sign.	**	**	**
CV%	6.50	2.33	4.45

In conclusion, it can be stated that time and rooting media have tremendous effect on the success of air layering in guava. The overall results obtained from this study reveal that in context of Mymensingh region of Bangladesh May and June is the optimum time for better rooting of air layering in guava when compost or moss is used as rooting media.

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