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## Effect of Different Post Detachment Conditions on the Survivability and Growth Performance of Two Varieties of Guava Air-layers

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**Abstract:** An experiment was conducted to study the effect of variety and different nursery conditions on the survivability of air-layers of two varieties of guava at the Germplasm Centre (GPC) of Fruit Tree Improvement Project, Department of Horticulture, Bangladesh Agricultural University, Mymensingh during the period from August 2001 to July 2002. Planting air-layer after detached from the mother plant and planted under different nursery conditions showed significant variation in success of air-layers. Open condition (both layers in poly bag and layers *in situ*) increased the percentage of survivability then under shade condition. Layers *in situ* (both shade and open condition) increased the number of shoots and leaves of the detached air-layers than layers in polybag. The highest percentage of survivability (100%) was observed from layers *in situ* under open condition which was statistically similar to layers in polybag under open condition.

**Key words:** Guava, air-layers, different nursery conditions, survivability, growth performance

### INTRODUCTION

Guava are generally propagated by air-layering. Most of the cases, after separation of air-layers from the mother plant, it was found that certain percentage of layers die due to detachment shock injury, handling and other factors particularly low humidity, high temperature, scorching sunlight etc. Vyas<sup>[1]</sup> reported that time of operation, shoot thickness, shoot position, rooting media, wrapping material, use of growth regulators, pruning and shade treatment after separation of air-layers also plays an important role on the success of air-layers after detachment. Providing some shade and protection from the wind followed by cut back of the top of the branch, so as to secure a proper proportion of leaves to root are also advocated for maximum survival of the detached air-layers in case of guava and litchi<sup>[2]</sup>.

Keeping all stated facts in mind, the present experiment has been designed to investigate the different nursery conditions of guava air-layers on their survivability and growth performance.

### MATERIALS AND METHODS

The present research work was carried out at the Germplasm Centre of Fruit Tree Improvement Project (FTIP), Bangladesh Agricultural University, Mymensingh during the period from August, 2001 to July,

2002 to study the effect of different nursery conditions on the survivability and growth performance of air-layers of two varieties of guava. Two varieties namely Swarupkathi ( $V_1$ ), Madhuri ( $V_2$ ) and four different conditions in the nursery maintained for layers after detachment namely layers in polybag under shade condition ( $M_1$ )-Artificial shade with coconut leaves, layers in polybag in open condition ( $M_2$ ), layers *in situ* under shade ( $M_3$ ), layers *in situ* in open condition ( $M_4$ ) were practiced on the detached air-layered shoots.

For guava air-layering healthy, disease free, lateral shoots of approximately 1-year-old and preferably from previous years growth was selected. The approximate diameter of branches were taken as 1.0 to 1.5 cm and this was done according to Ruehle<sup>[3]</sup>. In the month of August, 2001 guava air-layer was done by removal of 3 cm long bark cylinder and then scrapping the exposed wood to remove the cambium layer from above them with the help of a sharp knife. The wood was then covered with moistened rooting medium. To cover the mixture completely a 0.65 m<sup>2</sup> piece of clear polyethylene sheet was used. The ends of the wrapping materials were carefully tied up thoroughly with rope and left for rooting.

A well leveled land was selected for the layers planting. The nursery bed was prepared before detachment of the layer from the mother plant. The nursery bed was prepared by opening the soil with a spade and followed by laddering to break the soil clods

and to level the surface before planting. No chemical fertilizers were used in the soil. Well rotten cowdung (20 m t ha<sup>-1</sup>) was applied at the time of land preparation. The bed was cleaned by collecting and removing weeds, stubbles, stones etc. After detachment from the mother plant, pruning of 75% leaf of each layer, i.e. allowing 25% of leaves to remain with the layers. Then the layers were planted in nursery bed directly and planted in polybag. Layers of guava and litchi were planted in the afternoon at a spacing of 25×25 cm and immediately after planting watering was done uniformly by watering can. Some of the layers were planted in open air and some were placed in shade condition. Shading was provided with coconut leaves at a height of 3 m after planting to protect the layers from excessive rainfall and sunlight. Proper care was taken in the nursery bed so that, the growth of air-layers was adequate.

