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INFLUENCE OF POTTING MEDIA CONTAINING INDUSTRIAL BY-PRODUCTS ON GROWTH AND QUALITY OF *DRACAENA FRAGRANS* (L.) KER GAWL CV. MASSANGEANA

Gunti Divya[1]*, Zehra Salma[2], G. Jyothi[2] and G. Sathish

[1]Department of Floriculture and Landscaping, Post Graduate Institution for Horticultural Sciences, Sri Konda Laxman Telangana Horticultural University, Siddipet - 502 279, Telangana, India.

[2]Floricultural Research Station, Sri Konda Laxman Telangana Horticultural University, Rajendranagar, Hyderabad - 500 030, Telangana, India.

[3]Department of Agricultural Statistics, Post Graduate Institution for Horticultural Sciences, Sri Konda Laxman Telangana Horticultural University, Siddipet - 502 279, Telangana, India.

*Corresponding author E-mail : divyagunti20@gmail.com

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ABSTRACT

The present investigation entitled "Influence of potting media containing industrial by-products on growth and quality of *Dracaena fragrans* (L.) Ker Gawl cv. Massangeana" was carried out during the period January 2025 - May 2025 at Sri Konda Laxman Telangana Horticulture University, Floricultural Research Station, Rajendranagar, Hyderabad. The experiment was laid out in Completely Randomized Design (CRD) with nine treatments and replicated thrice. The treatments include different combinations of industrial by-products *viz.* vermicompost, perlite, vermiculite, cocopeat, press mud and fly ash in various combinations in volume basis. The data recorded includes growth and quality parameters at initial, 30, 60 and 90 days after planting. The Research findings revealed that treatment T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) recorded maximum plant height (9.70 cm), plant spread in E-W direction (16.78 cm) at 90 days after planting, initial and final root volume (2.00 ml and 2.50 ml), shoot fresh and dry weight (4.17 g and 0.72 g), leaf fresh weight (0.95 g), plant score on over all presentability (4.64) and B:C ratio (1: 0.51). The results revealed that T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) shows maximum influence on growth and quality parameters. It can be concluded that the treatment T_5 was found to be a better alternative for replacing red soil in potting media in the nursery industry.

Key words : Dracaena, Industrial by-products, Press Mud, Fly ash, Perlite.

Introduction

Dracaena fragrans Massangeana is most widely used ornamental plant in landscaping, indoor, outdoor gardens, bouquet preparation and in decoration purpose. It is commonly known as Corn-Plant, Fragrant Dracaena. It belongs to family Agavaceae, native to Tropical Africa and grows in shade conditions. Flowers are white and open during night. Gilman (2007). As it is a widely used ornamental plant, it is chosen for our present investigation.

In today's nursery industry the major concern is depletion of red soil as it is excessively used for filling the polybags for transportation of nursery plants. Earlier the top fertile red soil was the only media used for nursery industry. But, over the few decades it has became a threat because of extensive use, the top layer of fertile red soil is being depleted. Hence, an alternative has to be chosen. Lot of research work has done on various nursery media mostly cocopeat as it is a widely used growing media in India due to its excellent water retention and cation exchange capacity (Wahlang *et al.*, 2024) and vermicompost improves soil fertility in physical, chemical, and biological ways (Lim *et al.*, 2015) is used now-a-days as a cheap alternative.

Earlier, perlite holds water on its irregular surface areas (Boodley and Sheldrake, 1972) and vermiculite holds a lot of water and aids in drainage and aeration of the soil

(Hussain *et al.*, 2014) were also used but, because of their higher cost, their usage is minimal. However, a very meagre work has done on industrial bi-products like press mud as it is a soft, spongy, light weight, amorphous, dark brown to black coloured material. It generally contains 60-85% moisture. It can be used as a fertilizer and animal feed (Katiyar *et al.*, 2016), increases microbial growth, increases soil aeration (Anjana and Dharsha, 2023) and protects the plants from soil borne diseases (Kumar *et al.*, 2017) and fly ash alters the physical, chemical and biological properties of soil makes it an effective soil conditioner. (Sheoran *et al.*, 2014). Indian Fly ash has low availability of Nitrogen and Phosphorus. Shaheen *et al.* (2014). It contains high concentration of toxic heavy metals like Cu, Zn, Cd, Pb, Ni and Cr. Rautaray *et al.* (2003) to be used as an alternative for red soil in the nursery industry.

