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EFFECTS OF ROOTING MEDIA AND VARIETIES ON ROOTING PERFORMANCE OF DRAGON FRUIT CUTTINGS (*Hylocereu sundatus* Haw.)

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ABSTRACT

The experiment was carried out to investigate the effects of different rooting media on rooting performance, plant growth and development of two varieties of Pitahaya (dragon fruit) cuttings at the Fruit Tree Improvement Project (FTIP), Germplasm Centre (GPC) of Bangladesh Agricultural University (BAU), Mymensingh during the period from May 2014 to August 2014. The two factors experiment consisted with of two different varieties of dragon fruit viz., BAU Dragon fruit-1 (V_1) and BAU Dragon fruit-2 (V_2) with 14 rooting media. viz. control (soil 100%) (T_0), 50% cow dung + 50% soil (T_1), Saw dust (100%) (T_2), Compost (100%) (T_3), 50% soil + 50% sand (T_4), 50% soil + 50% saw dust (T_5), Sand (100%) (T_6), Indole-3 Acetic Acid (IAA) 500 ppm solution + soil (100%) (T_7), 300 ppm solution + soil (100%) (T_8), 200 ppm solution of IAA + soil (100%) (T_9), 500 ppm solution of Indole-3 Butyric Acid (IBA) + soil (100%) (T_{10}), 300 ppm solution IBA + soil (100%) (T_{11}), 200 ppm solution IBA + soil (100%) (T_{12}), (IBA+IAA) 200 ppm solution of each + soil (100%) (T_{13}). All the parameter showed significant effect except number of branches per plant. In case of variety less time was needed for first root initiation (22.33 days) with the longest plant height (34.02 cm). The better result regarding number of roots per cutting (6.00) was found in case of BAU dragon fruit-2 (V_2) where the highest root length (15.22 cm). In case of different treatment, the better result regarding number of roots per cutting (8.17) at 100 DAP was counted from the combination of (IAA+IBA) 200 ppm solution + soil (100%) (T_{13}). The highest root length (25.38 cm) was observed in IAA 200 ppm solution + soil (100%) (T_9). In case of combined effect, the minimum time was required for first root initiation (20.78 days) with IAA 300 ppm solution + soil (100%) (T_8). The highest root length (25.87 cm) was observed in BAU Dragon fruit-1 with IAA 200 ppm solution + soil (100%) (V_1T_9). Number of roots per cutting was noticed (9.67) in BAU Dragon fruit-2 200 ppm solution of each IAA and IBA + soil (100%) (V_2T_{13}).

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INTRODUCTION

Pitahayas (*Hylocereus* spp.) (Commonly known as dragon fruit) are perennial climbing cactus plants native to tropical areas of North, Central, and South America (Morton 1987). Major pitahaya fruit growing countries are Vietnam, Colombia, Mexico, Costa Rica, and Nicaragua and, to a lesser degree, cultivation occurs in Australia, Israel, and Reunion Island. The European Union and Asia, especially China, are the largest import markets (Le Bellec et al. 2006). Different types of dragon fruit like most *Hylocereus* species have red-purple pigmented skin, while the pulp color ranges from white (in *H. undatus*) to red and purple (in *H. polyrhizus* and *H. costaricensis*) (Esquivel et al. 2007). Dragon fruits is an excellent source of vitamin C and therefore are abundant with minerals, particularly calcium supplement as well as phosphorus. Also, it is a good source of of natural pigments in food processing, due to their high content of betalains. Pitahaya is considered a promising crop to be grown commercially in dry regions (Vaillant et al., 2005). This species is found to have high water-use efficiency. One of the pitahaya mechanisms to secure water requirement is developing aerial roots from the sides of the stem to collect water from the surroundings (Nobel et al., 2004). Pitaya fruit has red or pink thornless skins, while its juicy flesh can range from white to magenta. The skin is covered with bracts or scales. The small seeds are consumed with the fruit.

The most advantage of this crop is that once it is planted, it will grow for about 20 years, and one hectare could accomodate 1000 to 1200 Dragon fruit plants.More importantly, it is a fast return perennial fruit crop with production in the second year after planting and full production within five years. Usually, pitahaya fruit is propagated sexually by seed and asexually by grafting and stem cutting. The easiest, cheapest and convenient method of propagating dragon fruit is by stem cutting. After 1 week, 100% of the big cuttings developed roots. However, (87 and 65%) of the medium and small cuttings, respectively, developed roots after the same time (Obeidy 2006). On the other hand, there are some reports of success of micropropagation in dragon fruit. According to Vinas et al. 2012, central region of new joint as explant showed about 100 per-cent survival rates and the growth was higher compare to basal and distal joints.

