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Response of different soil media combinations on shoot growth of dragon fruit cuttings

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ABSTRACT

The aim of the present study was to study the response of different combinations of various soil media and to come up with the proper composition for better shoot growth along with the survival percentage on cuttings of dragon fruit. The experiment was set up with a completely randomized design of seven treatments with five replications. Treatments consisted of combinations, viz., T1-FYM, Sand and Soi; T2-FYM, Red Soil and Soil; T3-FYM, Silt and Soil; T4-Vermicompost Sand and Soil; T5-Vermicompost Red Soil and Soil; T6-Vermicompost Silt and Soil; with a ratio of 1:1:2 and T7 100%. Soil was used as a control. Representative cuttings were selected at random from each replication and were used to record data on different growth parameters. For successful propagation of dragon fruit cuttings, better performance in terms of shoot growth parameters, viz., shoot length (71.48 cm), shoot diameter (5.98 cm), fresh weight of shoot (126.48g), dry weight of shoot (22.28 g), number of sprouts per cutting (4.46), survival percentage (97.59%), and minimum days required to first sprout (33.2), was recorded in treatment T5, which was vermicompost, red soil, and soil in a ratio of 1:1:2. The present study was carried out at the Fruit Nursery, Department of Fruit Science, Dr. Panjabrao Deshmukh Krishi Vidypeeth, Akola.

Key words: *Cuttings, Dragon Fruit, Media, Red soil, Vermicompost.*

Introduction

Dragon fruit, a newly introduced exotic fruit in India, is seen as a potential and profitable fruit crop. It originated in Mexico and Central and South America (Mizrahi, 1997). It supplies fiber, which is digestive and helpful for a healthy liver. Dragon fruits consist of phytoalbumins, which may have anti-oxidant qualities that help stop the development of cancer cells. Dragon fruit is said to offer various health advantages, such as preventing memory loss, regulating blood sugar in diabetics, resisting oxidation, and helping wounds heal. Furthermore, it can boost the growth of good bacteria in the gut (Zainoldin and Baba, 2012). It is gaining popularity in various agro-climatic zones of India, viz., Karnataka, Maharashtra, West Bengal, and Andhra Pradesh. It is being cultivated in areas like Bharuch, Tapi, and Surat districts in southern Gujarat. Many farmers in Narmada district, too, are considering dragon fruit cultivation as an alternative. The important hurdle in dragon fruit cultivation is the limited availability of good-quality, genuine planting material. Plant propagation on a large scale is an important step in dragon fruit cultivation. The availability of dragon fruit seedlings can be increased by vegetative propagation through stem cutting. Asexual propagation of dragon fruit by cuttings is time-saving and easy, and it can ensure the availability of quality planting material to meet the

growing demand from farmers. The combination of different growing media is crucial for the success of dragon fruit propagation and cultivation. Therefore, the growing medium of dragon fruit is a crucial factor in the success of dragon fruit propagation (El Obeidy, 2006).

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Materials and Methods

Media combinations

The treatments were T1-FYM, Sand and Soil; T2-FYM, Red Soil and Soil; T3-FYM, Silt and Soil; T4-Vermicompost, Sand and Soil; T5-Vermicompost, Red Soil and Soil; T6-Vermicompost, Silt and Soil; with a ratio of 1:1:2, and T7 100% soil (black) was used as a control. The black plastic bags measuring 11.5 × 26 cm were filled with the right rooting mix, made as per the treatment.

Planting of cuttings and aftercare

A slant cut with a sharp knife was given at the basal end of the cuttings to expose the maximum absorbing surface for effective rooting. Prior to planting, cuttings were dried under shade for one day. The cuttings were treated with an Indole Butyric Acid (IBA) solution for about 15 minutes. The plants were covered with a shade net. Watering and weeding operations were carried out at regular intervals. The cuttings were treated with carbendazim (0.15%) at twice-monthly intervals to check for disease. Support for the cuttings was provided with the help of sticks.

Data collection and analysis

The experiment was conducted using a completely randomized design (CRD) with seven different treatments, each replicated five times. Recording of shoot growth observations was carried out on three plants for each treatment and each replication. The same three cuttings were carefully uprooted and gently rinsed under cold tap water to observe root growth. The information gathered from different observations was examined using a completely randomized design (CRD); following the recommendations of Panse and Sukhatme (1967). The experiment was conducted at the Fruit Nursery of the Department of Fruit Science, College of Horticulture, Dr. PDKV, Akola. Analytical work was carried out at the analytical laboratory, Department of Fruit Science, and the analysis was carried out at the computer research center, Directorate of Research, Dr. PDKV, Akola, during the years 2021–22.

