Current Horticulture **13**(2): 55–57, April–June 2025
DOI: 10.5958/2455-7560.2025.00023.7
Received: 05 September 2024; Accepted: 04 March 2025

Evaluation of propagation technique of Dragon fruit (*Hylocereus polyrhizus*) on various media

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Abstract

A study was carried out on dragon fruit (*Hylocereus polyrhizus* L.) with two factor randomized block design replicated five times at School of Agricultural Sciences, Nagaland University, Medziphema, Nagaland, during 2022-23. The treatments consisted of four types of media (sand, sand + FYM, sand + vermicompost and sand + leaf compost) and two cladode parts (upper half and lower half). The shoot parameters such as number of primary and secondary shoots (5.66 and 1.99), number of aereoles (30.77) and fresh weight and dry weight of shoots (103.66 g and 0.94 g) were recorded best under sand + compost, which were statistically at par with sand + vermicompost. The lower cladode part resulted in better shoot parameters, *viz.* number of primary and secondary shoots (4.84 and 1.68), length of primary and secondary shoots (36.30 cm and 27.14 cm), number of aereoles (27.72), fresh weight and dry weight of shoots (99.86 g and 0.80 g) over the upper cladode part. Similarly, highest number of primary and secondary roots (7.90, 29.08), longest root length (23.36 cm) and fresh and dry weight of roots (2.04 g, 0.80 g) resulted in lower cladode cuttings. The number of primary and secondary roots (8.29, 35.73), fresh and dry weight of roots (2.27 g, 0.94 g) were significantly more under sand + compost. Sand medium triggered the longest root length (28.79 cm). The use of sand + compost or sand + vermicompost with lower half cladode part can effectively enhance the growth of dragon fruit cuttings.

Key words: Media, Cladode part, Shoot and root growth , Aereoles, Fresh and dry weight

Dragon fruit (*Hylocereus* spp.) is a quick-growing, perennial and exotic crop grown in tropical regions of the world. It belongs to Cactaceae family and is a native of Central America, Mexico and South America (Koli *et al.,* 2022). Its cultivation is a lucrative proposition as it fetches high price in market (₹ 250-300 /kg) up to ₹ 350 /kg depending on the demand. The Northeastern region of India has scope for diversifying dragon fruit. There is a need of high-quality, disease free planting material of dragon fruit. A proper media composition serves as a good anchor to the plant and permits the exchange of gases between roots and atmosphere surrounding the rooting media (Rahad *et al.,* 2016). Propagation through cuttings is simple, rapid and cheaper than other sexual or asexual methods of plant propagation (Stokes *et al.,* 2020). The piece of the stem that is utilized for cutting also plays an important part in rooting of cuttings, with the basal or proximal portion being the area that has the highest rooting percentage (Hartmann *et al.,* 2011). The paper elucidates the results on the use of best cladode part and media in propagation of dragon fruit.

MATERIALS AND METHODS

The experiment was conducted in a shade net house at Horticulture Cenre, Chite, Aizawl, Department of Horticulture, Government of Mizoram, during October 2022 to June 2023 with eight treatments replicated five times under two factor randomized block design. The first factor consisted of four different growing media, *viz.* clean coarse sand (control), sand + FYM, sand + vermicompost and sand + leaf compost mixed in 1:1 ratio each, while second factor consisted of two cladode parts, *viz,* upper half and lower half parts. The percentage of NPK content in FYM was 0.5:0.2:0.2, vermicompost having 2.5:2.0:2.0 and leaf compost with 1.25:0.25:0.5. The planting material were obtained from two year old mother plants of red flesh and red skin cv. Dark Star and cuttings of 25-30 cm were dipped in 0.5% Bavistin (Carbendazim) solution cured for a couple of days in shade. The treated cuttings were then planted in rows in polybags of 8 x 8 inches and thereafter their progressive growth was evaluated. The final data of each character recorded were analysed statistically as per Sukhatme and Panse (1995). The significance of different sources of variation were tested by error mean square using Fisher Snedecor 'F' test of probability at 0.05 level of significance.