The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications number of shoots and no of leaves per successful layers were recorded at 15 days interval starting from 35 days after planting and was continued up to 320 days. Percentage of success in the survivability of detached rooted layers was counted after 2 months from the date of planting, the number of successfully air-layers (root initiation) were counted after 35 days from the date of operation.

The collected data on different parameters under different experiments were statistically analysed wherever necessary. The mean for all treatments were calculated

and analyses of variances for all the parameters/characters under consideration were performed by F variance test using MSTAT program. The significance of difference between pair of means was expressed as Least Significant Difference (LSD) test.

## RESULTS AND DISCUSSION

### Main effect of variety on the growth, success and survivability of detached air-layers

**Percentage of survivability of detached air-layers:** The data obtained from the experiment showed significant variation between the varieties Swarupkathi (V<sub>1</sub>) and Madhuri (V<sub>2</sub>). The variety Swarupkathi (V<sub>1</sub>) survived at highest percentage (97.41%) in the nursery bed, than the Madhuri (V<sub>2</sub>) (88.98%) (Fig. 1).

**Number of shoots per layer:** Number of shoots at different days due to the influence of two varieties was highly significant except 250 and 265 DAP. The variety Swarupkathi (V<sub>1</sub>) produced the highest number of shoots per layer at different days than Madhuri (V<sub>2</sub>) (Table 1).

**Number of leaves per layer:** Two varieties had significant influence on the number of leaves at different days after planting. The variety Swarupkathi (V<sub>1</sub>) produced the maximum number of leaves at different days and the lowest number was obtained from the variety Madhuri (V<sub>2</sub>) than Swarupkathi (Table 2).

Table 1: Main effect of variety on the number of shoots of guava layerage at different days after detachment from the mother plant

Variety	Number of shoots per layer																		
	Days After Planting (DAP) of layers																		
	25	40	55	70	85	100	115	130	145	160	175	190	205	220	235	250	265	280	295
Swarupkathi	2.370	3.390	4.360	4.510	4.700	4.630	4.830	5.060	5.410	5.430	4.680	4.330	4.220	4.430	3.920	3.890	3.850	4.500	4.620
Madhuri	0.000	1.260	2.750	3.160	3.370	3.580	3.280	3.260	3.070	3.280	3.100	3.080	3.010	3.650	3.500	3.750	3.830	3.780	3.750
LSD (0.05)	0.111	0.257	0.235	0.175	0.207	0.222	0.297	0.228	0.209	0.216	0.220	0.182	0.323	0.144	0.190	0.149	0.133	0.130	0.138
(0.01)	0.154	0.356	0.326	0.243	0.288	0.307	0.412	0.317	0.290	0.300	0.305	0.252	0.448	0.200	0.263	0.207	0.184	0.180	0.192
Level of significance	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	NS	NS	**	**

Table 2: Main effect of variety on the number of leaves of guava layerage at different days after detachment from the mother plant

Variety	Number of shoots per layer																		
	Days After Planting (DAP) of layers																		
	25	40	55	70	85	100	115	130	145	160	175	190	205	220	235	250	265	280	295
Swarupkathi	5.890	10.250	12.960	14.120	18.230	20.070	23.490	25.380	28.310	29.020	29.180	29.520	33.780	36.730	40.410	44.810	45.100	46.280	48.880
Madhuri	0.000	4.750	10.190	12.220	15.590	17.340	19.250	21.190	22.130	23.070	26.460	27.720	30.360	32.030	31.620	32.080	33.030	33.960	35.150
LSD (0.05)	0.166	0.446	0.440	0.289	0.308	0.423	0.458	0.394	0.414	0.282	0.462	0.422	0.634	0.440	0.351	0.935	0.319	0.333	0.292
(0.01)	0.231	0.619	0.610	0.401	0.428	0.587	0.635	0.546	0.575	0.392	0.641	0.585	0.881	0.611	0.488	1.298	0.443	0.463	0.405
Level of significance	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

