Indian J. Hort. 68(1), March 2011: 86-90

Standardization of growing medium for anthurium cv. Flame under protected conditions

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ABSTRACT

The present experiment was conducted to standardize of growing medium in pots for anthurium (*Anthurium andreanum* L.) cv. Flame under protected conditions of 75 per cent shade net house. Combinations of growing medium significantly influenced the vegetative growth, flowering pattern and flower production of anthurium. The over all best performance was recorded in medium comprised of saw dust + brick pieces + wooden charcoal + soil + sand + FYM (2:1:1: 1: 1:1), *i.e.* T_7 treatment for almost all the parameters like leaf area (229.11 cm²), petiole length (21.31 cm), minimum days to flowering (260.47), stalk length (36.16 cm), spathe length and width (8.5 and 8.08 cm, respectively) and number of flowers per plant (6.07). The maximum number of leaves per plant (7.40), highest number of suckers per plant (5.00) and longest inflorescence longevity (63.53 days) were recorded in treatment combination involving saw dust + wooden charcoal + soil + sand + FYM (2:1:1: 1: 1), *i.e.* T_6 treatment. The growing medium consisting soil: sand: FYM (T_1) showed the least response for all the parameters.

Key words: Anthurium, growing medium, rice husk, saw dust, cocopeat.

INTRODUCTION

Anthurium (*Anthurium andreanum* L.) belongs to family Araceae and is highly praised flowering plant for its colourful long lasting unique flower and shining foliage. It is also an excellent plant for interior and as cut flower, especially for flower arrangement. The most suitable part of anthurium is modification of the leaf and botanically known as 'spathe'. The heart shaped spathe appears on a long flower stalk with a cute spadix. This plant blooms almost continuously under suitable conditions. It is epiphytic in nature with creeping, climbing or arborescent stems including lots of aerial roots that aid in taping water and nourishment.

In India, growing of anthurium has been a hobby earlier but at present this crop has become an important export oriented crop. It requires a highly organic and aerated medium with good water retention capacity. However, the secret of success for commercial cultivation is to have good drainage in medium used. Considering the need of this, the present investigation on standardization of growing medium for anthurium was undertaken to find its suitability for improved growth, quality and flower yield.

MATERIALS AND METHODS

The present investigation was carried out at Greenhouse Complex of ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during March, 2007 to August, 2008 with the objective to standardize growing medium for anthurium. Planting material was procured from a registered private nursery of Pune. Uniformly developed, 3.0 cm tall tissue cultured plants of anthurium cv. Flame were used for the present experiment after dipping the roots in a fungicide solution (0.1% bavistin). Well hardened tissue cultured plants were transplanted in pots of 22.5 cm diameter and maintained under 75 per cent shade net house with 60-65 per cent relative humidity. The pot experiment was conducted with 13 medium treatment combinations and repeated thrice in completely randomized design. These treatments were prepared by volumetric ratios of basic media are as hereunder.

Treatment	Medium	Ratio
T_1	Soil : sand : FYM (control)	1:1:1
T_2	Rice husk : brick pieces: soil : sand : FYM	2:1:1:1:1
T_3	Rice husk : wooden charcoal : soil : sand : FYM	2:1:1:1:1
T_4	Rice husk : brick pieces :wooden charcoal: soil : sand : FYM	2:1:1:1:1:1
T_5	Saw dust : brick pieces : soil : sand : FYM	2:1:1:1:1
T_6	Saw dust : wooden charcoal : soil : sand : FYM	2:1:1:1:1
T_7	Saw dust : brick pieces : wooden charcoal : soil : sand : FYM	2:1:1:1:1:1

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T_8	Coco peat : brick pieces : soil : sand : FYM	2:1:1:1:1
T_9	Coco peat : wooden charcoal : soil : sand : FYM	2:1:1:1:1
T_{10}	Coco peat : brick pieces : wooden charcoal : soil : sand : FYM	2:1:1:1:1:1
T_{11}	Compost : brick pieces : soil : sand : FYM	2:1:1:1:1
T_{12}	Compost : wooden charcoal : soil : sand : FYM	2:1:1:1:1
T_{13}	Compost: brick pieces : wooden charcoal : soil : sand : FYM	2:1:1:1:1:1

The observations were recorded on important growth and flowering characteristics of anthurium cv. Flame. The physico-chemical properties of medium were analysed at the end of experiment.

