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Standardization of growing medium and primary nutrients for anthurium cultivation under greenhouse

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ABSTRACT

The present experiment was carried out for two consecutive years (2013-14 and 2014-15) to standardize the media alongwith primary nutrients for anthurium variety 'Tropical' under fan and pad type greenhouse. According to pooled data of two years, among different combinations of growing media and weekly foliar spray of NPK, plants grown in coconut husk + charcoal media (3:1) with foliar spray of 30:10:10 NPK @ 0.2% on anthurium plants performed superior with respect to vegetative growth parameters where maximum plant height (46.77 cm), number of leaves per plant (8.14), leaf area (180.46 cm^2) and plant spread (33.08 cm) was recorded. While plants grown in coconut husk and charcoal as growing media with foliar application of 12:61:40 NPK @ 0.2 per cent weekly produced significantly maximum flower stalk length (39.12 cm), spathe length (10.87 cm), spathe width (8.53 cm) and maximum number of flowers per plant (8.04). The same treatment had also resulted in advanced flowering (90.00 days).

Key words: *Anthurium andreanum*, coconut husk, charcoal, NPK, foliar spray.

INTRODUCTION

Anthurium (*Anthurium andreanum*) belongs to family Araceae, assumes significant position on account of its beauty. It is also known as tail flower and very popular among florists due to its spectacular bloom, elegance, variety of bright colours and long lasting vase life. Heart shaped colourful attractive spathe of this high valued flower attracts viewers. These special characters have created greater demand of it in domestic as well as international markets. Anthurium was introduced to India via England by coffee and tea planters who wanted showy exotic plants for their bungalows. Even now some of the old tea and coffee plantation in Assam, Darjeeling and Coorg have beautiful and exotic anthurium specimens.

It's cultivation has been catching up in India especially in the Western Ghats and the North-Eastern regions, Karnataka, Kerala, Tamil Nadu and Andhra Pradesh. Anthuriums grow well in warm humid with tropical and subtropical climate.

It is an epiphytic plant, therefore, growing medium play pivotal role alongwith nutrients application technique. Owing to a widespread use of media and nutrition, the quality of growing medium and nutrient management has a significant influence on growth and flowering of floricultural plants (Blanchard and Runkle, 4). Foliar applications of nutrients are easy and quick approach to provide nutrients. The quality and quantity of applied fertilizers are key factors affecting the growth, yield, and quality of the cut flowers of anthurium (Higaki *et al*., 6). Several studies have been conducted to evaluate the effect of media and nutrition on the growth of anthurium plants. However, the cultivation and management practices adopted are varying and yet to be standardized. The present work was thus, taken up with a view to standardize growing media and primary nutrients for anthurium plants for enhancing quality and yield of anthurium flowers..

MATERIALS AND METHODS

The present investigation was carried out for two consecutive years *viz.*, 2013-14 and 2014-15 at Greenhouse Complex, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari which comes under south Gujarat Heavy Rainfall Zone-I, AES-III. The experiment was laid out in split plot design, having five main plots of different growing media *viz.,* cocopeat (M_1), cocopeat + perlite + vermiculite (8:1:1) (M_2), coconut fiber (M_3), coconut husk (M_4) and coconut husk + charcoal (3:1) (M_5); five sub plots having different combinations of NPK *viz.,* 30:10:10 (F_1), 12:61:40 (F_2), 13:40:13 (F_3), 19:19:19 (F_4) and 16:8:24 (F_5) @ 0.2% weekly spray with 25 treatment combinations and replicated thrice. Six months old tissue cultured plants of anthurium var. 'Tropical' were obtained from a registered company of Bangalore and planted under fan and pad type

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greenhouse. The artificial plastic beds of 1.20 meter wide, 10 meter long and 30 cm height were used which were made up of plastic foil (0.1 cm thick) with a drainage holes for removing excess water at each side for plantation and 4-5 cm layer of small brick pieces were spreaded on bottom of the beds. Media was also filled in beds as per treatments up to top of the beds and one line of four plants between two plots was left as border. The bottom of the bed was sloped from the side to the middle of the bed (2-3 cm), so that the drain water flows to the drainage hose. Path width of 0.5 meter was maintained between two beds. Sixteen plants were accommodated in net plot area of 1.2 m × 1.0 m size for per treatment and five plants were randomly selected among of it for observations. Foliar application of primary nutrients by making of 30:10:10 (N:P:K) using 2.27g of urea, 0.87g of DAP and 0.8g of sulphate of potash diluted in one liter of RO water. Similarly, all other combinations were prepared and sprayed to the plants. Surfactant (*Chipko*) was also added as wetting agent before spray on plants. Other graded fertilizers (19:19:19, 13:40:13, 12:61:40 NPK) were purchased from market. Micro sprinklers of 32 lph were used for irrigation to the plants. The support to anthurium plants was provided by nylon wire passed throughout the length of bed with the help of iron rods at 1.20 m distance to both side of the bed. Uniform cultural practices were followed throughout the experiment. The data were recorded on vegetative growth parameters *viz.,* plant height, number of leaves, leaf area, plant spread and flowering parameters *viz.,* days taken to flower initiation, stalk length, spathe length, spathe width and yield of anthurium var. Tropical. Only pooled analysed data of two years are presented in Tables for growth, flowering and yield parameters which were analysed in split plot design as suggested by Panse and Sukhatme (10).