\*\* = Significant at 1% level, NS = Non-significant

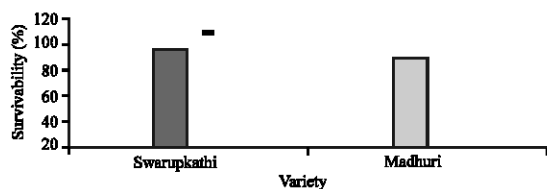


Fig. 1: Effect of variety on the percentage of survivability in case of nursery condition of guava layerage at 60 DAP. Vertical bar represents LSD at 1% level

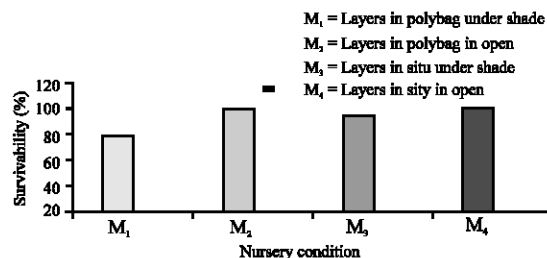


Fig. 2: Effect of nursery condition on the percentage of survivability of guava layerage at 60 DAP. Vertical bar represents LSD at 1% level

**Main effect of nursery condition**

**Percentage of survivability of detached air-layers:** It was observed that the effect of different nursery conditions on the survivability of guava air-layers were highly significant. The highest percentage of survivability (100%) was observed from layers *in situ* in open condition (M<sub>4</sub>) at 60 days after planting which was statistically similar to layers in polybag in open condition (M<sub>2</sub>) and the lowest percentage of survivability (78.14%) was observed from layers in polybag under shade condition (Fig. 2). This result differs with Voltolini<sup>[4]</sup> who suggested to grow the rooted layer under 70% shade. Percentage rooting and survival were highest (94.63%) when layers planted in the nursery bed directly under open condition than polybag in open condition (78.14%). The present result are in agreement of Kamleshkar and Jain<sup>[5]</sup>.

**Number of shoots per layer:** The effects of nursery condition method on the number of shoots at different

days after planting were highly significant. Layers planted *in situ* in open condition (M<sub>4</sub>) produced the highest number of shoots per layer at different days after planting followed by layers *in situ* under shade condition (M<sub>3</sub>), polybag in open condition (M<sub>2</sub>) and polybag under shade condition (M<sub>1</sub>) (Table 3).

Number of shoots per layer was decreased when layers were grown in shade condition compared to full sun (0% shade) due to the lower phenolic substance contents. Layers in heavy shade having poor root system, number of shoots per layer was also decreased. Similar result was also reported by Vinzant and Criley<sup>[5]</sup>, Voltolini<sup>[4]</sup>. When layers grown under nursery bed condition (*in situ*), the number of shoots per layer was also increased than in polybag due to proper aeration, high moisture content, proper nutrient uptake etc. This result was also supported by Leon *et al.*<sup>[6]</sup> who stated that *in situ* condition significantly increased the number of shoots per layer.

**Number of leaves per layer:** Number of leaves was recorded at different days and it was observed that there was highly significant variation for different nursery conditions at different days. The highest number of leaves was produced when layers were grown *in situ* in open condition (M<sub>4</sub>) and the lowest number of leaves per layer was produced when layers were grown in polybag under shade (Table 4). When layers grown under *in situ* condition the number of leaves per layer was increased than in polybag method due to high moisture content, proper aeration but number of leaves was decreased under full shade condition over open condition in nursery bed. Similar result was also reported by Leon *et al.*<sup>[6]</sup>.

Combined effect of variety and nursery condition on growth, success and survivability of guava air-layers.

**Percentage of survivability of detached air-layers:** Combined effect of the variety and the nursery condition showed highly significant variation on the survivability of detached guava air-layers. Highest percentage (100%) of survivability was obtained from the variety

Table 3: Main effect of nursery condition on the number of shoots of guava layerage at different days after detachment from the mother plant