So, in this research an attempt has been made to use industrial by-products in different combinations with cocopeat and vermicompost on volume basis to find out the effective combination of potting media that can be used in the nursey industry.

Materials and Methods

The present study was conducted at Floricultural Research station, Sri Konda Laxman Telangana Horticultural University, Rajendranagar, Hyderabad, Telangana. The experiment was laid out in Completely Randomized Design (CRD) with nine treatments and replicated thrice.

Treatments	Treatment Combinations (Volume/Volume)
T_1 (Control)	Cocopeat + Vermiculite + Perlite (33.3:33.3:33.3)
T_2	Fly Ash + Vermicompost + Cocopeat (15:35:50)
T_3	Fly Ash + Vermicompost + Cocopeat (20:30:50)
T_4	Press Mud + Vermicompost + Cocopeat (25:25:50)
T_5	Press Mud + Vermicompost + Cocopeat (45:15:40)
T_6	Fly Ash + Press Mud + Cocopeat + Vermicompost (12.5:37.5:25:25)
T_7	Fly Ash + Press Mud + Cocopeat + Vermicompost (15:35:40:10)
T_8	Fly Ash + Press Mud + Cocopeat + Vermicompost (20:45:25:10)
T_9 (Nursery Control)	Soil + Cocopeat + Vermicompost (50:25:25)

The media was mixed thoroughly and filled in 7" pot. The two months old dracaena plantlets were transplanted into the pots during the evening time. Irrigation was given manually with rose can for every 3 days. Each potted plant was supplied with foliar nutrition (NPK 19:19:19 @ 1g/lt) and fungicide (Carbendazim 12%+Mancozeb 63% WP @ 2g/lt) at weekly intervals. The parameters recorded during initial, 30, 60 and 90 days of planting. The parameters include plant height, plant spread, number of leaves per plant, leaf width, leaf length, chlorophyll content, leaf fresh weight, shoot fresh and dry weight, root fresh and dry weight, root volume, root shoot ratio, number of days taken for full leaf expansion, plant score on overall presentability and benefit cost ratio.

Results and Discussion

Growth parameters

Plant height (cm)

The plant height was significantly maximum in T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) (9.70 cm) during 90 DAP was presented in (Table:1). The better performance of potting media combination containing press mud, vermicompost, cocopeat and cocopeat with vermiculite and perlite at 90 days after planting might be due to Combination of perlite and vermiculite had the ability to provide adequate aeration in the root zone (Kazzaz and Kazzaz, 2017) and better nutrient availability due to higher cation exchange capacity of vermiculite (Hindman, 2006).

Plant spread (cm)

The plant spread at north-south direction was maximum in T_1 (Cocopeat + Vermiculite + Perlite, 33.3:33.3:33.3 v/v) (17.02 cm) and at East - West Direction was maximum in T_5 (Press Mud +

Table 1 : Influence of Potting media on plant height (cm) in *Dracaena fragrans*.

Treatments	Plant height (cm)			
	Initial	30 DAP	60 DAP	90 DAP
T_1	6.58	7.43	7.93	9.48
T_2	5.90	6.05	5.81	7.18
T_3	5.74	5.72	5.72	6.58
T_4	6.06	6.65	8.48	9.09
T_5	6.08	6.58	8.29	9.70
T_6	5.83	6.90	6.58	7.43
T_7	5.46	4.98	6.07	7.13
T_8	5.42	5.13	5.31	6.03
T_9	5.08	5.62	7.14	8.39
SE(m)±	0.48	0.43	0.47	0.56
CD at 5%	NS	1.28	1.39	1.65

Table 2 : Influence of Potting media on plant spread (cm^2) in *Dracaena fragrans*.

Treatments	Plant spread (East-West and North- South) (cm)							
	Initial		30 DAP		60 DAP		90 DAP	
	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W
T_1	9.92	13.88	13.88	14.58	15.77[a]	14.49	17.02	15.91
T_2	11.38	12.25	11.61	11.58	12.07[b]	11.10	11.54	11.20
T_3	13.21	11.93	12.78	12.07	13.23[b]	12.09	12.64	11.58
T_4	12.92	12.25	12.81	13.12	14.23[ab]	13.86	15.95	15.26
T_5	13.50	13.42	13.55	14.22	15.84[a]	15.41	16.70	16.78
T_6	13.96	13.00	13.51	13.13	14.16[ab]	13.02	12.68	12.55
T_7	11.96	12.25	12.32	12.48	12.39[b]	12.58	11.98	12.37
T_8	11.33	12.83	11.03	12.33	12.11[b]	11.85	11.92	12.26
T_9	11.83	11.71	13.69	12.56	14.43[ab]	13.06	15.20	14.74
SE(m) ±	1.04	1.21	0.94	0.67	0.81	0.86	0.80	1.10
CD at 5%	NS	NS	NS	NS	2.40	NS	2.38	3.28

Table 3 : Influence of Potting media on number of leaves per plant in *Dracaena fragrans*.