RESULTS AND DISCUSSION

The mean data regarding the different growth and flowering characters of anthurium cv. Flame as influenced by growing medium are presented in Table 1. Among the different combinations of growing mediums studied, saw dust + wooden charcoal + soil + sand + FYM @ 2:1:1: 1:1 (T_6) recorded maximum number of leaves per plant (7.40) followed by T_9 (7.33) and T_7 (7.27), which were at par with each others at 18th months after planting. Plants were grown in a medium consisting of saw dust + brick pieces + wooden charcoal + soil + sand + FYM (T_7) resulted in maximum leaf area (229.11 cm^2) and the highest petiole length (21.31cm) followed by T_9, T_5, T_6 and T_8. Treatment T_6 (saw dust + wooden charcoal + soil + sand + FYM @2:1:1: 1:1) produced significantly maximum number of suckers per plant (5.00). This might be attributed to the good physico-chemical properties, *viz.* higher porosity, neutral pH and minimum EC value of these medium. Porosity encourages root aeration. The meida pH is of major importance to plant growth, because of its effect on the availability of nutrients, particularly minor elements (Bunt, 4). Thus, this might have helped in initial vigour and better metabolic activities especially with the production of photo assimilates, which would have favoured more production of shoots. These results corroborate the findings of Dhananjaya and Sulladmath (7) in anthurium, and Gupta *et al.* (10) in gerbera.

The minimum days to flowering (260.47) were recorded in treatment T_7 (saw dust + brick pieces + wooden charcoal + soil + sand + FYM), while treatment T_1 (soil + sand + FYM) required maximum days to flowering (310.67) after planting. Saw dust + brick pieces + wooden charcoal + soil + sand + FYM (T_7) also produced the plants with vigorous growth so that they might have taken a minimum time for flower emergence as compared to the soil + sand + FYM (T_1), which produced less vigorous growth, it may be due to lower aeration and more compactness in the medium. Flower quality parameters, *viz.* stalk length (36.16 cm), spathe length (8.50 cm) and spathe width (8.08 cm) were found maximum in saw dust + brick pieces + wooden charcoal + soil + sand + FYM (T_7). The increase in the size of flower might be due to the cumulative effect of all growth parameters observed throughout the growing period. The increase in the growth parameters increased the size of the flower in different growing medium as resulted by higher porosity, adequate nutrient availability in these medium. Nitrogen greatly influences leaf growth, leaf area and photosynthetic rate per unit leaf area to control production of carbohydrates and other photosynthetic products (source activity) and influence numbers and size of vegetative and reproductive storage organs (sink capacity) as reported by Enggels and Marschner (8). When phosphorous supply is inadequate, cell division slows and whole plant becomes dwarfed, as in nitrogen deficiency. Potassium also affects plant growth mainly by affecting cell extension (Shuman, 15). Potassium efficiency in plants is linked to root growth and flowering and morphology, uptake efficiency, translocation and utilization efficiency (Fageria *et al.*, 9). Wooden charcoal acts as a purifying agent, absorbs harmful gases produced in medium and provides best root environment throughout the growing period which resulted in bigger size of flowers. Holcroft and Liaing (11) reported that largest flowers of anthurium were produced from plants grown in uncomposted pine bark medium, while smallest flowers were produced in soil.

Treatment T_7 (saw dust + brick pieces + wooden charcoal + soil + sand + FYM, 2:1:1:1:1:1, v/v) also recorded significantly more number of flowers per plant (6.07), which was at par with T_6 (5.93) and T_9 (5.80) and least number of flowers per plant (4.00) were recorded in treatment T_1 (soil + sand + FYM, 1:1:1 v/v) up to final observation, *i.e.* 18th months after planting. In the present study, the increase in yield can be attributed to use of saw dust with combination of brick pieces, wooden charcoal, soil, sand and FYM in the growing medium which provided good physico-chemical properties. Both physical and chemical characteristics of the growing medium exert substantial effect on growth of plants. Among the physical characteristics, aeration and water holding capacity are probably the most important factors while, among the chemical characteristics nutritional status and salinity level have crucial role on plant development (Dewayne

Table 1. Response of different growing medium combinations on anthurium cv. Flame under protected conditions.