Treatment (nursery condition)	Number of shoots per layer																		
	Days After Planting (DAP) of layers																		
	25	40	55	70	85	100	115	130	145	160	175	190	205	220	235	250	265	280	295
M <sub>1</sub>	0.820	1.380	2.430	2.700	2.870	2.770	2.080	2.170	2.580	2.420	1.880	2.450	2.350	2.930	2.720	2.420	2.150	2.000	2.100
M <sub>2</sub>	1.100	2.330	3.420	3.030	3.020	2.950	3.030	3.080	3.350	4.370	3.970	3.380	3.720	4.270	3.270	3.100	2.880	3.000	3.170
M <sub>3</sub>	1.130	2.600	3.880	4.670	4.980	4.950	4.980	5.230	5.020	4.830	4.370	4.650	4.170	4.350	3.930	4.700	4.770	5.220	5.370
M <sub>4</sub>	1.680	2.980	4.480	4.930	5.270	5.750	6.100	6.150	6.000	5.800	5.330	4.350	4.220	4.600	4.920	5.070	5.580	6.330	6.100
LSD (0.05)	0.157	0.363	0.332	0.248	0.293	0.313	0.420	0.323	0.296	0.306	0.311	0.257	0.457	0.203	0.268	0.211	0.188	0.184	0.196
(0.01)	0.217	0.504	0.461	0.344	0.407	0.435	0.583	0.448	0.410	0.425	0.431	0.356	0.634	0.282	0.373	0.293	0.261	0.255	0.272
Level of significance	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

Table 4: Main effect of nursery condition on the number of leaves of guava layerage at different days after detachment from the mother plant

Treatment (nursery condition)	Number of shoots per layer																		
	Days After Planting (DAP) of layers																		
	25	40	55	70	85	100	115	130	145	160	175	190	205	220	235	250	265	280	295
M <sub>1</sub>	2.530	3.470	6.480	8.280	7.670	7.250	7.650	6.920	6.720	7.120	6.600	6.170	7.630	8.250	6.630	5.420	4.800	5.250	5.030
M <sub>2</sub>	2.120	6.720	11.050	10.520	10.700	10.720	11.450	12.870	13.670	14.230	14.300	14.030	16.100	18.480	16.280	17.600	18.680	19.470	20.470
M <sub>3</sub>	2.700	8.880	14.120	16.150	21.870	25.350	30.320	34.320	39.630	40.570	44.970	45.680	50.770	53.720	55.020	61.330	61.950	63.650	67.930
M <sub>4</sub>	4.430	9.980	14.650	17.720	27.400	31.500	36.070	39.030	40.850	42.250	45.420	48.580	53.780	57.070	66.120	69.430	70.830	72.120	74.630
LSD (0.05)	0.235	0.630	0.622	0.409	0.436	0.598	0.647	0.557	0.586	0.399	0.653	0.597	0.897	0.623	0.497	1.322	0.452	0.472	0.413
(0.01)	0.326	0.875	0.863	0.567	0.605	0.830	0.898	0.772	0.813	0.554	0.906	0.828	1.245	0.865	0.690	1.835	0.627	0.654	0.573
Level of significance	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

\*\* = Significant at 1% level, M<sub>1</sub> = Layers in polybag under shade condition, M<sub>2</sub> = Layers in polybag in open condition, M<sub>3</sub> = Layers *in situ* under shade, M<sub>4</sub> = Layers *in situ* in open

Table 5: Combined effect of variety and nursery condition on the number of shoots of guava layerage at different days after detachment from the mother plant