Results and Discussion

All the shoot growth parameters were significantly affected by the treatments applied. The results of the investigation were based on the observation of different shoot growth parameters of dragon fruit cuttings, which were recorded during the course of the investigation. The recorded observation is presented in Table 1 and discussed as follows:

The days required for the first sprouting of dragon fruit cuttings varied from 33.2 to 55.2. Minimum days required to first sprout (33.2) were observed in treatment T5, i.e., vermicompost, red soil, and soil, which was superior over the rest of the treatment, followed by T1, i.e., FYM, sand and soil (37.8). The maximum days required to first sprout

(55.2) were found in treatment T7, i.e., control.

Early root development led to the quick establishment of the cuttings, leading to quicker sprouting. Part of this growth promotion is linked to the plant hormone-like effects of the microflora associated with vermicomposting and the metabolites produced during secondary metabolism (Gopinath *et al*., 2010). The present findings are in conformity with the results of El-Obeidy (2006), Chahal (2020), Rani *et al*. (2015) , Mehra *et al*. (2019) and Jaiwal *et al*. (2021).

The shoot diameter of dragon fruit cuttings was recorded in a range of 4.48 to 5.98 cm. Maximum shoot diameter (5.98 cm) was observed in treatment T5, i.e., vermicompost, red soil, and soil, which was superior to the rest of the treatment. The minimum shoot diameter (4.48 cm) was found in treatment T7, i.e., control. This may be attributed to the availability of different nutrients in an easy form to be absorbed by the seedlings, which is reflected in the growth parameters by increasing stem diameter (El-Quasni *et al*., 2014). The present findings are in conformity with the results of El-Obeidy (2006), Rahad *et al*. (2016), Sudarjat *et al*. (2018), Chahal (2020), Rathwa *et al*. (2017) and Deshmukh *et al*. (2019).

The shoot length of dragon fruit cuttings varied from 59.24 to 71.48 cm. Maximum shoot length (71.48 cm) was observed in treatment T5 i.e., vermicompost, red soil, and soil, which was superior to the rest of the treatment, followed by T1, i.e., FYM, sand, and soil (69.14 cm). The minimum shoot length (59.24 cm) was found in treatment T7, i.e., control. The synergetic combination of the nutritional factors and physical condition of the media probably resulted in the maximum growth of cuttings (Chopde *et al*., 1999). Similar results were reported by Rahad *et al*. (2016), Chahal (2020), Sudarjat *et al*. (2018), Rathwa *et al*. (2017) and Jaiwal *et al*. (2021)

The length of the longest shoot of dragon fruit cuttings varied from 12.98 to 24.22 cm. The maximum length of the longest shoot (24.22 cm) was observed in treatment T5, i.e., vermicompost, red soil, and soil, which was superior to the rest of the treatment. The minimum length of the longest shoot (12.98 cm) was found in treatment T7, i.e., control. The present findings are in conformity with the results of Sudarjat *et al*. (2018), Rahad *et al*. (2016), Chahal (2020), Jaiwal *et al*. (2021), and Rathwa *et al*. (2017).

The fresh weight of the shoot of dragon fruit cuttings was in the range of 91.22 to 126.48 cm. Maximum (126.48 cm) was observed in treatment T5, i.e., vermicompost, red soil, and soil, which was superior over the rest of the treatment, followed by T1, i.e., FYM, sand, and soil (120.86 cm). The minimum fresh weight of the shoot (91.22 cm) was found in treatment T7, i.e., control. The fresh weight of shoots increased because of a greater number of shoots per cutting and an increase in plant height. The overall enhancement in the chemical and physical attributes of the growing media further contributed to the increased fresh weight of the shoots (Dileep *et al*., 1994). The present findings are in conformity with the results of Rahad *et al*. (2016), Dhruve *et al*. (2018), Chahal (2020) and Jaiwal *et al*. (2021.

