Plant Archives Vol. 25, Supplement 1, 2025 pp. 1893-1897 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.259

EFFECT OF DIFFERENT GROWING MEDIA ON SHOOT DEVELOPMENT OF DRAGON FRUIT CUTTINGS (*HYLOCEREUS UNDATUS* L. HAWORTH BRITTON & ROSE)

Rishabh Singh[1], R.S. Verma[1*], S.S. Verma[2], Saurabh Verma[1] and Bipin Kumar[1]
[1]Department of Horticulture, School of Agricultural sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow 226025 (U.P), India
[2]Subject Matter Specialist, Krishi Vigyan Kendra, Bilari, Moradabad (U.P.), India
*Corresponding author E-mail: ravihort.009@gmail.com
(Date of Receiving : 13-09-2024; Date of acceptance : 26-11-2024)

ABSTRACT

The present investigation was carried out on the effect of different growing media on shoot development of dragon fruit cutting (*Hylocereus undatus L.) and* was conducted in the polyhouse at the Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Vidya Vihar Rae Bareli Road, Lucknow U.P. (India) during the years 2022–23. The experiment was laid out in a randomized block design (RBD) for shoot development parameters of dragon fruit cuttings with one factor and three replications under polyhouse. Treatment combination has shown the significant difference. Among the different treatment combinations used media containing soil, sand, FYM, vermiculite, perlite, soil+ sand+ FYM, soil+ sand+ vermiculite, soil+ vermiculite + perlite enriched with different growing media combination has recorded minimum days taken to sprout initiation, number of sprouts per cutting, shoot length, shoot fresh weight, shoot dry weight, survivance percent per cutting, root to shoot ratio.
Keywords **:** Shooting media shoot development, dragon fruit cuttings, vermiculite, and perlite.

Introduction

Dragon fruit (*Hylocerus undatus* L.), a recently introduced superfruit in India, is considered to be a promising, remunerative fruit crop. It has very attractive color and mouth-melting pulp with black edible seed embedded in the pulp along with tremendous nutritive property, which attracts the growers from different parts of India to cultivate this fruit crop, which originated in Mexico and Central and South America (Mizrahi *et al.,* 1997). Dragon fruit is also reported to have health benefits, including prevention of memory losses, control of blood glucose levels in diabetic patients, prevention of oxidation, aiding in the healing of wounds, etc. In addition, it has the ability to promote the growth of probiotics in the intestinal tract (Zainoldin and Baba, 2012). Dragon fruits are an excellent source of vitamin C and therefore are abundant with minerals, particularly calcium supplements as well as phosphorus. Also, it is a good source 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). One alternative to obtaining uniform seedling in large quantities is to propagate stem cuttings. Stem cuttings must be healthy, green in color, and ideally be between 20 and 30 cm in length. The ability of stem cuttings to form shoots is impacted by physical factors such as the length and diameter of the cuttings (El Obeidy, 2006). The growing medium plays an important role in the successful propagation and cultivation of dragon fruit. The type of growing medium used for the propagation of dragon fruit is crucial, as it plays a pivotal role in the successful propagation, growth, and cultivation. The selection and preference of a growing medium depend on availability, quality, material cost, efficacy, feasibility for growth of dragon fruit, and appropriateness in chemical, biological, and physical

properties. The media types used in treating cuttings are a matter of concern for the growth and development of cuttings. Healthy media compositions are one of the materials that can be used to increase the supply of nutrients in soil. Some commonly available media are soil, sand, FYM, vermiculite, sawdust, etc. (Mubarok *et al.* 2017).

Material and Methods

The present investigation was carried out at the Horticulture Research Farm, Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Vidya Vihar Rae Bareli Road, Lucknow U.P. (India) during the years 2022–23 to study the effect of different growing media on shoot development of dragon fruit (*Hylocereus undatus* L.) cuttings under polyhouse. The experiment field was situated at 26'55' North latitude and 80'59Longitude, and the elevation was 123 meters above mean sea level (MSL). The present investigation was laid out in a randomized block design (RBD) with nine treatment combinations replicated three times, and the numbers of cuttings in each replication are two. Thus, there were a total 48 plants. Shoot cuttings of three-year-old plants were collected from progressive farmer Shri Ram Sharan Verma at Rasoolpur in Sultanpur, Uttar Pradesh, and planted directly in the field. The shooting media was prepared by mixing soil, sand, FYM, vermiculite, and perlite. The various treatment combinations of soil + sand + FYM, soil + sand + vermiculite, and soil + vermiculite + perlite ratio 1:1:1 were as follows: (T1-Soil, T2-Sand) T3-FYM T4: Vermiculite; T5: Perlite T6-soil + sand + FYM, T7-soil + sand + vermiculite, T8-soil + vermiculite + perlite), respectively. The observation on shoot growth parameters—days taken to sprout initiation, number of sprouts per cutting, shoot length, shoot fresh weight, shoot dry weight, survivance percent per cutting, root to shoot ratio—was recorded at 60, 90, and 120 DAP. The data recorded from the present studies were subjected to analysis using the standard method suggested by Panse and Sukhatme (1967).