Dragon fruit is suitable for everyone to eat. Flesh and seeds are edible parts and they are eaten altogether. It supplies fiber which is digestive and helpful for healthy liver. Dragon fruits consist of phytoalbumins, which may have anti-oxidant qualities which help to stop the development of cancer cells. Dragon fruit also reported to have health benefits including prevention of memory losses, control of blood glucose level in diabetic patients, prevention of oxidation, aiding in healing of wounds etc. In addition, it has the ability to promote the growth of probiotics in the intestinal tract (Zainoldin and Baba, 2012). In Bangladesh, it is newly extending in all the area. It is important to select the soil media where it can grow well which will help to provide the planting materials of dragon fruit to the whole country of Bangladesh. Considering the present experiment was therefore undertaken to examine the root and plant growth, to evaluate the varietal effect and to find out the suitable condition of rooting media and variety.

MATERIALS AND METHODS

The present experiment was conducted at the Fruit Tree Improvement Project (FTIP), BAU Germplasm Centre (GPC), Bangladesh Agricultural University (BAU), Mymensingh during the period from May, 2014 to August, 2014. The site is situated between 24.6°N and 90.5°E latitude and at latitude 18 m from sea level. The soil of the experimental area is sandy loam type and belongs to the Old Brahmaputra Flood Plain Alluvial Tract (UNDP, 1988) of AEZ 9 having non-calcareous dark grey flood plain soil. The matured Dragon fruit plants were established by cuttings and planted in May, 2014. The experiment consisted with following treatments:

Factor A: Variety

(a) BAU Dragon fruit-1, (V_1)
(b) BAU Dragon fruit-2, (V_2)

Two varieties of Dragon fruit bear different characteristics. BAU Dragon fruit-1 bears white fleshed fruit and BAU Dragon fruit-2 bear red fleshed fruit. Generally, red fleshed one is the sweater than white fleshed one.

Factor B: Rooting media:

T_0=	Control (soil 100%)	T_7=	Dipped in IAA (500 ppm solution) + soil (100%)
T_1=	50% cow dung + 50% soil	T_8=	Dipped in IAA (300 ppm solution) + soil (100%)
T_2=	Saw dust (100%)	T_9=	Dipped in IAA (200 ppm solution) + soil (100%)
T_3=	Compost (100%)	T_{10}=	Dipped in IBA (500 ppm solution) + soil (100%)
T_4=	50% soil+50% sand	T_{11}=	Dipped in IBA (300 ppm solution) + soil (100%)
T_5=	50% soil + 50% saw dust	T_{12}=	Dipped in IBA (200 ppm solution) + soil (100%)
T_6=	Sand (100%)	T_{13}=	Dipped in IBA (200 ppm solution) + IAA (200 ppm solution) + soil(100)

The 2 factors experiment consisting of two varieties, and 14 treatment combinations with 3 replications was laid out in Randomized Complete Block Design (RCBD).

Application of rooting hormone

A. Rooting media as different organic fertilizer

Different types and amount of organic fertilizer like cow dung, sawdust, compost and sand were applied in the field before planting.

B. Media Solution preparation

Different concentration of solution of IAA and IBA were prepared where powder of IAA and IBA was mixed into the water according to the different concentration (200, 300, 500 ppm). Before planting, cutting were dipped into targeted solution for 10 minutes and then placed into the 100% soil.

Data collection

Data on Plant height, Number of branches per cuttings were recorded at 25 day's interval after planting the cutting in the bed. Days to first root initiation were recorded at different treated cutting. During final harvest (after 100 DAP) number of roots per cutting (at final harvest), Root length, Fresh weight roots and shoots, Fresh weight of shoots, Fresh weight of roots, Dry weight of roots and Survival rate of plant (%) were recorded.

