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Effect of Nursery Media on Rooting and Growth of Terminal Stem Cuttings of Chrysanthemum (*Dendranthemagrandiflora*Tzvelev.) in Andaman Isands

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Abstract: An experiment was conducted to study the effect of nursery media on rooting and growth of terminal cuttings of chrysanthemum at ICAR-Central Island Agricultural Research Institute, Port Blair, Andaman and Nicobar Islandsduring 2013. The experiment was laid out in a completely randomized block design using different treatment combinations with varied proportions of soil, sand, perlite, coircompost, vermicompost and FYM as nursery media and terminal cuttings as the propagule. Findings of this study showed that the media combination of coir compost + vermicompost (1:1) had recorded the maximum survival percentage (100%), shoot length (24.53 cm), shoot diameter (3.86 mm), number of leaves (18.6), leaf length (5.93 cm), leaf width (3.93 cm), fresh plant weight (26.34 g), fresh shoot weight (19.81 g), dry shoot weight (4.91 g), root length (13.16 cm), number of roots (32.33), fresh root weight (6.52 g) and dry root weight (1.72 g) compared to other treatment combinations. Hence, the media consisting of coir compost + vermicompost (1:1)will be useful for large scale multiplication of chrysanthemum through terminal cuttings in protrays.

Keywords: *Chrysanthemum, Propagation, Terminal cutting, Nursery media*

Chrysanthemum (*Dendranthemagrandiflora* Tzvelev.) is a very popular flower crop grown worldwide. It is valued as a potted plant and commercially cultivated as cut flower crop in many countries. In India, chrysanthemum is widely grown in open fields as loose flower for making garlands and veni bracelets. The Andaman group of Island offer good scope for cultivation of a wide variety of flowers because of diversified topography, altitude and climatic conditions. Congenial agro climatic conditions coupled with fertile soils and well distributed rainfall though out the year ensure year round production of tropical and sub tropical flowers (Baskaran *et al.*, 2014). Among the loose flowers, chrysanthemum is of high demand in the Island due to its requirement in various religious and social functions throughout the year. For large scale cultivation of chrysanthemum, huge planting materials are required. Generally, chrysanthemum is multiplied through suckers, but the multiplication process may not meet the existing demand as the rate of sucker production is poor from the mother stock (Waseem *et al.*, 2011). Propagation by terminal cuttings is cheaper, less cumbersome, effective and faster with minimum exploitation of mother plants.Along with the standardization of propagation for large scale multiplication, it is felt necessary to standardize the nursery media with locally available organic sources as the Island focuses organic agriculture. The growing media standardization is very important for propagation as it influences the growth and quality of the seedlings (Wilson *et al.*, 2001). The propagation medium directly affects seedling growth, development and maintenance of the extensively functional rooting system (Agbo and Omaliko,

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2006). A good growth medium provides sufficient anchorage or support to the plant, serves as a reservoir for nutrients and water, allows oxygen diffusion to the roots and permits gaseous exchange between roots and the atmosphere outside root substrate (Abad *et al*, 2002). Hence this experiment was initiated to study the effect of different growing media combination on propagation of chrysanthemum through terminal stem cuttings.

MATERIALS AND METHODS

The experiment was conducted during 2013 in the Division of Horticulture and Forestry, ICAR-Central Island Agricultural Research Institute, Port Blair, Andaman and Nicobar Islands. Healthy, uniform sized (5-7 cm long) terminal stem cuttings were collected from disease free mother plants and placed in water for 5 minutes. The cuttings were then planted in portrays, which were filled with different media combinations, treatment wise. The experiment was laid out in a completely randomized design (CRD) and there were three replications in each treatment. In total there were twelve different treatments *viz.*, T_1- sand, T_2- perlite, T_3- coir compost,T_4 – vermicompost, T_5 – coircompost + vermicompost (1: 1), T_6 – sand + perlite + coircompost (1: 1: 1),T_7 – soil+ vermicompost (1: 1), T_8– sand + coircompost +FYM (1: 1: 1), T_9 – coircompost + FYM (1: 1), T_{10} – perlite + coircompost (1: 1), T_{11} – coircompost + sand (1: 1) and T_{12} – soil + coircompost +FYM (1: 1: 1). The physico-chemical properties of different growing media were analyzed before planting the cuttings. The twelve media combination samples were air dried, ground and sieved through 2mm sieve, then stored separately in plastic bags. The pH of media was measured in 1:2.5, media: water suspension using a digital pH meter (Jackson, 1967).The EC was also determined with the supernatant using conductivity meter (Rhoades, 1989). Available nitrogen in the media was estimated by alkaline permanganate method (Subbiah and Asija, 1956). Available phosphorus was estimated by extracting soil with N/2 NaHCO3 (PH 8.5) in 1:20 ratio (Olsen *et al.*, 1954). The potassium was estimated by flame photometer method (Hanway and Heidel, 1952). The root and shoot growth were observed in the terminal cuttings of chrysanthemum at 30 days after planting. The experiment was conducted for two consecutive years and the pooled data obtained were statistically analyzed using Gomez and Gomez 1984.