Treatments	Number of leaves per plant			
	Initial	30 DAP	60 DAP	90 DAP
T_1	8.17	8.33	8.83	9.08
T_2	7.33	7.67	7.75	7.75
T_3	7.67	8.25	8.25	8.25
T_4	8.58	9.17	9.17	9.75
T_5	8.33	8.83	9.17	9.50
T_6	8.08	8.25	8.33	7.00
T_7	8.00	8.50	8.67	6.92
T_8	7.92	8.00	8.00	8.33
T_9	7.33	7.83	7.42	8.00
SE(m) ±	0.37	0.37	0.30	0.42
CD at 5%	NS	NS	0.90	1.26

Vermicompost + Cocopeat, 45:15:40 v/v) (16.78 cm) during 90 DAP was presented in (Table 2). The increase in number of leaves and leaf width might have resulted in maximum plant spread in media containing press mud, vermicompost and cocopeat. The high nutrient content and increased growth of beneficial bacteria in press mud can generate beneficial compounds and improve fertility of the media (MDiaz, 2016).

Number of Leaves per plant

Number of Leaves per Plant was maximum in T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) (8.00) during 90 DAP was presented in Table 3. The high nutrient content in press mud, vermicompost and porosity and water holding capacity of cocopeat in the media of T_5 and T_4 treatment might have encouraged rapid growth and tissue formation which might have resulted in increased number of leaves. Similarly, high water holding capacity, good aeration of perlite and high potassium and magnesium in vermiculite (Hussain *et al.*, 2014) might have resulted in maximum number of leaves.

Leaf width (cm)

Leaf Width was maximum in T_1 Control (Cocopeat + Vermiculite + Perlite, 33.3:33.3:33.3 v/v) (3.23 cm) during 90 DAP was presented in Table 4). The high nutrient status and optimum pH of media containing press mud and vermicompost might have promoted faster cell division and expansion which resulted in maximum leaf width similarly good porosity and water holding capacity of perlite with high nutrient content in vermiculite aided in leaf expansion (Hussain *et al.*, 2014).

Leaf length (cm)

Leaf Length was recorded longest in T_1 Control (Cocopeat + Vermiculite + Perlite, 33.3:33.3:33.3 v/v) (17.08 cm) during 90 DAP was presented in Table 5. The leaf length followed the same pattern as leaf width because of similar reason. The media present in the treatment T_1 and T_5 might have support cell division and cell elongation which resulted in increased leaf length.

Chlorophyll content (SPAD)

Chlorophyll content T_1 Control (Cocopeat + Vermiculite + Perlite, 33.3:33.3:33.3 v/v) (26.00) during 90 DAP was presented in Table 6. The highest chlorophyll content in treatments containing press mud, vermiculite, perlite, vermicompost and cocopeat might be due to efficient root uptake, balance between water retention and aeration. supports over all plant growth, leaf development, nutrient uptake. Therefore, might have resulted increased nitrogen content thereby the chlorophyll content was recorded high (Dubey *et al.*, 2013).

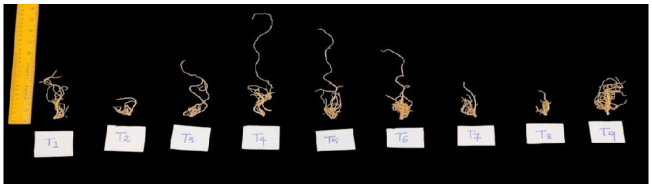

Fig. 1 : Influence of potting media containing industrial by-products on root growth of *Dracaena fragrans*.

Table 4 : Influence of Potting media on Leaf width (cm) in *Dracaena fragrans*.