Statistical analyses

The recorded data for each parameter from the present experiment was analyzed statistically to find out the variation resulting from experimental treatments using MSTAT-C package program developed by Russel (1986). The means for all treatments were calculated and analyses of variances of the parameter under study were performed by F variance test at 5% and 1% levels of significance. The means of the parameter were compared by least significant difference test (LSD) (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

A statistically significant difference was found in case of varieties, treatments and combined effect in terms of days to first root initiation. In case of variety BAU dragon fruit-1 (V_1) required shorter time for root initiation (22.33 days) comparing with BAU dragon fruit-2 (V_2). V_2requiredlonger time (24.03 days) compare to V_1. Among the different rooting media (treatments), Indole-3 Butyric Acid (IBA) 200 ppm solution + soil (100%) (T_{12}) required longer time for root initiation (24.00 days) comparing with Indole-3 Acetic Acid (IAA) 200 ppm solution + soil (100%)(T_9) where shorter time (22.08 days) was needed. In case of combined effect of variety and treatment the maximum time (25.11 days) was required for BAU Dragon-2 with IAA 300 ppm solution + soil (100%) (V_2T_8) and minimum time (20.78 days) was needed for first root initiation in BAU Dragon-1 with IAA 300 ppm solution + soil (100%) (V_1T_8) (Table 1, 3 and 5).

Plant height was significantly influenced by different treatments. The plant height was recorded at different dates after planting (DAP) i.e. at 25, 50, 75 and 100 days after planting. In case of variety at 100 DAP; the longer plant (34.02 cm) was noticed in BAU Dragon fruit-1 (V_1), whereas the shorter (32.89 cm) was in BAU Dragon fruit-2 (V_2). In case of treatment at 100 DAP; the longer plant (37.5 cm) was noticed in 50% soil + 50% saw dust (T_5) whereas the shorter (30.33 cm) was in IBA 300 ppm solution + soil (100%) (T_{11}). In case of

combined effect at 100 DAP the longest plant (41.88 cm) was noticed in BAU Dragon fruit-1 with 50% soil + 50% sand (V_1T_4) and shortest plant (30.75 cm) was found in BAU Dragon fruit-2 with 50% soil + 50% saw dust (V_2T_5) (Figure 1, Table 2, Table 4).

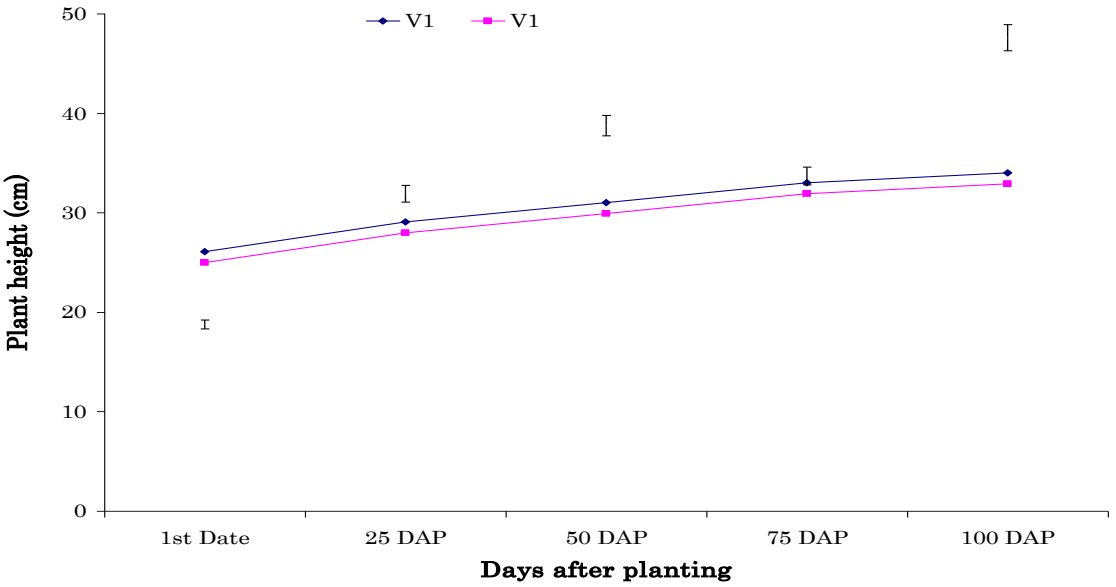

Figure 1. Effect of variety on plant height.