Treatment combination	Number of shoots per layer																		
	Days After Planting (DAP) of layers																		
	25	40	55	70	85	100	115	130	145	160	175	190	205	220	235	250	265	280	295
V <sub>1</sub> M <sub>1</sub>	1.630	2.770	3.200	3.100	3.000	3.230	2.500	2.670	3.330	3.430	2.430	1.900	2.530	2.200	2.100	1.830	1.300	1.000	1.200
V <sub>1</sub> M <sub>2</sub>	2.200	2.870	3.830	3.400	3.700	3.530	3.300	3.830	4.600	5.270	4.530	4.100	3.770	4.200	3.530	3.200	3.430	3.000	3.200
V <sub>1</sub> M <sub>3</sub>	2.270	3.630	4.430	5.000	4.970	4.900	5.300	5.430	5.700	5.400	4.730	5.300	4.730	4.700	4.200	4.400	4.500	4.670	4.200
V <sub>1</sub> M <sub>4</sub>	3.370	4.300	5.970	6.530	7.130	6.830	8.200	8.300	8.000	7.600	7.000	6.030	5.830	6.600	5.830	6.130	6.200	6.430	6.400
V <sub>2</sub> M <sub>1</sub>	0.000	0.000	1.670	2.300	2.330	2.000	1.670	1.670	1.830	1.400	1.330	2.670	2.170	2.600	3.000	3.000	2.330	3.000	3.000
V <sub>2</sub> M <sub>2</sub>	0.000	0.370	2.670	3.000	2.730	2.670	2.770	2.330	2.100	3.330	3.400	2.670	2.600	3.670	3.330	3.000	3.000	3.000	3.130
V <sub>2</sub> M <sub>3</sub>	0.000	2.330	3.000	3.330	3.400	4.670	4.000	4.000	4.000	4.000	3.670	3.000	3.600	4.000	3.670	4.000	3.330	4.000	4.330
V <sub>2</sub> M <sub>4</sub>	0.000	2.330	3.330	4.330	5.000	5.000	4.670	5.030	4.330	4.400	4.000	4.000	3.670	4.330	4.000	5.000	6.670	8.000	8.000
LSD (0.05)	0.222	0.514	0.470	0.350	0.414	0.443	0.594	0.457	0.418	0.433	0.444	0.363	0.646	0.288	0.380	0.298	0.266	0.260	0.277
(0.01)	0.307	0.713	0.652	0.486	0.575	0.615	0.824	0.634	0.580	0.600	0.610	0.504	0.896	0.527	0.414	0.369	0.361	0.384	
Level of significance	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

\*\* = Significant at 1% level, V<sub>1</sub>M<sub>1</sub> = Swarupkathi × Layers in polybag under shade condition, V<sub>1</sub>M<sub>2</sub> = Swarupkathi × Layers in polybag in open condition, V<sub>1</sub>M<sub>3</sub> = Swarupkathi × Layers *in situ* under shade, V<sub>1</sub>M<sub>4</sub> = Swarupkathi × Layers *in situ* in open, V<sub>2</sub>M<sub>1</sub> = Madhuri × Layers in polybag under shade condition, V<sub>2</sub>M<sub>2</sub> = Madhuri × Layers in polybag in open condition, V<sub>2</sub>M<sub>3</sub> = Madhuri × Layers *in situ* under shade, V<sub>2</sub>M<sub>4</sub> = Madhuri × Layers *in situ* in open

Table 6: Combined effect of variety and nursery condition on the number of leaves of guava layerage at different days after detachment from the mother plant

Treatment combination	Number of shoots per layer																		
	Days After Planting (DAP) of layers																		
	25	40	55	70	85	100	115	130	145	160	175	190	205	220	235	250	265	280	295
V <sub>1</sub> M <sub>1</sub>	4.230	6.930	7.270	7.800	6.830	6.470	6.830	6.430	6.270	7.100	7.400	4.830	5.370	8.330	6.170	4.500	3.270	4.330	4.070
V <sub>1</sub> M <sub>2</sub>	5.070	7.100	10.300	9.870	11.030	10.830	12.100	14.230	15.070	16.770	13.600	13.170	14.700	17.930	16.570	17.700	19.030	18.600	19.600
V <sub>1</sub> M <sub>3</sub>	5.400	10.770	13.570	14.630	26.800	31.370	36.570	37.570	39.530	38.870	41.130	46.070	40.170	41.900	39.870	37.630	37.270	35.700	34.670
V <sub>1</sub> M <sub>4</sub>	8.870	16.200	20.700	24.170	28.230	31.600	38.470	43.270	52.370	53.330	54.600	54.000	61.200	59.930	63.870	68.500	72.570	77.200	82.270
V <sub>2</sub> M <sub>1</sub>	0.000	0.000	5.700	8.770	8.500	8.030	8.470	7.400	7.170	7.1300	5.800	7.500	9.900	8.170	7.100	6.330	6.330	6.170	6.000
V <sub>2</sub> M <sub>2</sub>	0.000	3.770	8.600	11.170	10.370	10.600	10.800	11.500	12.270	11.700	15.000	14.900	17.50	19.030	16.000	17.500	18.330	20.330	21.330
V <sub>2</sub> M <sub>3</sub>	0.000	6.330	11.800	11.270	15.500	19.330	22.170	25.370	29.330	31.170	35.330	37.370	46.37	54.200	68.370	70.370	69.100	67.030	67.000
V <sub>2</sub> M <sub>4</sub>	0.000	7.000	14.670	17.670	28.000	31.400	35.570	40.500	39.730	42.270	49.700	51.100	61.37	65.530	70.170	85.030	86.630	91.600	101.200
LSD (0.05)	0.332	0.891	0.879	0.578	0.617	0.845	0.915	0.787	0.829	0.565	0.923	0.844	1.269	0.881	0.703	1.870	0.639	0.667	0.584
(0.01)	0.461	1.237	1.220	0.803	0.856	1.173	1.270	1.092	1.150	0.784	1.282	1.171	1.761	1.223	0.975	2.595	0.886	0.926	0.810
Level of significance	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