Table 1. Effect of media and nutrients on vegetative growth of anthurium (*Anthurium andreanum*) var. Tropical (pooled data over two years).

Treatments	Plant height (cm)	Number of leaves	Leaf area (cm^2)	Plant spread (cm)
M_1F_1	35.43	6.20	125.50	25.25
M_1F_2	26.91	3.94	98.75	18.33
M_1F_3	27.91	4.13	95.51	17.26
M_1F_4	31.93	4.35	113.75	23.30
M_1F_5	33.40	4.81	117.45	24.27
M_2F_1	36.70	7.19	127.83	25.96
M_2F_2	29.34	4.23	111.44	22.99
M_2F_3	29.98	3.76	111.94	21.90
M_2F_4	33.12	4.51	116.76	23.41
M_2F_5	35.22	5.36	118.94	23.99
M_3F_1	36.60	7.01	150.22	24.62
M_3F_2	32.23	5.47	92.87	22.78
M_3F_3	32.10	5.53	110.64	21.39
M_3F_4	35.55	6.11	112.66	22.03
M_3F_5	36.79	6.48	128.52	23.79
M_4F_1	41.31	7.59	144.43	27.05
M_4F_2	34.51	5.91	110.20	22.49
M_4F_3	33.80	5.63	117.36	23.37
M_4F_4	35.27	6.30	130.56	25.52
M_4F_5	37.07	6.62	138.01	26.44
M_5F_1	46.77	8.14	180.46	33.08
M_5F_2	34.53	5.71	95.13	25.35
M_5F_3	34.52	5.41	119.28	27.91
M_5F_4	36.20	6.10	132.13	28.45
M_5F_5	42.48	7.92	163.43	31.80
C.D. at 5%	2.17	0.56	20.24	2.88

RESULTS AND DISCUSSION

Combination of different growing media and nutrients exhibited wide variation for vegetative and flowering attributes of anthurium in pooled data of two years. It is explicit from the data (Table 1) that significantly maximum plant height (46.77 cm), number of leaves per plant (8.14), leaf area (180.46 cm^2) and plant spread (33.08 cm) was recorded in combination of coconut husk + charcoal as growing medium alongwith weekly once foliar application of 30:10:10 NPK @ 0.2 % (M_5F_1) on anthurium plants. This can be attributed to the fact that the coconut husk as growing medium improves aeration and maintain moisture level in root zone as desired by anthurium whereas charcoal helps in absorption of dissolvable salts and other impurities that could damage the root systems of the plant that allows free air movement, retains moisture and nutrients for growth of plants and delays senescence of the leaves present on the plant when used in combination with other growing media (Santiago and Santiago, 12). Moreover, increase in leaf area can be attributed to favorable physico-chemical properties like low bulk density, high porosity and lower pH value of coconut husk media that supported proper growth of plants. Coconut husk helps in proper drainage, whereas charcoal helps to improve the CEC and porosity of a substrate, which provided affable surroundings for root development that facilitate well establishment of plant growth (Jackson, 7). Application of nutrient

in foliar spray has been found beneficial to improve the growth and flower production in anthurium (Valsalakumari *et al*., 14). It has been observed that proper supply of nitrogen increased synthesis of proteins and consequence of which there is an increased meristematic activity leading to higher plant growth (Arney, 1; Salvi, 11; Valsalakumari *et al*., 14; Srinivasa and Reddy, 13). Higher concentration of nitrogen is more critical than phosphorus or potassium in promoting vegetative growth in *Phalaenopsis* by Wang (15). Application of appropriate nitrogen promoting growth due to enhanced synthesis and accumulation of proteins, amino acids and enzymes which is essential for formation of protoplasm thus affecting the cell division, cell elongation and ultimately better vegetative growth (Arora and John, 2).