Result and Discussion

Days taken to sprout initiation

The data tabulated clearly indicates that there are significant impacts on different growing media on the number of days taken for sprouting of cuttings. Significant differences were noticed among different growing media and their combined effect with respect to days taken to sprout initiation. The minimum number of days taken to sprout commencement (37.16) was observed in T6-Soil + Sand + FYM tailed by T7-Soil + Sand + Vermiculite with average days to sprout commencement of 39.50 days. Both of these treatments were on par and significantly superior to other treatments. Meanwhile, the cuttings planted in T8-Soil + Vermiculite + Perlite (1:1:1) took 42.30 days for sprouting, which was also statistically similar with T3-FYM with a mean of 41.14 days. Whereas, in T5-Perlite, recorded the maximum number of days (63.01) for sprouting, which showed no significant difference with T1-Soil having a corresponding mean of 59.72 days. Similar results were also concluded by Minz (2021) in dragon fruit cuttings.

Number of sprouts per cutting

The periodic observations on the number of sprouts per cutting at 60, 90, and 120 days after planting under different growing media. The data on the effect of different growing media with respect to the number of sprouts per cutting at 60, 90, and 120 days after planting significantly varied with different growing media under the present study. At 60 DAP, the number of sprouts per cutting was significantly impacted by different growing media and their composition. According to the statistically analyzed data, the treatment T6-Soil Sand + FYM (1:1:1) delivered the highest number of sprouts (3.87) per cutting and was significantly greater among all other treatments. Furthermore, the lowest number of sprouts per cutting (1.01) was obtained in T1-Soil, although it was not significantly different with 12-Sand, whose mean value was 1.25 with respect to the number of sprouts per cutting. At 90 DAP, it was observed that the maximum mean number of sprouts per cutting (4.91) was yielded in superiority of treatment T6-Soil + Sand+ FYM, which was tailed by T7-Soil + Sand+ Vermiculite (3.30) and T8-Soil + Vermiculite + Perlite (3.01), respectively. The treatments TI & T2 and T3 & T4 and T5, having the separate number of sprouts 1.49 & 2.63 and 2.43 & 2.33 and 2.00, were statistically similar, with each other at 5% level of significance. The lowest number of sprouts (1.49) was recorded in T1 soil. At 120 DAP, the same trend was observed for the uppermost average number of sprouts per cutting planted in the media T6-Soil Sand FYM, which gave a significantly superior number of sprouts (7.63) as compared to all other treatments except T7-Soil + Sand + Vermiculite and T8-Soil + Vermiculite + Perlite, which were statistically at par with each other having the respective average number of sprouts of 6.57 and 5.86 under the present investigation. While the minimum number of sprouts (2.41) was registered in T1-Soil. This result was in close agreement with the evaluation of Panchal *et al.* (2014).

Shoot length (cm)

The data on the effect of different growing media on shoot length (cm) of dragon fruit cuttings, as regards different growing media, indicated significant differences were noted between the treatments for shoot length under the present investigation. A significant trend in the increase of shoot length was observed at 60, 90, and 120 days after planting. At 60 DAP, significant variations were observed under the different growing media. The data showed that the treatment T6—Soil + Sand + FYM—improved the shoot length and delivered significantly the longest shoot length (27.38 cm) of all the other treatments. Furthermore, it was noticed that the treatments T2, T3, T4, and T5 with their respective mean shoot lengths of 18.69, 20.79, 19.77, and 20.75 cm were statistically at par with each other at the 5% level of significance. The minimum length of the shoot (18.57 cm) was observed in T1-Soil, although it was not significantly different (18.69 cm) from T2-Sand. At 90 DAP, the longest shoot length (32.96 cm) was recorded under the treatment T6-Soil + Sand + FYM, which was tailed by T7-Soil + Vermiculite having the average shoot length of 27.48 cm and T8-SSoil Vermiculite + Perlite (26.98 cm) under the present trial. The treatments 12 & T3 and T4 & T5 having the mean shoot length 23.19 & 25.54 and 22.91 & 21.46, respectively, were statistically at par with each other for this parameter. Whereas, T1-Soil recorded the lowest shoot length (21.28 cm). At 120 DAP, significant differences were found in various treatments with respect to the shoot length of cuttings. The same response with the treatment T6-Soil Sand + FYM was noted, which exhibited the longest shoot length (38.65 cm). It also showed a non-significant difference with T7: Soil + Sand + Vermiculite, with a corresponding mean value of 34.79 cm. Both T6 and T7 were similarly effective for shoot growth of cuttings. These treatments were tailed by T3-FYM, T4-VVermiculite, and TS-Perlite, whose average shoot length was 29.68, 30.86, and 31.45 cm, respectively. However, the shoot length in T1-Soil and T2-Sand progressively delivered cuttings with shorter shoot lengths (24.64 and 25.38 cm, respectively). As per the above-discussed mean data, it can be noticed that the shoot length was significantly impacted by the various treatments during different days of observations (60, 90, and 120 DAP). The data revealed that the media alignment with T6-Soil+ Sand + FYM and T7-Soil + Sand + Vermiculite improved the shoot length and gave longer shoot length compared to other growing media used without FYM. T1-Soil gave the shortest average shoot length during the entire period of annotations.