The dry weight of the shoots of dragon fruit cuttings varied from 15.18 to 22.28 g. The maximum dry weight of the shoot (22.28 g) was observed in treatment T5, i.e., vermicompost, red soil, and soil, which was superior to the rest of the treatment. A minimum dry weight of shoot (15.18 g) was found in

Table 1. Effect of different growing media on shoot and root growth behavior of dragon fruit cuttings

Treatment	Days required to first sprouting	Shoot diameter (cm)	Shoot length (cm)	Length of longest shoot (cm)	Fresh weight of shoot (g)	Dry weight of shoot (g)	Number of sprout per cutting	Survival percentage (%)
T_1	37.8	5.64	69.14	22.18	120.86	20.08	3.53	90.98(72.52)
T_2	41.8	5.42	67.72	20.04	115.24	19.12	3.40	86.58(68.51)
T_3	50.2	5.14	61.92	14.44	96.62	17.42	2.60	78.97(62.70)
T_4	46.8	5.28	65.46	18.26	110.42	19.08	3.06	81.37(64.42)
T_5	33.2	5.98	71.48	24.22	126.48	22.28	4.46	97.59(81.06)
T_6	49.8	4.84	62.68	15.96	107.48	18.54	2.20	79.76(63.26)
T_7	55.2	4.48	59.24	12.98	91.22	15.18	1.86	59.95(50.73)
'F' test	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG
SE (m) ±	0.89	0.05	0.47	0.16	0.57	0.21	0.22	1.01
CD at 5%	2.60	0.16	1.36	0.46	1.66	0.60	0.65	2.95

Fig. 1. Shoot growth of dragon fruit cuttings subjected to various soil media combination

treatment T7, i.e., control. Organic compounds lead to a boost in dry matter production, subsequently increasing both the dry and fresh weight of the shoot (Awasthi *et al*., 1996). Similar results were reported in dragon fruit by Ahmad *et al*. (2016) and Rathwa *et al*. (2017).

The number of sprouts per cutting recorded during the study varied from 1.86 to 4.46. The maximum number of sprouts per cutting (4.46) was observed in treatment T5, i.e., vermicompost, red soil, and soil, which was superior to the rest of the treatment. T1, i.e., FYM, Sand, and Soil (3.53) were statistically at par with treatment T2, i.e., Soil: Red Soil: FYM, (3.40). A minimum number of sprouts per cutting (1.86) were found in treatment T7, i.e., control. This happened because the soil quality, structure, ability to hold water, and presence of beneficial soil microorganisms improved. Additionally, the soil temperature was stable, and the health and nutrient content of the medium got better (Hartman *et al*., 1990). The present findings are in conformity with the results of Sudarjat *et al*. (2018), Rahad *et al*. (2016), Chahal (2020) and Rajkumar *et al*. (2017.

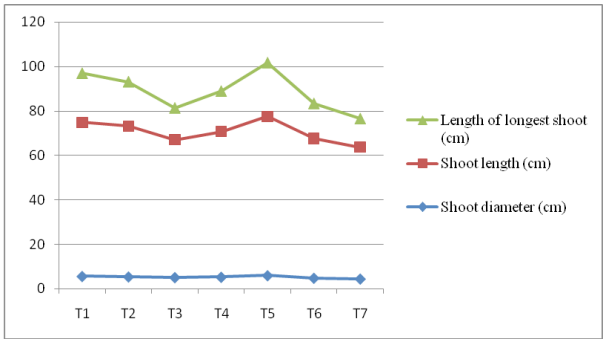

Fig. 2. Graphical representation of the shoot parameters

The survival percentage of dragon fruit cuttings was in the range of 59.95% to 97.59%. Maximum survival percentage (97.59%) was observed in treatment T5, i.e., vermicompost, red soil, and soil, which was superior to the rest of the treatment. Followed by T1, i.e., FYM, Sand and Soil (90.98%). A minimum survival percentage (59.95%) was found in treatment T7, i.e., control. This could be attributed to the high C:N ratio, its antifungal properties, and the increased space provided by the combination of red soil and vermicompost in the rooting media (Dehmukh *et al*., 2019). The present findings are in conformity with the results of El-Obeidy (2006), Rahad *et al*. (2016), Sudarjat *et al*. (2018), Kumar *et al*. (2015) and Rathwa *et al*. (2017).

Conclusion

Based on findings represented in the present study it is concluded that the response of different soil media on shoot growth, and survival percentage of dragon fruit cuttings were found significant. Moreover, better shoot growth performance of cuttings was observed in the treatment T5, i.e. Vermicompost, Red Soil and Soil in ratio 1:1:2.

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