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IMPACT OF VARIED GROWING SUBSTRATES ON SHOOT DEVELOPMENT IN DRAGON FRUIT *(HYLOCEREUS UNDATUS)* CUTTINGS

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ABSTRACT

The study conducted at Horticultural Research Farm No.1 Babasaheb Bhimrao Ambedkar University. the impact of various growing media on the root and shoot growth of *Hylocereus undatus* (dragon fruit) cuttings was investigated. Different compositions, including pure and ratios of 1:1 and 2:1 (v/v), were employed in the media. The experiment encompassed nine treatments and followed a Randomised Block Design replicated three times. The most favourable shoot parameters are as given average number of sprouts (7.6), shoot length (38.64cm) and shoot fresh and dry weight (126.53 and 15.57 g, respectively)- were observed when utilizing a mixture of Soil+ Sand + Vermicompost (in a ratio of 2:1:1), Notably, the initiation of Sprouts occurred in shortest duration (38 days) within the soil + sand +Vermicompost (2:1:1) group. Additionally, this particular media combination demonstrated the maximum survival % measuring (99.33%) with the root to shoot ratio (0.080)
***Keywords*:** Dragon fruit, media, vermicompost, FYM, Sand.

Introduction

The dragon fruit, scientifically known as [*Hylocereus undatus* (Webber) Britton and Rose], belongs to the cactaceae family and is a tropical climbing vine fruit crop. It has garnered global attention due to its striking appearance as a plant and its significance in fruit production. Pitaya, pitahaya, strawberry pear, and night blooming cereus are some of its other names. The skins of dragon fruit are thornless and red or pink, with a luscious flesh that ranges from white to magenta. The skin of *Hylocereus* spp. is typically covered by bracts or scales. Originating from the tropical and subtropical forest regions of Mexico, Central, and South America, these species of dragon fruit show promise as a potential crop suitable for commercial production in dry areas (Vaillant *et al*., 2005). Dragon fruit cultivation commonly involves both sexual propagation through seeds and asexual methods like grafting and stem cuttings. While seed propagation is straightforward, cross-pollination often leads to seeds that do not exhibit the exact characteristics of the parent plant, which can affect the consistency of the resulting fruit (Andrade *et al*., 2005). The choice of growing media is crucial for the successful propagation and cultivation of dragon fruit. A well-balanced media composition, such as a mixture of sand and organic matter, plays a significant role in obtaining high-quality cuttings. Various readily available materials like soil, sand, Farm Yard Manure (FYM), Vermicompost, and other similar media can be used in different combinations to create an effective growing medium for dragon fruit propagation.

Materials Methods

The current study, named "Impact of Varied Growing Substrates on Shoot Development in Dragon Fruit (*Hylocereus undatus*) Cuttings," was conducted at Horticultural Research Farm No. 1 BBAU, Lucknow in the years 2021-2022. The investigation was conducted to three times using Randomly Block

Design. To acquire the planting material, fresh dragon fruit cuttings were obtained from a one-year-old stem section of the Red to White genotype, sourced from Horticultural Research Farm no. 1 at BBAU Lucknow. Each treatment involved two cuttings. These cuttings were subjected to various media compositions, including soil, sand, FYM, Vermicompost, and their combinations, at different volume ratios. The treatments were as follows: T_0-Soil (Control) T_1 - Sand T_2-Vermicompost T_3-FYM T_4 - Soil + Sand (1:1) T_5-Soil + Vermicompost (1:1) T_6-Soil + FYM (1:1) T_7-Soil + Sand + Vermicompost (2:1:1) T_8-Soil + Sand + FYM (2:1:1). These cuttings were then planted in grow bags filled with the respective media combinations and positioned in areas receiving partial shade.It was then moved to an open field and arranged suitably once all of the cuttings had been planted.In the first week of December, the planting was completed. Throughout the inquiry, all of the experiment cuttings were kept in the same condition and subjected to the same cultural procedures, such as fertilisation, irrigation, and plant protection. Shoot growth characteristics were measured during the final harvest (120 DAP).