\*\* = Significant at 1% level, V<sub>1</sub>M<sub>1</sub> = Swarupkathi × Layers in polybag under shade condition, V<sub>1</sub>M<sub>2</sub> = Swarupkathi × Layers in polybag in open condition, V<sub>1</sub>M<sub>3</sub> = Swarupkathi × Layers *in situ* under shade, V<sub>1</sub>M<sub>4</sub> = Swarupkathi × Layers *in situ* in open, V<sub>2</sub>M<sub>1</sub> = Madhuri × Layers in polybag under shade condition, V<sub>2</sub>M<sub>2</sub> = Madhuri × Layers in polybag in open condition, V<sub>2</sub>M<sub>3</sub> = Madhuri × Layers *in situ* under shade, V<sub>2</sub>M<sub>4</sub> = Madhuri × Layers *in situ* in open

Swarupkathi and layers planted *in situ* in open condition (V<sub>1</sub>M<sub>4</sub>) treatment combination which was statistically similar to Swarupkathi and layers *in situ* under shade condition (V<sub>1</sub>M<sub>3</sub>), Swarupkathi and layers in polybag in open condition (V<sub>1</sub>M<sub>2</sub>), Madhuri and layers *in situ* in open condition (V<sub>2</sub>M<sub>4</sub>), as well as Madhuri

and layers *in situ* under shade condition (V<sub>2</sub>M<sub>3</sub>). The lowest percentage (66.66%) survivability was obtained from Madhuri and layers in polybag under shade condition (V<sub>1</sub>M<sub>1</sub>) (Fig. 3). The interaction effect of different nursery conditions and varieties was found to be significant.

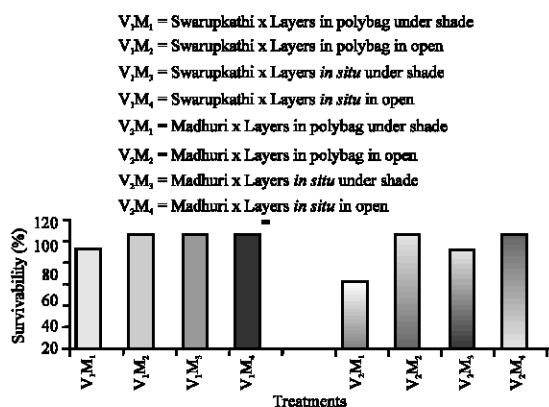


Fig. 3: Combined effect of variety and nursery condition on the percentage of survivability of guava layerage at 60 DAP. Vertical bar represents LSD at 1% level

**Number of shoots per layer:** The combined effect of variety and nursery condition was found to be significant in respect of number of shoots per layer at different days. At different days after planting the maximum number of shoots per layer was obtained from the combination of variety Swarupkathi and layers *in situ* in open condition ( $V_1M_4$ ) and minimum from variety Madhuri and layers in polybag under shade condition ( $V_2M_1$ ) (Table 5). There was significant interaction between varieties and different nursery conditions for number of shoots per layer at different days after planting.

**Number of leaves per layer:** The combined effect of nursery condition and variety was highly significant on the number of leaves per layer. The maximum number of

leaves was achieved by the variety Swarupkathi and layers *in situ* in open condition ( $V_1M_4$ ) and the lowest was obtained from variety Madhuri and layers in polybag under shade condition ( $V_2M_1$ ) at different days (Table 6). There was significant interaction between the varieties and different nursery conditions.

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