Treatment	No. of leaves/ plant	Leaf area (cm^2)	Petiole length (cm)	No. of suckers/ plant	No. of days to flowering	Stalk length (cm)	Spathe length (cm)	Spathe width (cm)	No. of flowers/ plant	Inflorescence longevity on plant (days)	BD (g/cc)	Pore space (%)
T_1	5.87	143.20	17.00	2.80	310.67	28.68	6.55	6.31	4.00	49.80	1.46	44.91
T_2	6.53	175.85	18.41	3.80	306.40	31.12	6.87	6.49	4.73	52.13	1.15	56.48
T_3	6.80	189.73	19.06	4.80	294.47	32.83	7.20	6.85	5.27	56.47	1.18	55.35
T_4	6.73	188.78	19.46	4.53	301.20	33.67	7.40	7.25	4.93	54.33	1.10	58.36
T_5	7.00	220.25	20.61	4.60	272.33	34.96	8.19	7.87	5.67	59.67	1.11	58.11
T_6	7.40	218.53	20.39	5.00	265.07	35.65	8.35	8.00	5.93	63.53	1.15	56.73
T_7	7.27	229.11	21.31	4.73	260.47	36.16	8.50	8.08	6.07	62.13	1.07	59.75
T_8	6.87	197.08	19.79	4.27	277.40	33.97	7.49	7.34	5.20	55.87	1.10	58.36
T_9	7.33	223.28	20.86	4.80	268.93	34.80	8.16	7.84	5.80	60.77	1.13	57.36
T_{10}	7.07	204.16	20.00	4.40	274.33	34.43	7.80	7.66	5.47	58.93	1.06	60.00
T_{11}	6.47	175.01	18.74	4.07	282.20	33.01	7.25	6.93	5.33	54.00	1.21	54.47
T_{12}	6.00	155.65	17.66	3.33	297.20	30.18	6.75	6.42	4.40	50.53	1.19	55.22
T_{13}	6.33	167.12	18.10	3.53	288.87	31.61	6.93	6.57	4.87	51.20	1.16	56.10
CD at 5%	0.53	11.64	1.63	0.45	14.44	2.13	0.62	0.59	0.35	4.79	0.08	3.01
CV (%)	4.65	3.62	5.02	6.33	3.02	3.82	4.90	4.85	3.99	5.09	4.10	3.19

BD = Bulk density

et al., 6). Saw dust showed analogous properties, which stimulated nutrient uptake, assimilation and had positive effect on protein synthesis and vegetative growth, hence increased the yield (Tomati *et al*., 18). The major problem noted with the mixture of soil + sand + FYM (T_1) is that they have tendency to settle and compact. Increase in number of flowers per plant with saw dust based growing medium have also been reported by Talukdar and Barooah (16) in *Dendrobium densiflorum*, Bhatia *et al*. (3) in carnation, Thakur *et al*. (17) in rose, and Chandrapa *et al.* (5) in anthurium.

Inflorescence longevity on plant was considerably increased in treatment T_6, *i.e*., saw dust + wooden charcoal + soil sand + FYM (63.53 days) followed by T_7 (62.13 days), T_9 (60.77 days) and T_5 (59.53 days). The increase in Inflorescence longevity might be due to the fact that organic substrates contain optimum levels of essential nutrients that produce quality flowers giving superior longevity of inflorescences on plant. The treatment T_1 (soil + sand + FYM) showed the least longevity (49.80 days). This might be due to the fact that root aeration was less due to more compactness resulting in poor drainage by causing water stagnation, which affected the uptake of nutrients by the plants thereby producing inferior quality flowers. Increases in longevity of flowers with growing medium have also been reported by Jawaharlal *et al*. (12) in anthurium, and Arumugam and Jawaharlal (1) in *Dendrobium* cv. Sonia-17.

The data regarding physical properties of medium are also presented in Table 1. Among the various combinations of growing medium, significantly highest bulk density (1.46 g/cc) was recorded in media containing soil + sand + FYM (T_1) after production of anthurium. Whereas, lowest bulk density was recorded in treatment T_{10} (1.06 g/cc) followed by treatment T_7, T_8 and T_4. All the growing media showed the increasing trend after production of anthurium as compared to initial values of bulk density.

Significantly maximum pore space (60%) was recorded in treatment T_{10} which was at par with T_7, T_8, T_4, T_9 and T_5. While, significantly minimum pore space (44.91%) was recorded in treatment T_1 at the end of experiment. The data in relation to pore space showed decreasing trend at the end of experiment as compared to initial value in all the growing media. Bulk density is one of the most commonly used index for the evaluation of soil physical conditions. By the inclusion of saw dust, coco peat, rice husk, compost in the potting medium, the bulk density was decreased which favoured good physical properties like improved pore space and water holding capacity. The bulk density was reduced from 1.34 g/cc (T_1) to 0.93 g/cc (T_9) by the incorporation of saw dust, brick pieces and wooden charcoal in the normal potting medium. Similarly, per cent pore space was also improved by the addition of saw dust, coco peat, rice husk, compost, brick pieces and wooden charcoal in the normal potting medium as is evident from ranged of porosity, i.e. 49.42% in T_1 to 65.03% in T_9. Pore space was inversely related to bulk density. The bulk density was slightly increased and pore space slightly decreased from initial to end of experiments which might be due to compaction of the potting medium. Similar findings were also observed by many workers (Ramaswamy *et al*., 13; Saravanan and Nambisan, 14; Baskar and Saravanan, 2).

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Received: November, 2009; Revised: December, 2010; Accepted : January, 2011