Results and Discussion

The following is a summary of the results of the experiment on several elements of shoot growth parameters:

Days taken to sprout initiation

Differences in the days to first sprout initiation among the various growing media and their combined effects were found to be statistically significant (as shown in Table-1). Analysis of the dragon fruit stem cuttings treated with different growing media indicated that T_7 - Soil + Sand + Vermicompost (2:1:1) exhibited the shortest duration for sprout initiation, taking (38.18) days, followed by T_8-Soil+ Sand +FYM (2:1:1) with average days to sprout initiation 39.50 days. Similarly, at the 5% level of significance, treatments T_5&T_6 and T_3&T_4 and T_1&T_2 with respective days taken to sprout initiation of 41.16 & 42.16 and 43.00 & 45.00 and 55.88 & 55.01 days were statistically equivalent.In comparison to the other treatments, T_0-Soil (control) took the longest (57.46 days) to initiate root growth. Similar result was also concluded by Awasthi *et al*. (2008) in guava and Minz(2021) in dragon cuttings.

Number of sprouts per cutting

Table -1 indicates that the combination of T_7 - Soil + Sand + Vermicompost (2:1:1) yielded the highest average number of sprout (7.60). This average number of sprout corresponded closely to the cuttings treated with T_8 - Soil + Sand + FYM (2:1:1) in this study, which showed an average number of sprout of 6.54. At a 5 percent LOS, the treatments T_6, T_5, T_4, T_2, T_3 & T_1 with average number of roots of 5.83, 5.50, 4.50, 4.45, 4.28, & 3.35 per cutting were statistically equivalent. However, in T0-Soil, the minimum average number of sprout was 2.39. (Control). According to Norman *et al*. in 2005, vermicompost has been shown to enhance the physical, chemical, and biological properties of soil. This result was close agreement with the evaluation of Panchal *et al*. (2014) in sapota

Shoot length

The statistical analysis, as depicted in Table -1, indicates a significant impact of the various media combinations on the average length of shoots. The media combination of T7 - Soil + Sand + Vermicompost (2:1:1) demonstrated the longest average shoot length, measuring at 38.64 cm. This length was statistically comparable to the mean lengths observed in T_8 (34.74cm) and T_6(32.47 cm) media combinations. Meanwhile, cuttings planted in T_5-Soil + vermicompost (30.39 cm) had shorter shoot lengths, which were not significantly different from those planted in T_2-Vermicompost (29.63cm). T_0-Soil produced the shortest average length of shoot (22.64 cm control). The superior performance observed in the T_7 combination (Soil + Sand + Vermicompost) could be due to its ability to enhance soil porosity and reduce cutting desiccation. The addition of an aerating agent likely facilitated improved air circulation within the medium, contributing to longer shoot development. This finding is similar to that of Panchal *et al*. (2014) in Khirni.

Fresh weight of shoot (g)

In the current study, T_7 - Soil + Sand + Vermicompost (2:1:1) exhibited the highest shoot fresh weight at 126.53 g, followed by T_4 - Soil + Sand (1:1) with a mean of 118.64 g. These two treatments were not significantly different from each other but showed significant variation from the other treatments (as shown in Table -1). T_8 - Soil +sand +FYM (1:1) had a slightly lower mean fresh weight of 104.48 g, while the control, T_0 - Soil, showed the lowest fresh weight (70.38 g) among all treatments. The similar result were obtained by Dhakar *et al*.(2016) in acid lime.