RESULTS AND DISCUSSION

The media consisting of sand + leaf compost recorded highest number of shoots throughout the study. The maximum number (5.66) of primary shoots and secondary shoots (1.99) were found at 8 MAP (months after planting), which were statistically at par with sand + vermicompost (4.52 and 1.59 primary and secondary shoots respectively). Significantly least number of primary and secondary shoots were recorded in sand at 8 MAP and were also found to be the lowest amongst other

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treatments. The resultant effect of compost may be due to its humic acid content that contributed to the increase in shoot growth, as it influences soil structure, ecology and soil fertility (Chen *et al.,* 1996). It was found that lower half cladode part recorded maximum of 4.84 primary shoots and 1.68 secondary shoots and was significantly superior over the upper half cladode part on all days (Table 1 and Fig 1). The effect of lower half cladode part may be due to more nutritional content, presence of rooting co-factors as well as growth promoters that resulted in desirable shoot growth of cuttings. The interactive effect of media and cladode part was also found significant.

The more shoot length at 8 MAP was recorded in sand + FYM media and lower cladode produced more primary and secondary shoot length (40.87 cm and 36.30 cm respectively). The increase in length of shoots as affected by lower cladode part is also supported by Dachlan *et al.* (2020), which can be attributed to its higher level of auxins and carbohydrate content, resulting in increased shoot lengths. There was significantly more number of aereoles in cuttings grown in sand + leaf compost and lower half cladode produced maximum fresh and dry weight (Table 2). Similar effects of media on shoot characteristics was reported by Atiyeh *et al.* (2000) while Bacilio *et al.* (2006) reported increased dry shoot weight of cordon cacti grown in compost added barren soil.

The fresh weight of cuttings is a significant component in determining the success of the cuttings. This is because the cuttings include food resources that are stored, which aid in the rooting process. Longer cutting sizes (15 cm) produced significantly greater fresh and dry weight of shoot which progressively lessened with smaller cutting sizes (Malsawmkimi *et al.*, 2019) The number of primary and secondary roots was recorded highest with sand + leaf compost media followed by sand + vermicompost. Similarly fresh and dry weight of roots were found highest in sand + leaf compost which was found statistically at par with sand + vermicompost (Table 2 and Fig 2). The present findings lend credence to reports of Vijaya and Syariful (2018).

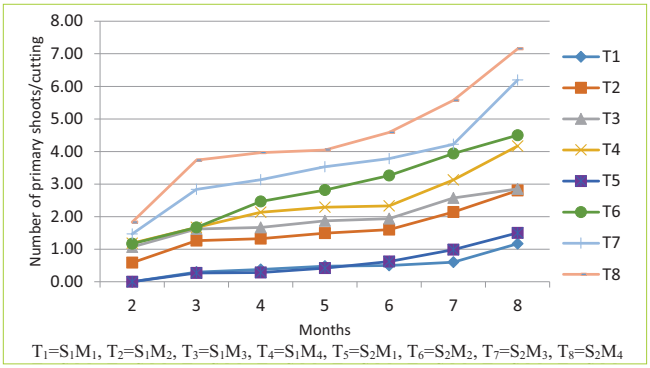


Fig. 1: Interactive influence of media and cladode part on number of primary shoots with progress in time

In our study, least fresh and dry weight of roots but the highest root length was recorded in sand media which may be due to loose nature of sand allowing unrestricted growth of roots. Similar root length was reported by Nandi *et al.* (2019). There were significant variations in interaction between cladode part and media used on root characteristics. These findings are supported by Fumoro (2011) where higher root fresh weight was obtained from basal segment of dragon fruit cuttings over upper and middle segments in mature as well as immature herbaceous cuttings. Interactive influence of both the factors on fresh and dry weight of roots was also found significant. There was cent per cent survival of all cuttings irrespective of cladode part and various media evaluated 12 months after planting.

CONCLUSION

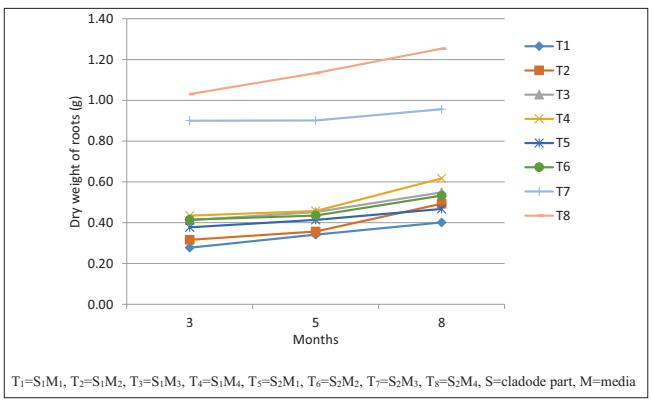
It may be concluded that media consisting of sand