[BAU Dragon fruit-1, (V_1), BAU Dragon fruit-2, (V_2) and DAP= Days after Planting]

Moreover, statistically non-significant difference was found in case of varieties and significant difference was found in case of treatments and combined effect in terms of number of branches. In case of variety the number of branches per cutting (.984) was noticed in BAU Dragon-1 (V_1) and (.960) was noticed in BAU Dragon fruit-1 (V_1). In case of treatment the highest number of branches per cutting (1.44) was noticed in control (soil 100%) and IAA 200 ppm solution + soil (100%) (T_9) and the lowest number of branches (0.22) was noticed in IAA 500 ppm solution + soil (100%) (T_7). In case of combined effect the maximum number of branches (2.00) was noticed in BAU Dragon fruit-1 with IBA 200 ppm solution + soil (100%) (V_1T_{12}) and minimum number of branches (0.11) was found in BAU Dragon fruit-1 with 50% soil + 50% saw dust (V_1T_5) and IAA 500 ppm solution + soil (100%)(V_1T_7) respectively (Table 1, Table 3 and Table 5).

On the other hand, statistically significant difference was found in case of varieties, treatments and combined effect in terms of number of roots per cutting. In case of variety the higher numbers of roots (6.00) at 100 DAP was counted in the BAU Dragon fruit-1 (V_1) but the lower number of roots (5.36) was in BAU Dragon fruit-2 (V_2). In case of treatment the higher numbers of roots (8.17) at 100 DAP was counted in (IAA+IBA) 200 ppm solution + soil (100%) (T_{13}) but the lower number of roots (4.39) was found in control (soil 100%) condition. In case of combined effect the maximum number of roots per cutting was noticed (9.67) in BAU Dragon fruit-2 with (IAA+IBA) 200 ppm solution + soil (100%) (V_1T_{13}) and minimum number of branch was found (3.44) in BAU Dragon fruit-2 with 50% soil + 50% saw dust (V_2T_5) (Table 1, Table 3 and Table 5).

In addition, statistically significant difference was found in case of varieties, treatments and combined effect in terms of root length. In case of variety the highest root length was measured in case of BAU Dragon fruit-2 (V_2) (15.22 cm) but lower length was found in BAU Dragon fruit-2 (V_2) (14.44 cm). In case of treatment the highest root length was measured (25.38 cm) in case of IAA 200 ppm solution + soil (100%) (T_9) but lower length (8.39 cm) was found in sand (100%) (T_6). In case of combined effect the longest (25.87 cm) was observed in BAU Dragon fruit-1 in case of IAA 200 ppm solution + soil (100%) (V_1T_9)

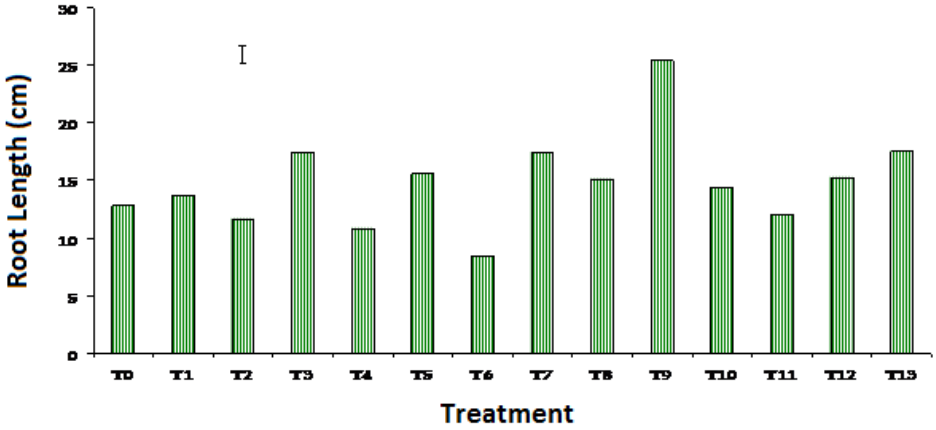

Figure 2. Effect of Treatment on root length (cm)