Shoot fresh weight (g)

The data recorded at 120 days after planting for shoot fresh weight in dragon fruit cuttings under the impact of different growing media. The data related to the mean fresh weight of the shoot signifies that the different growing media had a significant impact on the fresh weight of the shoot per cutting. Among the various treatments, a more positive response can be observed in vermiculite-containing media. The maximum fresh weight of the shoot (126.56 g) was recorded under the treatment T6-Soil + Sand + FYM, which was first-rate among all other treatments. The mean comparison between the treatments showed that T1 Soil, T2-Sand, and T3-FFYM were (75.61) g, (74.45) g, and (75.63) g, respectively, were statistically non-significant with each other at the 5% level of significance. Whereas, the minimum fresh weight of the shoot (70.45 g) was obtained under the media T5-Perlite tailed by T4-Vermiculite with a mean 71.57 g, respectively, during the current investigation. Hence, from the above paragraph, it can be suggested that the treatment T6—Soil + Sand + FYM—was beneficial for gaining maximum fresh weight (126.56 g) of shoot per cutting; in contrast, the minimum fresh weight of shoot (70.45 g) was observed in TS-Perlite among all the treatments.

Shoot dry weight (g)

The dry weight of the shoot at the end of the investigation (120 DAP) was significantly affected by different growing media and the data. In the present investigation, the effect of different growing media was statistically significant with respect to shoot dry weight per cutting of dragon fruit. It was observed that treatments with combined media showed more positive impact than the soil alone. Among the various treatments, T6—Soil + Sand + FYM—resulted in the highest dry weight of shoot (15.59 g) at the end of the investigation (120 DAP). It was succeeded by 17-Soil + Sand + Vermiculite T8-SSoil + Vermiculite Perlite having mean shoot dry weight values of 13.54 and 12.25, respectively. According to mean differences, T2-Sand showed a significant difference with T3 FYM but was non-significant with T4-Vermiculite, each having their mean values of 5.84, 5.69, and 8.16 g, respectively, under the present study. The lowest shoot dry weight (4.56 g) was obtained under the treatment T1-Soil. From the observations cited above, it can be observed that different media combinations responded differently and were statistically momentous. T6 Soil Sand FYM registered the maximum shoot dry weight (15.59 g) among all other treatments, and the lowest shoot dry weight (4.56 g) was recorded under TI-Soil.

Survivance per cent of cuttings (%):

Existence percentage of cuttings was recorded in each growing media treatment, and the data collected were subjected to statistical analysis. Significant differences were observed between treatments for the survival percentage of dragon fruit cuttings recorded at 120 days of planting. The highest survivance percentage (99.35%) was registered in the treatment T6-Soil Sand + FYM, and the treatments 17-Soil + Sand + Vermiculite and T8-Soil + Vermiculite + Perlite, with their experiential mean 95.68 and 93.86%, respectively, were statistically obtained during the current investigation. The survivance percentage for T6-sawdust was slightly less (76.67%), but that of T1-soil was substantially lower (72.64%). Thus, it was noticed that growth rate response varied with different rooting media. The maximum survivance percentage (99.35%) was retained in T6 Soil Sand + FYM, which showed similar performance (95.68%) with 17 Soil Sand Vermiculite. Meanwhile, the minimum (72.64%) was observed in TI-Soil.

Root-to-shoot ratio:

The observations regarding mean root-to-shoot ratio as impacted by different growing media in dragon fruit cuttings were recorded at 120 DAP, and the data related to this have been presented. In the present experiment, the root shoot ratio increased significantly at the end of the investigation. The root and shoot growth were impacted by different growing media under the present trial. The maximum root-to-shoot ratio (0.059) was recorded in the treatment T6: Soil + Sand + FYM, and it was on par with T7: Soil + Sand + Vermiculite and T8: Soil + Vermiculite + Perlite, with mean values of 0.059 and 0.57, respectively. Non-significant differences were also observed in the treatments T4 and T5, having the respective mean root-to-shoot ratios of 0.051, 0.053, $p<0.05$. However, the minimum root to shoot ratio (0.025) was registered in TI-Soil. It is evident from the data discussed above that, after 120 days of planting, an extreme root-to-shoot ratio (0.083) was recorded in T6-Soil Sand + FYM, which was at par with T7-SSoil + Sand + Vermiculite and T8-SSoil Vermiculite + Perlite with mean values of 0.059 and 0.057, respectively, which showed significantly superior performance than the rest of the treatments. The lowest root-to-shoot ratio (0.025) was obtained in T1 soil. It might be due to higher organic matter content in the media blends, attributing to better aeration and water holding volume of the media, which invigorates improved physiological activities of the plant and thus helps in obtaining maximum root and shoot dry mass, which further results in a higher root-to-shoot ratio. This finding also corroborates with earlier findings of Dhakar *et al*. (2016) in Papaya.

Table 1: Effect of different growing media on shoot development of dragon fruit cuttings (*Hylocereus undatus* L.).

Sr. No.	Treatment	Days taken to sprout initiation	Number of sprouts			Shoot length (cm)			Shoot fresh weight (g)	Shoot dry weight (g)	Survivance percentage	Root-to-shoot ratio
			60 DAP	90 DAP	120 DAP	60 DAP	90 DAP	120 DAP	120 DAP	120 DAP	120 DAP	120 DAP
T1	Soil	59.72	1.01	1.49	2.41	18.57	21.28	24.64	75.61	4.56	72.64	0.025
T2	Sand	56.77	1.25	2.63	3.38	18.69	23.19	25.38	74.45	5.84	71.63	0.027
T3	FYM	41.14	1.33	2.43	4.49	20.79	25.54	29.68	75.63	5.69	70.85	0.039
T4	Vermiculite	51.11	1.36	2.33	4.30	19.77	22.91	30.86	71.57	8.16	72.66	0.051
T5	Perlite	63.01	1.42	2.00	5.54	20.75	21.46	31.45	70.45	9.45	75.68	0.053
T6	Soil+ Sand +FYM	37.16	3.87	4.91	7.63	27.38	32.96	38.65	126.56	15.59	99.35	0.083
T7	Soil+ Sand +Vermiculite	39.50	3.06	3.30	6.57	21.59	27.48	34.79	118.67	13.54	95.68	0.059
T8	Soil+ Vermiculite +Perlite	42.30	2.95	3.01	5.86	20.86	26.98	32.51	104.51	12.25	93.86	0.057
S. Em (±)		2.38	0.94	1.23	1.21	1.83	1.50	1.96	2.81	1.56	1.83	0.001
C.D. at 5%		0.77	0.31	0.40	0.69	0.27	0.49	0.31	0.91	0.18	0.66	0.001

Conclusion

1. The media combined with FYM had better survivability and success rate as compared to the media used without FYM. The highest survival percentage (99.35%) was noted under the media combination of soil + sand + FYM.
2. In case of shoot parameters, number of sprouts per cutting, shoot length, shoot fresh and dry weight, and root-to-shoot ratio were influenced under the treatment T6: Soil + Sand + FYM. However, the minimum days to sprout initiation were achieved under the treatment To-Soil.
3. It was also recorded that T6 Soil Sand + FYM also performed better as compared to other treatments, making it the second-best treatment to increase root-to-shoot growth parameters of dragon fruit cuttings.

Plate 1 : Photos of Research Trail

References

El-Obeidy, A.A. (2006). Mass propagation of pitaya (Dragon fruit). Fruits. 61: 313-319.

G. Panse and P.V. (1967). Sukhatme, "Statistical Methods for Agricultural Workers," 2nd Edition, Indian Council of Agricultural Research, New Delhi.

Minz, V. (2021). Effect of growing media and plant growth regulators on root and shoot growth of dragon fruit cuttings. M.Sc. (Horti.) Fruit Science thesis, Indira Gandhi KrishiVishwavidyalaya, Raipur, Chhattishgarh, Pp. 1-78.

Mizrahi, Y., and Nerd, A. (1996). "New crops as a possible solution for the troubled Israeli export market." 37-45.

Mubarok, S., Kusumiyati, K., Muhardiono, I., Yuniarti, A., Rosniawati, S., & Suminar, E. (2017). Improvement of Soil Chemical Properties of Typic Hapludult After Application of Organic and Inorganic Fertilizers. Journal of Tropical Soils, **22**(3), 131-137.

Vaillant, F., Perez, A., Dornier, M., & Reynes, M. (2005). Colorant and antioxidant properties of red-purple pitahaya (Hylocereus sp.). Fruits, **60**(1), 3-12.

Zainoldin, K.H., & Baba, A.S. (2009). The effect of Hylocereus polyrhizus and Hylocereus undatus on physicochemical, proteolytic, and antioxidant activity in yogurt. World Academy of Science, Engineering, and Technology, **60**(3), 361-366.