Dry weight of shoot (g)

The different growth conditions significantly influenced the dry weight of shoots, as indicated in Table -1, showing variation between 4.26to15.57 grams. T_7 - Soil + Sand + Vermicompost (2:1:1) demonstrated a significantly greater dry weight of shoots per cutting at 15.57 grams, which was statistically similar to T_4 - Soil + Sand (13.50 grams) in

this study. Conversely, T_0- Soil (Control) showed the lowest dry weight of shoots per cutting at (4.26 grams) a value that did not significantly differ from T_2 - Vermicompost (5.64 grams), Similarly Prajapati *et al*, (2017) reported that media with soil+ Vermicompost registered higher dry weight in shoot in acid lime.

Survival percent of cuttings (%)

The survival % of cuttings in each growing media treatment, as indicated in Table -1, showing variation between 68.63 to 99.33%. T_7 -Soil+Sand +Vermicompost (2:1:1) demonstrated greater survival percentage at 99.33%, which was statistically similar to T_8- Soil + Sand +FYM (95.67%) in this study. Conversely, T_1- Sand showed the lowest survival % of shoots per cutting at (68.63%) a value that did not significantly differ from T_0-Soil (control) at 70.83%. This result is equivalent to earlier findings of Rashmita *et al*.(2015) in pear (*Pyrus pyrifolia* L.) and Baghel and Saraswati (1989) in Pomegranate.

Root to Shoot ratio

It is evident from the data demonstrated above that the variation of root to shoot ratio is showed between 0.022 to 0.080. T_7-Soil +Sand +Vermicompost (2:1:1) showed highest ratio at 0.080, which was statistically similar to T_8 (Soil +Sand +Vermicompost) and T_5 (Soil+ Vermicompost) 0.057 &0.054 respectively in this study. Conversely, T_0- Soil showed the lowest root to shoot ratio at (0.022) a value that did not significantly differ from T_3-FYM (0.025). It might be due to higher organic matter content in the media, which invigorates improved physiological activities of the plant and thus, helps in obtaining maximum root shoot dry mass, which further results in higher root to shoot ratio. This finding also correlates with earlier findings of Dhakar *et al.* (2016) in Papaya.

Table 1 : Effect of Various Growing Media on Sprout Initiation Duration, shoot Quantity, shoot Length, Fresh Weight, Dry Weight, Survival % and Root to Shoot Ratio of Dragon Fruit Cuttings.

Treatments	Days taken to sprout Initiation	Average number of sprouts per cutting	Average length of shoots per cutting (120 DAP)	Shoot Fresh weight(g) @ 120 DAP	Shoot Dry weight(g) @ 120 DAP	Survival % @ 120 DAP	Root to Shoot Ratio @ 120 DAP
T_0-Soil	57.46	2.39	22.64	70.38	4.26	70.83	0.022
T_1-Sand	55.88	3.35	25.32	71.56	5.83	68.63	0.052
T_2-Vermicompost	55.01	4.45	29.63	75.60	5.64	72.60	0.035
T_3-FYM	43.00	4.28	31.40	74.42	8.14	71.61	0.025
T_4-Soil +Sand	45.00	4.50	24.34	118.64	13.50	72.63	0.56
T_5-Soil+Vermicompost	41.16	5.50	30.39	95.55	9.43	93.83	0.054
T_6-Soil+FYM	42.16	5.83	32.47	98.70	11.37	75.67	0.051
T_7-Soil +Sand + Vermicompost	38.18	7.60	38.64	126.53	15.57	99.33	0.080
T_8-Soil +Sand +FYM	39.50	6.54	34.74	104.48	12.23	95.67	0.057
SE(m)±	0.58	0.60	0.49	0.63	0.56	0.60	0.001
CD at 5%	1.75	1.83	1.49	1.91	1.71	1.82	0.002

Conclusion

The study highlights the significant impact of varied growing substrates on the success and growth of cuttings across various parameters. Specifically, the combination of vermicompost and soil emerged as the most successful among all treatments. The inclusion of vermicompost in the soil notably enhanced shoot growth in the cuttings, indicating its positive influence on the overall growth performance of the dragon fruit cuttings.

Plate 1: Pictures of Research Trail

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