[T_0= Control (soil 100%), **T_1=** 50% cow dung + 50% soil, **T_2=** Saw dust (100%), **T_3=** Compost (100%), **T_4=** 50% soil+50% sand, **T_5=** 50% soil + 50% saw dust, **T_6=** Sand (100%), **T_7=** Dipped in IAA (500 ppm solution) + soil (100%), **T_8=** Dipped in IAA (300 ppm solution) + soil (100%), **T_9=** Dipped in IAA (200 ppm solution) + soil (100%), **T_{10}=** Dipped in IBA (500 ppm solution) + soil (100%), **T_{11}=** Dipped in IBA (300 ppm solution) + soil (100%), **T_{12}=** Dipped in IBA (200 ppm solution) + soil (100%), **T_{13}=** Dipped in IBA (200 ppm solution + IAA (200 ppm solution) + soil (100)] and the shortest (7.78 cm) was recorded from BAU Dragon fruit-2 with sand (100%) (V_2T_6) (Table 1 and 5).

Again, statistically significant difference was found in case of varieties, treatments and combined effect in terms of fresh weight of roots and shoots. In case of variety the higher fresh weight of roots and shoots (108.25 g) was measured in case of BAU Dragon fruit-2 (V_2) whereas the lower (104.58 g) was in BAU Dragon fruit-1 (V_1). In case of treatment the higher fresh weight of roots and shoots (128.61 g) was measured in case of saw dust (100%) (T_2) and the lower (75.69 g) were in sawdust (100%) (T_2). In case of combined effect the maximum fresh weight of roots and shoots (144.17 g) was found in BAU Dragon-2 with IBA 300 ppm solution + soil (100%) (V_2T_{11}) and minimum (66.54 g) was observed in BAU Dragon-2 with IBA + IAA 200 ppm solution + soil (100%) (V_2T_{13}) (Table 1, 3 and 5).

Moreover, statistically significant difference was found in case of varieties, treatments and combined effect in terms of fresh weight of shoots. In case of variety the higher fresh weight of shoots (106.4 g) was measured in case of BAU Dragon fruit-2 (V_2) whereas the lower (103.12 g) was in BAU Dragon fruit 1 (V_1). In case of treatment the higher fresh weight of shoots (125.96 g) was measured in case of saw dust (100%) (T_2) and the lower (74.27 g) were in (IAA+IBA) 200 ppm solution + soil (100%) (T_{13}). In case of combined effect the maximum fresh weight of shoots (142.69 g) was found in BAU Dragon-2 with IBA 300 ppm solution + soil (100%) (V_2T_{11}) and minimum (65.03 g) was observed in BAU Dragon-2 with IBA + IAA 200 ppm solution + soil (100%) (V_2T_{13}) (Table 1, 3 and 6).

Moreover, statistically significant difference was found in case of varieties, treatments and combined effect in terms of fresh weight of roots. In case of variety the higher fresh weight of roots (1.85 g) was measured in case of BAU Dragon fruit-2 (V_2) whereas the lower (1.46 g) was in BAU Dragon fruit-1(V_1). In case of treatment the higher fresh weight of roots (2.66 g) was measured in case of compost (100%) (T_3) whereas the lower (1.18 g) was in 50% soil + 50% saw dust (T_5) and IBA 200 ppm solution + soil (100%) (T_{12}). In case of combined effect the maximum fresh weight of roots (142.69 g) was found in BAU Dragon-2 with IBA 300 ppm solution + soil (100%) (V_2T_{11}) and minimum (65.03 g) was observed in BAU Dragon-2 with IBA + IAA 200 ppm solution + soil (100%) (V_2T_{13}) (Table 1, 3 and 6).

Moreover, statistically significant difference was found in case of varieties, treatments and combined effect in terms of dry weight of roots. In case of variety the higher dry weight of roots (0.433 g) was measured in case of BAU Dragon fruit-2 (V_2) whereas the lower (0.353 g) was in BAU Dragon fruit-1 (V_1). In case of treatment the higher dry weight of roots (0.679 g) was measured in case of saw dust (100%) (T_2) and the lower (0.253 g) were in case of IBA 200 ppm solution + soil (100%) (T_{12}). In case of combined effect the maximum dry weight of roots (0.992 g) was found in BAU Dragon-2 with saw dust (100%) (V_2T_2) and minimum (0.218 g) was observed in BAU Dragon-2 with IBA 200 ppm solution + soil (100%) (V_2T_{12}) (Table 1,3 and 6).