Treatments	Leaf width (cm)			
	Initial	30 DAP	60 DAP	90 DAP
T_1	2.80	2.78	2.92	3.23
T_2	2.60	2.33	2.63	2.72
T_3	2.58	2.43	2.46	2.63
T_4	2.90	2.68	2.80	2.83
T_5	2.82	2.65	2.82	2.61
T_6	2.74	2.76	2.68	2.54
T_7	2.53	2.58	2.69	2.79
T_8	2.79	2.38	2.53	2.63
T_9	2.42	2.57	2.50	2.41
SE(m) ±	0.18	0.18	0.17	0.14
CD at 5%	NS	NS	NS	0.41

Table 5 : Influence of Potting media on leaf length (cm) in *Dracaena fragrans*.

Treatments	Leaf length (cm)			
	Initial	30 DAP	60 DAP	90 DAP
T_1	9.74	11.16	11.94	17.08
T_2	9.17	9.62	9.98	11.05
T_3	10.63	10.51	10.38	11.85
T_4	10.67	11.21	12.03	14.61
T_5	11.40	11.85	11.98	15.52
T_6	9.67	10.24	10.41	12.09
T_7	9.86	10.06	10.43	11.40
T_8	8.71	8.98	9.19	10.28
T_9	9.67	10.41	10.46	13.16
SE(m) ±	0.68	0.70	0.67	1.14
CD at 5%	NS	NS	NS	3.38

Leaf fresh weight (g)

Leaf fresh weight was recorded maximum in Treatment T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) (0.95 g) which is at par with T_1 Control (Cocopeat + Vermiculite + Perlite, 33.3:33.3:33.3 v/v) (0.82 g), T_4 (Press Mud + Vermicompost + Cocopeat, 25:25:50 v/v) (0.74 g), T_6 (Fly Ash + Press Mud + Cocopeat + Vermicompost, 12.5:37.5:25:25 v/v) (0.66 g) and T_9 (Soil + Cocopeat +Vermicompost, 50:25:25 v/v) (0.73 g) was presented in Table 7. However, lowest leaf fresh weight (0.27 g) was recorded in T_2 (Fly Ash + Vermicompost + Cocopeat, 15:35:50 v/v) (0.27 g) and (T_8) Fly Ash + Press Mud + Cocopeat + Vermicompost (20:45:25:10 v/v) (0.33 g). Increased leaf parameters like leaf length, leaf width might have proportionately increased the leaf weight in treatments containing press mud, vermicompost, perlite and cocopeat. However, treatments containing high quantity of fly ash resulted lower leaf weight due to its under-performance in leaf parameter.

Table 6 : Influence of Potting media on Chlorophyll content (SPAD) in *Dracaena fragrans*.

Treatments	Chlorophyll Content (SPAD)			
	Initial	30 DAP	60 DAP	90 DAP
T_1	21.38	27.93	24.78	26.00
T_2	20.38	20.13	18.00	16.84
T_3	22.11	21.08	20.28	16.93
T_4	21.15	21.72	22.83	23.06
T_5	19.63	24.73	23.29	25.45
T_6	21.95	21.86	19.97	19.38
T_7	21.54	23.54	19.39	17.70
T_8	20.90	20.02	19.14	18.55
T_9	22.47	24.28	24.52	23.78
SE(m) ±	1.00	1.04	1.14	1.37
CD at 5%	NS	3.11	3.39	4.08

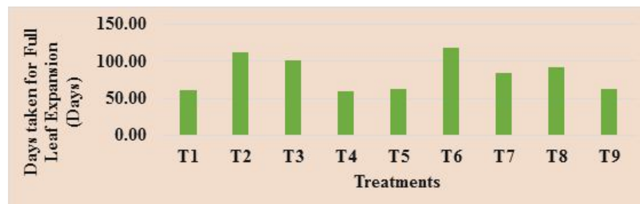

Fig. 2 : Influence of potting media containing industrial by-products on days taken for full leaf expansion of *Dracaena fragrans*.

Shoot fresh and dry weight (g)

Shoot fresh weight was significantly maximum in T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) (4.17 g) was presented in Table 7. The increased fresh shoot weight might be due to increased growth parameters *viz.*, leaf length, leaf width, plant height recorded in the treatments earlier. So, there was a substantial increment in shoot fresh weight.

Shoot dry weight was recorded maximum in T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) (0.72 g) was presented in Table 7. The shoot dry weight followed the same trend with respect to fresh weight. This holds that the biomass was proportionally influenced by the growth parameters.