RESULTS AND DISCUSSION

Observations on various growth parameters *viz*., shoot length, shoot diameter, fresh shoot weight, dry shoot weight , number of roots, root length, fresh root weight, dry root weight, number of leaves, leaf length, leaf width and fresh plant weight were recorded at 30 days after planting the terminal cuttings in protrays under various nursery media are presented in Table 1.

Shoot growth

The results showed that maximum shoot length (24.53 cm) and shoot diameter (13.16 mm) were recorded in T5 – coircompost+ vermicompost (1: 1) followed by T3-coircompost. This may be due to the fact that coir compost when amended with organic manure proves to be the best media with good physical characteristics (Garcia and Daverede, 1994; Van Holm, 1993). This finding was also in accordance with those of Swetha *et al* (2014) in Aglaonema and Abirami *et al* (2010) in nutmeg. Maximum number of leaves (18.66), leaf length (5.93 cm) and leaf width (3.93 cm) were recorded in the treatment combination of coircompost+ vermicompost (1: 1). The combination of coircompost and vermicompost is effective as coircompost provides more pore space with good water holding capacity, while vermicompostis rich in humic compounds, the best food source for microbial activity (Sahni *et al.*, 2008). Development of more number of leaves on the plant may reflect an earlier growth of root system. Thus, production of more leaves with maximum leaf growth in this medium, largely agrees with improved root development. Tilt *et al*. (1987) demonstrated positive correlation between water holding capacity and increased top growth in several landscape plant species.

Root growth

Maximum number of roots (32.0) and root length (13.16 cm)were recorded in T5- coircompost+

Table 1
Effect of various nursery media on growth parameters of terminal stem cuttings of chrysanthemum (Pooled data)

Treatments	*Shoot length (cm)*	*Shoot diameter (mm)*	*Number of leaves*	*Leaf length (cm)*	*Leaf width (cm)*	*Fresh plant weight (g)*	*Fresh shoot weight (g)*	*Dry shoot weight (g)*	*Root length (cm)*	*Number of roots*	*Fresh root weight (g)*	*Dry root weight (g)*
T_1- sand	17.40	2.81	12.33	5.13	3.03	21.64	16.22	3.70	8.36	22.33	5.40	1.15
T_2- perlite	19.20	2.82	13.66	5.00	3.13	20.25	15.19	3.51	9.20	22.00	5.05	1.09
T_3- coir compost	22.50	3.52	17.33	5.66	3.76	23.75	17.80	4.11	11.20	28.33	5.93	1.51
T_4- vermicompost	21.40	3.39	16.00	5.53	3.63	22.71	17.09	4.01	10.83	26.00	5.71	1.31
T_5- coir compost + vermicompost	24.53	3.86	18.66	5.93	3.93	26.34	19.81	4.91	13.16	32.33	6.52	1.72
T_6- sand + perlite + coir compost	18.56	2.95	12.66	5.03	3.13	20.70	15.37	3.51	8.50	23.00	5.24	1.04
T_7- garden soil + vermicompost	18.43	2.88	11.66	4.96	3.03	19.13	14.30	3.31	9.20	22.00	4.81	0.98
T_8- sand + coir compost + FYM	19.10	3.01	14.66	4.80	2.96	17.98	13.65	3.02	9.06	22.66	4.32	0.91
T_9- coir compost +FYM	19.13	2.89	13.66	4.83	2.80	18.19	13.71	3.07	10.13	22.00	4.48	0.91
T_{10}- perlite + coir compost	18.10	2.79	12.33	4.63	2.90	17.26	12.88	2.91	9.50	22.00	4.02	0.85
T_{11}- coir compost+ sand	18.43	2.72	11.00	4.50	2.66	19.29	14.67	3.28	9.76	20.00	4.60	0.92
T_{12}- garden soil + FYM + coir compost	20.33	3.21	15.66	5.50	3.46	22.33	16.69	3.85	10.70	24.00	5.62	0.19
S.E.D	0.13	0.02	0.91	0.08	0.07	0.16	0.07	0.03	0.18	0.77	0.17	0.01
C.D (0.05)	0.27	0.05	1.89	0.18	0.16	0.33	0.15	0.07	0.37	1.61	0.35	0.02
CV	0.81	1.06	7.92	2.08	2.97	0.96	0.57	1.18	2.25	3.99	4.10	1.11