Table 1. Effect of varieties on plant growth and development of Dragon fruit

Variety	Days to first root initiation	Root length (cm)	Number of roots per plant	Fresh weight of Roots and Shoots/plant (g)	Fresh weight of Roots/plant (g)	Fresh weight of shoots (g)	Dry weight of roots/plant (g)	Survival rate of plant (%)
V_1	22.33	14.441	5.36	104.58	1.46	103.12	0.353	86.01
V_2	24.03	15.219	6.00	108.25	1.85	106.40	0.433	84.41
LSD at 5%	0.132	0.327	0.065	1.145	0.028	1.206	0.014	0.245
LSD at 1%	0.176	0.435	0.087	1.526	0.037	1.607	0.018	0.327
Level of sig.	**	**	**	**	**	**	**	**

** = Significant at 1% level of probability; * = Significant at 5% level of probability

Table 2. Effect of different rooting media (treatments) on plant height

	Plant height (cm)				
Treatments	1st Date	25 DAP	50 DAP	75 DAP	100 DAP
T_0	26.60	29.60	31.59	33.59	34.59
T_1	25.55	28.55	30.41	32.41	33.41
T_2	26.75	29.75	31.46	33.46	34.46
T_3	27.76	30.76	32.72	34.72	35.72
T_4	29.53	32.53	34.50	36.50	37.50
T_5	25.11	28.11	29.80	31.80	32.80
T_6	27.30	30.30	32.54	34.54	35.54
T_7	23.57	26.57	28.98	30.98	31.98
T_8	24.07	27.07	28.90	30.90	31.90
T_9	25.91	28.91	31.29	33.29	34.29
T_{10}	24.63	27.63	29.56	31.56	32.56
T_{11}	22.56	25.56	27.33	29.33	30.33
T_{12}	24.07	27.07	28.70	30.70	31.70
T_{13}	23.87	26.87	28.56	30.56	31.56
LSD at 5%	0.463	0.881	1.095	0.934	1.377
LSD at 1%	0.617	1.174	1.460	1.245	1.836
Level of sig.	**	**	**	**	**

** = Significant at 1% level of probability; * = Significant at 5% level of probability; DAP = Days after planting

Table 3. Effect of different rooting media (treatments) on plant growth and development of Dragon fruit

Treatment	Number of roots per plant	Fresh Weight of Roots and Shoots/plant (g)	Fresh Weight of Roots/plant (g)	Fresh weight of hoots/plant (g)	Dry weight of roots/plant (g)	Survival rate of plant %	Days to first root initiation	Survival rate of plant %
T_0	4.39	101.67	1.59	100.08	0.521	71.2	23.83	71.2
T_1	5.17	100.83	1.58	99.25	0.36	74.81	23.56	74.81
T_2	6.17	128.61	2.65	125.96	0.679	94.25	23.33	94.25
T_3	5.89	118.06	2.66	115.4	0.511	79.77	23.56	79.77
T_4	5.22	93.06	1.26	91.8	0.398	75.43	23.61	75.43
T_5	6	106.11	1.18	104.93	0.292	91.58	22.94	91.58
T_6	4.69	116.81	1.19	115.62	0.264	89.68	23.06	89.68
T_7	5.28	95.5	1.75	93.75	0.418	85.01	22.50	85.01
T_8	5.56	110.42	1.78	108.64	0.398	92.39	22.94	92.39
T_9	5.5	103.75	2.11	101.64	0.382	89.04	22.28	89.04
T_{10}	5.56	102.67	1.36	101.31	0.392	99.25	22.78	99.25
T_{11}	6.5	124.17	1.45	122.72	0.297	84.55	23.06	84.55
T_{12}	5.42	112.5	1.18	111.32	0.253	78.82	24.00	78.82
T_{13}	8.17	75.69	1.42	74.27	0.341	87.22	23.06	87.22
LSD at 5%	0.172	3.026	0.073	3.186	0.037	0.648	0.349	0.648
LSD at 1%	0.229	4.034	0.098	4.248	0.049	0.863	0.466	0.863
Level of sig.	**	**	**	**	**	**	**	**

Table 4: Combined effect of varieties and rooting media (treatments) on plant height