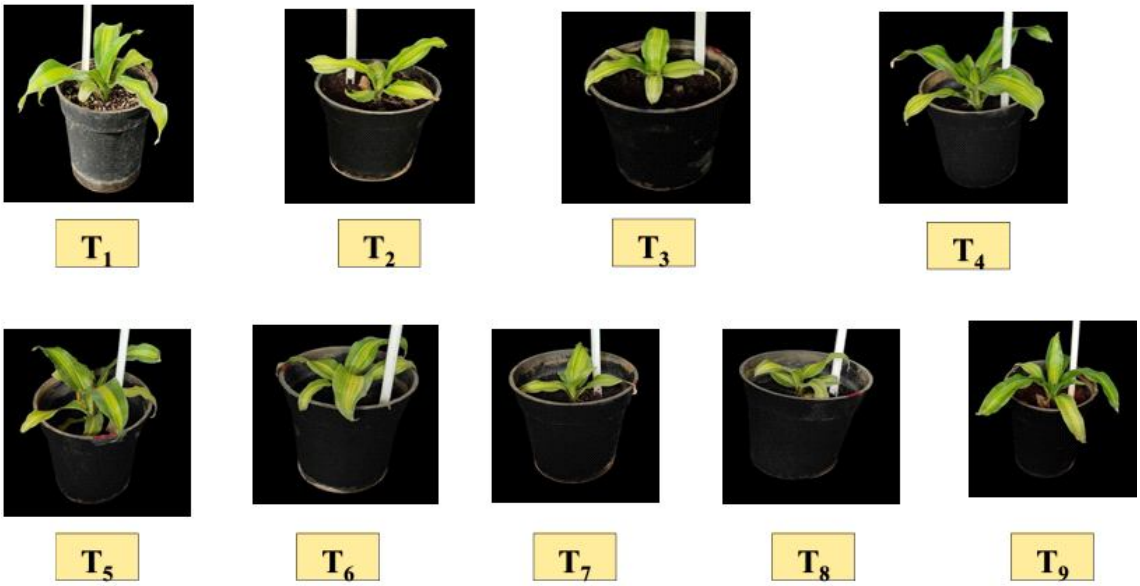

Fig. 3 : Response of plants to different Treatment combinations. **T_1**: Cocopeat + Vermiculite + Perlite (33.3:33.3:33.3),**T_2:** Fly Ash + Vermicompost + Cocopeat (15:35:50),**T_3:** Fly Ash + Vermicompost + Cocopeat (20:30:50),**T_4:** Press Mud + Vermicompost + Cocopeat (25:25:50),**T_5:** Press Mud + Vermicompost + Cocopeat (45:15:40),**T_6:** Fly Ash + Press Mud + Cocopeat + Vermicompost (12.5:37.5:25:25),**T_7:** FlyAsh + Press Mud + Cocopeat + Vermicompost (15:35:40:10),**T_8:** Fly Ash + Press Mud + Cocopeat + Vermicompost (20:45:25:10),**T_9:** Soil + Cocopeat +Vermicompost (50:25:25).

Table 7 : Influence of Potting media on root shoot ratio and number of days taken for full leaf expansion in *Dracaena fragrans*.

Treatments	Leaf weight (g)	Shoot weight (g)		Root weight (mg)		Root Volume (ml)	
	Fresh	Fresh	Dry	Fresh	Dry	Initial	Final
T_1	0.82	3.96	0.62	443	126.7	1.50	2.00
T_2	0.27	1.12	0.21	150	30.0	0.33	1.17
T_3	0.45	2.21	0.41	420	90.0	1.33	1.17
T_4	0.74	3.81	0.60	413	126.7	0.90	1.83
T_5	0.95	4.17	0.72	697	153.33	2.00	2.50
T_6	0.66	2.61	0.46	717	136.67	1.10	1.67
T_7	0.42	1.75	0.30	353	70.00	0.30	1.00
T_8	0.33	1.65	0.34	313	70.00	0.43	0.83
T_9	0.73	2.74	0.47	553	120.00	1.27	1.83
SE(m) ±	0.14	0.59	0.10	101.57	29.21	0.37	0.32
CD at 5%	0.41	1.75	0.29	301.77	NS	NS	0.96

Root fresh and dry weight (mg)

Root fresh weight was maximum in T_6 (Fly Ash + Press Mud + Cocopeat + Vermicompost, 12.5:37.5:25:25 v/v) (720 mg) was presented in Table 7. The increased root fresh weight in the treatment with less fly ash and high press mud might be due to availability of high phosphorus and potassium in these industrial by products reported by MDiaz (2016) and Sheoran *et al*. (2014). The root dry weight among all the treatments was found to be statistically non-significant.