Table 1. Number of primary and secondary shoots of cuttings as influenced by media and cladode part

Treatment	Primary shoots							Secondary shoots
	Months after planting							
	2	3	4	5	6	7	8	8
Media (M)								
Sand	0.00	0.28	0.33	0.45	0.56	0.79	1.33	0.58
Sand + FYM	0.88	1.46	1.89	2.16	2.43	3.04	3.65	1.26
Sand+vermicompost	1.27	2.23	2.40	2.70	2.86	3.40	4.52	1.59
Sand +leaf compost	1.51	2.70	3.05	3.17	3.46	4.35	5.66	1.99
SEm (±)	0.18	0.34	0.42	0.45	0.29	0.17	0.32	0.23
LSD (p=0.05)	0.55	1.03	1.19	1.37	0.87	0.52	0.97	0.69
Cladode part (S)								
Upper half	0.71	1.21	1.37	1.53	1.59	2.11	2.75	1.03
Lower half	1.12	2.13	2.46	2.70	3.06	3.68	4.84	1.68
SEm (±)	0.13	0.24	0.30	0.32	0.20	0.12	0.23	0.16
LSD (p=0.05)	0.39	0.73	0.90	0.97	0.61	0.37	0.69	0.49
Interaction (media x cladode part)								
SEm (±)	0.25	0.48	0.59	0.66	0.40	0.24	0.45	0.32
LSD (p=0.05)	0.77	1.46	1.79	1.99	1.22	0.74	1.37	0.98

Table 2. Influence of treatments on shoot and root characteristics of dragon fruit cutting

Treatment	Length of shoot at 8 MAP	Number of aereoles	Shoot weight (g)		Number of roots		Root length (cm)	Root weight (g)	
			Fresh	Dry	Primary	Secondary		Fresh	Dry
Media (M)									
Sand	19.23	13.36	66.12	0.43	6.80	16.03	28.79	0.94	0.43
Sand + FYM	40.87	22.42	97.44	0.51	7.32	19.49	19.38	1.38	0.51
Sand + vermicompost	29.10	23.03	101.35	0.75	8.13	34.01	18.21	2.11	0.75
Sand + compost	31.71	30.77	103.66	0.94	8.29	35.73	18.11	2.27	0.94
SEm (±)	1.29	1.55	5.21	0.09	0.22	1.13	1.82	0.20	0.09
LSD (p=0.05)	3.92	4.71	15.81	0.26	0.67	3.42	5.52	0.59	0.26
Cladode part (S)									
Upper half	24.15	17.07	83.97	0.52	7.37	23.55	18.88	1.31	0.52
Lower half	36.30	27.72	99.86	0.80	7.90	29.08	23.36	2.04	0.80
SEm (±)	0.91	1.10	3.68	0.06	0.16	0.80	1.29	0.14	0.06
LSD (p=0.05)	2.77	3.33	11.18	0.19	0.47	2.42	3.9	0.42	0.19
Interaction (media x cladode part)									
SEm (±)	1.83	2.20	7.37	0.14	0.31	1.59	2.57	0.28	0.14
LSD (p=0.05)	5.54	6.66	22.35	0.44	0.95	4.83	7.81	0.84	0.44



$T_1=S_1M_1$, $T_2=S_1M_2$, $T_3=S_1M_3$, $T_4=S_1M_4$, $T_5=S_2M_1$, $T_6=S_2M_2$, $T_7=S_2M_3$, $T_8=S_2M_4$, S=cladode part, M=media

Fig. 2. Interactive influence of media and cladode part on dry weight of roots

+ leaf compost and sand + vermicompost provided more or less equal desirable shoot and root growth qualities which may be attributed to their rich organic nutrient content. Leaf compost also has high soil-binding ability and therefore may be recommended to be used in the northeastern region.

ACKNOWLEDGEMENTS

The authors sincerely acknowledge the assistance and support given by the Director and Staff, Department of Horticulture, Government of Mizoram, in carrying out the investigation

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