Variety and Treatment	Plant height (cm)				
	1st Date	25 DAP	50 DAP	75 DAP	100 DAP
V_1T_0	27.04	30.04	32.23	34.23	35.23
V_2T_0	26.16	29.16	30.94	32.94	33.94
V_1T_1	25.97	28.97	30.64	32.64	33.64
V_2T_1	25.13	28.13	30.18	32.18	33.18
V_1T_2	26.32	29.32	31.16	33.16	34.16
V_2T_2	27.18	30.18	31.76	33.76	34.76
V_1T_3	28.24	31.24	33.39	35.39	36.39
V_2T_3	27.27	30.27	32.04	34.04	35.04
V_1T_4	33.87	36.87	38.88	40.88	41.88
V_2T_4	25.18	28.18	30.11	32.11	33.11
V_1T_5	27.07	30.07	31.85	33.85	34.85
V_2T_5	23.15	26.15	27.75	29.75	30.75
V_1T_6	29.97	32.97	35.6	37.6	38.6
V_2T_6	24.63	27.63	29.47	31.47	32.47
V_1T_7	23.21	26.21	28.8	30.8	31.8
V_2T_7	23.92	26.92	29.17	31.17	32.17
V_1T_8	23.09	26.09	28.17	30.17	31.17
V_2T_8	25.04	28.04	29.63	31.63	32.63
V_1T_9	25.52	28.52	30.51	32.51	33.51
V_2T_9	26.3	29.3	32.07	34.07	35.07
V_1T_{10}	26.15	29.15	31.04	33.04	34.04
V_2T_{10}	23.1	26.1	28.08	30.08	31.08
V_1T_{11}	20.87	23.87	25.22	27.22	28.22
V_2T_{11}	24.24	27.24	29.43	31.43	32.43
V_1T_{12}	24.01	27.01	28.58	30.58	31.58
V_2T_{12}	24.13	27.13	28.81	30.81	31.81
V_1T_{13}	23.43	26.43	28.16	30.16	31.16
V_2T_{13}	24.3	27.3	28.95	30.95	31.95
LSD at 5%	0.656	1.248	1.551	1.323	1.95
LSD at 1%	0.872	1.659	2.063	1.759	2.593
Level of sig.	**	**	**	**	**

** = Significant at 1% level of probability; * = Significant at 5% level of probability

Table 5.Combined effect of varieties and rooting media (treatments) on plant growth and development of Dragon fruit

Variety and Treatment	Number of branches per plant	Root length (cm)	Number of roots per plant	Fresh Weight of Roots and Shoots (g)	Days to first root initiation
V_1T_0	1.11	13.33	3.78	103.33	23.33
V_2T_0	1.78	12.33	5	100	22.67
V_1T_1	0.44	13.06	4.44	101.67	22.67
V_2T_1	1.78	14.22	5.89	100	23.00
V_1T_2	1.67	12.33	5.22	115	22.56
V_2T_2	0.22	11	7.11	142.22	22.67
V_1T_3	0.38	15	4.89	117.78	23.11
V_2T_3	1.22	19.78	6.89	118.33	21.11
V_1T_4	1.22	11.11	4.78	97.22	20.78
V_2T_4	1.22	10.56	5.67	88.89	21.33
V_1T_5	0.11	18.33	8.56	113.89	22.78
V_2T_5	0.89	12.83	3.44	98.33	21.22
V_1T_6	1.44	9	4.56	122.78	23.56
V_2T_6	0.33	7.78	4.83	110.83	21.78
V_1T_7	0.11	15.72	5.89	87.67	24.33
V_2T_7	0.33	19.17	4.67	103.33	24.44
V_1T_8	0.75	12.56	5.11	106.67	24.00
V_2T_8	1.11	17.67	6	114.17	24.11
V_1T_9	1.56	25.87	5.67	104.17	24.67
V_2T_9	1.33	24.89	5.33	103.33	23.22
V_1T_{10}	0.56	17.44	6.11	113.33	23.00
V_2T_{10}	1.22	11.33	5	92	23.89
V_1T_{11}	1.33	13.5	5.33	104.17	25.11
V_2T_{11}	1.22	10.5	7.67	144.17	23.22
V_1T_{12}	2	13.67	4	91.67	22.78
V_2T_{12}	0.67	16.83	6.83	133.33	24.89
V_1T_{13}	0.78	10.83	6.67	84.83	24.44
V_2T_{13}	0.44	24.17	9.67	66.54	24.33
LSD $_{at\ 5\%}$	0.073	1.22	0.243	4.285	0.495
LSD at 1%	0.098	1.63	0.323	5.698	0.658
Level of sig.	**	**	**	**	**