Root shoot ratio

All the treatment combinations were found to be on par with each other with respect to root shoot ratio. However, maximum root shoot ratio was observed in T_6 (Fly Ash + Press Mud + Cocopeat + Vermicompost, 12.5:37.5:25:25 v/v) (0.27) was presented in Table 8. Increase in root weight than shoot weight resulted in highest root shoot ratio.

Root volume (ml)

Final root volume ratio was maximum in T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) (2.50 ml) was presented in Table 7 and Fig. 1. The initial and final root volume was maximum in T_5 might be due to high nutrient content, pore space and good aeration in the media. The media with press mud, vermicompost and cocopeat resulted in good aeration of media might of have

Table 8 : Influence of Potting media on root shoot ratio and number of days taken for full leaf expansion in *Dracaena fragrans*.

Treatments	Root Shoot Ratio	Number of days taken for Full Leaf Expansion (days)
T_1	0.11	61.67
T_2	0.13	112.67
T_3	0.19	101.67
T_4	0.13	60.00
T_5	0.16	62.67
T_6	0.27	117.67
T_7	0.20	85.00
T_8	0.19	92.33
T_9	0.20	62.00
SE(m) ±	14.29	6.73
CD at 5%	18.17	19.98

Table 9 : Influence of Potting media on plant score and number of benefit cost ratio in *Dracaena fragrans*.

Treatments	Plant Score	Benefit Cost Ratio
T_1	4.24	1: 0.29
T_2	2.06	1: -0.10
T_3	2.69	1: -0.06
T_4	4.44	1: 0.45
T_5	4.64	1: 0.51
T_6	2.65	1: 0.12
T_7	3.31	1: -0.01
T_8	2.92	1: 0.05
T_9	4.52	1: 0.18
SE(m) ±	0.32	
CD at 5%	0.96	

resulted in production of more fibrous roots there by increasing its root volume.

Number of days taken for full leaf expansion

Number of days taken for full leaf expansion was earlier in T_4 (Press Mud + Vermicompost + Cocopeat, 25:25:50 v/v) (60 days) which was at par with T_1 Control (Cocopeat + Vermiculite + Perlite, 33.3:33.3:33.3 v/v) (61.67 days), T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) (62.67 days), T_9 (Soil + Cocopeat +Vermicompost, 50:25:25 v/v) (62.00 days) and delayed in T_6 (Fly Ash + Press Mud + Cocopeat + Vermicompost, 12.5:37.5:25:25 v/v) (117.67 days) was presented in Table 8 and Fig. 2. Earlier leaf expansion in the treatments containing press mud, vermiculite, perlite and vermicompost might be due to faster uptake of nutrients and rapid cell division and elongation (Hussain *et al.*, 2014).

Quality Parameter

Among the media combinations the plant score was recorded maximum for T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) (4.64) was presented in Fig. 3. The maximum score was recorded in T_5 and T_4 treatments due to their optimum shoot growth, plant spread, shiny healthy leaves and all together overall acceptance.

B:C ratio

It is evident from the data that the highest B:C ratio was observed in treatment T_5 (Press Mud + Vermicompost + Cocopeat, 45:15:40 v/v) (1: 0.45) was presented in Table 9. However, all other treatments recorded negative values which represents non-profitability. The lower cost of press mud and vermicompost along with its ability to enhance plant growth at a higher rate might have recorded them as profitable treatments. This could suggest that these potting media combinations can be explored to replace vulnerable depleting soil.

Conclusion

It can be concluded that the treatment T_5 (press mud + vermicompost + cocopeat, 45:15:40 v/v) followed by T_4 (Press Mud + Vermicompost + Cocopeat, 25:25:50 v/v) was found to be most suitable for the growth and quality of Dracaena as well as beneficial on economic basis. The treatment T_1 Control (Cocopeat + Vermiculite + Perlite 33.3:33.3:33.3 v/v) was also found at par in most of the parameters studied. However, the cost of vermiculite and perlite are higher.

It can be concluded that press mud can be used as a better alternative for red soil in nursery industry as a potting media in combination with cocopeat and vermicompost.

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