It is revealed from the Table 2 that plants grown in coconut husk and charcoal as growing media with foliar application of 12:61:40 NPK @ 0.2 per cent once in a week produced significantly maximum flower stalk length (39.12 cm), spathe length (10.87 cm), spathe width (8.53 cm) and maximum number of flowers per plant (8.04). The same treatment had also resulted in advanced flowering (90.00 days). The increase in the size of inflorescence may be due to the cumulative effect of all growth parameters observed throughout the growing period. The increase in the growth parameters increased the flower quality parameters like flower stalk length, length of spathe, width of spathe, spadix length and diameter of spadix which were greatly influenced by growing media in anthurium (Valsalakumari *et al*., 14) which might be due to higher porosity, adequate nutrient availability and lower pH and EC in coconut + charcoal media (Jawaharlal *et al*., 8). A good number of leaves coupled with conducive root environment which would have led to proper nutrient uptake in the organic substrates may have resulted in greater accumulation of food matter leading to increase in length of stalk, length and width of spathe. Similar results were found in sand + coir pith media by Basheer and Thekkeyam (3) and in sand + coconut husk medium by Hatibarua *et al*. (5) and in FYM + coconut fiber by Kalirana and Dubey (9) in anthurium. Optimum levels of balanced NPK nutrition as it enhances better photosynthetic activity and production of carbohydrates, which helps in better partitioning of nutrients from source to sink (Srinivasa and Reddy, 13; Jawaharlal *et al*., 8 and Higaki *et al*., 6) in anthurium.

Good quality flower production usually depends upon various factors including the type of growing media used in anthurium. Plants grown in coconut husk + charcoal media along with spray of 12:61:40 NPK @ 0.2% was found with respect to all flowering attributes in present study. It might be due to that coconut husk + charcoal media provides good porosity and drainage which are necessary for root development that developed favorable microclimate in root zone of anthurium plant while 12:61:40 NPK has optimum P and K therefore, produces more flowers. Phosphorus is a main constituent of chlorophyll and is involved in many physiological processes including cell division, development of meristematic tissue, photosynthesis, metabolism of carbohydrates, fats and proteins for synthesis of nucleic acids and main role in stimulation of roots. Potassium which is necessary for nitrogen assimilation into protein and major osmotically active component in the plant cells contributing to cell turgor

Table 2. Effect of media and nutrients on floral growth and yield of anthurium var. Tropical (pooled data over two years).

Treatments	*Days to flower initiation	Stalk length (cm)	Spathe length (cm)	Spathe width (cm)	Number of flowers/ plant
M_1F_1	189.27	15.42	6.67	6.08	1.29
M_1F_2	166.00	20.19	7.80	6.81	2.78
M_1F_3	186.00	14.22	6.18	5.18	1.86
M_1F_4	182.13	18.93	5.92	4.89	2.44
M_1F_5	181.33	21.95	7.26	6.22	3.15
M_2F_1	168.07	21.39	7.62	6.24	2.24
M_2F_2	146.13	23.26	8.22	6.85	3.26
M_2F_3	172.67	20.41	6.94	5.63	2.15
M_2F_4	164.80	22.27	7.99	6.46	1.74
M_2F_5	150.67	24.00	8.08	6.73	3.10
M_3F_1	137.73	28.93	9.52	6.47	2.79
M_3F_2	125.20	35.82	10.46	7.34	5.06
M_3F_3	147.87	28.12	9.18	5.97	3.00
M_3F_4	136.33	31.19	6.92	6.69	4.02
M_3F_5	132.13	33.59	9.79	6.90	4.67
M_4F_1	110.00	32.68	8.20	6.49	4.52
M_4F_2	92.13	38.77	8.82	7.56	6.53
M_4F_3	120.67	35.19	7.86	6.60	5.55
M_4F_4	113.00	32.17	7.25	6.84	6.07
M_4F_5	104.47	34.33	8.53	7.33	6.33
M_5F_1	118.20	33.01	9.00	6.31	5.57
M_5F_2	90.00	39.12	10.87	8.53	8.04
M_5F_3	121.00	29.55	8.07	6.40	6.10
M_5F_4	104.00	36.53	9.17	7.32	7.07
M_5F_5	98.67	37.06	10.05	7.57	7.75
C.D. at 5%	NS	2.98	0.89	0.70	0.62

*Data were recorded in first year only

and enhances the capacity of plant cell to retain water and nutrients, in this function K^+ seems to be particularly important in young tissue. The tugor in the young leaves has direct effect on the cell size and growth rate of entire plant. Activating apical meristems beside the protoplasm formation, division and elongation of meristems cell, enhancing the biosynthesis of proteins and carbohydrates. These nutrients together led to early flowering and produce better quality flowers.

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