** = Significant at 1% level of probability; * = Significant at 5% level of probability

Table 6.Combined effect of varieties and rooting media (treatments) on plant growth and development of Dragon fruit

Variety and Treatment	Fresh Weight of Roots (g)	Fresh weight of shoots (g)	Dry weight of roots (g)	Survival rate of plant %
V_1T_0	1.31	102.02	0.351	71.5
V_2T_0	1.86	98.14	0.691	75.36
V_1T_1	1.54	100.13	0.299	95.36
V_2T_1	1.62	98.38	0.421	80.42
V_1T_2	1.57	113.43	0.367	76.75
V_2T_2	3.72	138.5	0.992	92.45
V_1T_3	1.64	116.14	0.45	90.47
V_2T_3	3.68	114.65	0.572	86.31
V_1T_4	1.21	96.01	0.427	93.41
V_2T_4	1.31	87.58	0.37	89.4
V_1T_5	1.5	112.39	0.35	100
V_2T_5	0.86	97.47	0.233	85.14
V_1T_6	1.19	121.59	0.261	79.31
V_2T_6	1.2	109.63	0.267	88.27
V_1T_7	1.7	85.97	0.433	70.89
V_2T_7	1.8	101.53	0.402	74.25
V_1T_8	1.69	104.98	0.34	93.14
V_2T_8	1.88	112.29	0.456	79.12
V_1T_9	1.79	102.38	0.363	74.11
V_2T_9	2.43	100.9	0.4	90.71
V_1T_{10}	1.49	111.84	0.396	88.89
V_2T_{10}	1.24	90.76	0.388	83.71
V_1T_{11}	1.43	102.74	0.31	91.36
V_2T_{11}	1.48	142.69	0.283	88.67
V_1T_{12}	1.04	90.63	0.288	98.49
V_2T_{12}	1.33	132	0.218	83.95
V_1T_{13}	1.33	83.5	0.308	78.33
V_2T_{13}	1.51	65.03	0.373	86.17
LSD $_{at\ 5\%}$	0.104	4.513	0.052	0.917
LSD at 1%	0.138	6.001	0.069	1.22
Level of sig.	**	**	**	**

** = Significant at 1% level of probability; * = Significant at 5% level of probability

Again, statistically significant difference was found in case of varieties, treatments and combined effect in terms of survival rate of plant. In case of variety the higher survival rate of plant (86.01%) was observed in case of BAU Dragon fruit-1 (V_1) whereas the lower (84.41%) was in BAU Dragon fruit-2 (V_2). In case of treatment the higher survival rate of plant (99.25%) was observed in case of IBA 500 ppm solution + soil (100%) (T_{10}) and the lower (71.2%) were in case of control (soil 100%). In case of combined effect the highest survival rate of plant (100%) was observed in BAU Dragon fruit-1 with IBA 500 ppm solution + soil (100%) (V_1T_{10}) and the lowest survival rate of plants (70.89%) in BAU Dragon fruit-1 with control (soil 100%) (V_1T_0) (Table 1, 3 and 6).So in our experiment, it is observed that all the parameter were significant at 1% level in case of varieties, treatments and combined effect except the number of branches which was non- significant in case of variety.

CONCLUSION

In this experiment there were significant effects of rooting media and varieties of dragon fruit cuttings. Among the observations the best result was found in case of variety for the highest root length (15.22 cm) was measured in case of BAU Dragon fruit-2 (V_2). In case of treatment for the highest root length (25.38 cm) was measured in case of Indole-3 Acetic Acid (IAA) 200 ppm solution + soil (100%) (T_9) and in case of combined effect the highest root length (25.87 cm) was measured in case of BAU Dragon fruit-1 with (IAA) 200 ppm solution + soil (100%) (V_1T_9). On the other hand, in case of variety the longest plant height (34.02 cm) was noticed in BAU Dragon fruit-1 (V_1). Saw dust (100%) (T_2) also gave better result for another parameter in case treatment. So, the results obtained from this investigation that among the rooting media IAA 200 ppm solution + soil (100%)(T_9), IBA 300 ppm solution + soil (100%)(T_{11}), 50% soil + 50% saw dust (T_5) and 50% soil +50% sand (T_4) gave the better result for maximum parameter of Dragon fruit cultivation.

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