vermicompost (1: 1) followed by T3. coircompost is very slow to disintegrate compared to peat (Cresswell, 1992), which makes it resistant to bacterial and fungal growth. This could be one of the reasons for higher root growth. Coir amended medium enhances the phosphorous exchange sites, which induces maximum root growth in chrysanthemum terminal cuttings. Good physical and biological conditions in coircompost and vermicompost had a positive effect on root development. This is helpful in realizing increased survival per cent of saplings in the main field. Beneficial effect of coircompost on the root system was observed on nutmeg seedlings by Abirami*et al* (2010), in Osteospermum cuttings by Nowak (2004), in Salvia and Viola by Pickering (1997) and in Impatiens by Smith (1995).

Root and Shoot biomass

The results on root and shoot biomass were also found to be significantly higher in the treatment combination of coircompost+ vermicompost (1: 1) (Table 1). The maximum fresh (19.81 g) and dry weights of shoot system (4.91 g) were recorded in the coircompost and vermicompost combination (T5). Maximum fresh (6.52 g) and dry weight (1.72 g) of root system were also recorded in the treatment T5. Further, maximum fresh plant weight (26.34 g) was recorded in the same treatment, T5- coircompost+ vermicompost (1: 1) followed by T3 (23.75g).Bhardwaj (2013) working with papaya suggested that since coircompost was low in nutrients, mixingvermicompost provides a better growth medium for plant establishment. Results of many experiments revealed that coircompost (used

Table 2
Physico-chemical properties of various nursery media before planting

Treatments	*P^H^*	*EC*	*Protein (%)*	*N (%)*	*P (%)*	*K (%)*
T_1- sand	4.69	2.082	1.07	0.17	0.029	0.140
T_2- perlite	4.49	2.240	1.07	0.17	1.380	0.327
T_3- coir compost	4.48	2.585	0.74	0.12	1.130	0.283
T_4- vermicompost	5.29	0.005	1.30	0.21	1.250	0.127
T_5- coir compost + vermicompost	4.96	0.003	1.05	0.18	1.100	0.120
T_6- sand + perlite + coir compost	4.65	2.039	1.51	0.24	2.000	0.067
T_7- garden soil + vermicompost	5.10	0.004	0.68	0.11	0.380	0.143
T_8- sand + coir compost + FYM	4.60	2.769	1.75	0.28	1.750	0.293
T_9- coir compost +FYM	5.30	0.004	1.12	0.18	1.500	0.092
T_{10}- perlite + coir compost	5.07	1.669	0.40	0.06	0.380	0.063
T_{11}- coir compost + sand	4.84	2.352	1.19	0.19	0.001	0.120
T_{12}- garden soil + FYM + coir compost	4.84	3.700	1.10	0.18	0.008	0.100

alone, or as a component of soil medium), is suitable for roses, gerbera and many potted plants (De Kreij and Leeuven, 2001; Pickering, 1997). The physico-chemical properties of the media analyzed are presented in the Table 2. From the data, it is found that the EC level of the T5 media (coircompost+ vermicompost (1: 1)) is low when compared to other treatment combinations. Hence, the root damage in this particular medium is very less supporting good root and shoot growth, with maximum survivability. The pH and NPK content of the medium (coircompost+ vermicompost (1: 1)) are optimum, whichmight have influenced the root and shoot growth in the terminal cuttings of chrysanthemum. The coircompost enriched with vermicompostis known to improve nutrient availability and phosphorus absorption (Karama and Manwan, 1990). Thus, the treatment T5– (coircompost+ vermicompost (1: 1)) showed better water holding capacity, favourable pH, high cation exchange capacity, low electrical conductivity (Jeyaseeli and Samuel Paulraj, 2010), which would have resulted in higher nutrient uptake for better shoot and root growth characteristics of chrysanthemum terminal cuttings.

It may therefore be concluded that the nursery medium containing coircompost+ vermicompost at 1: 1 ratio could result in the best growth parameters and may be used for large scale production of quality chrysanthemum saplings by the commercial nurseries.

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