IMPACT OF HUMIC ACID ALONG WITH GROWING MEDIA COMBINATION WITH AZOSPIRILLUM AND FYM ON THE GROWTH, FLOWERING AND QUALITY OF *Anthurium andraeanum* PLANTS

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ABSTRACT

A research was carried out during 2015-2016 to study the impact of Humic Acid along with growing media combination with azospirillum and FYM on the growth, flowering and quality of anthurium plants (*Anthurium andreanum*) in Flora-tech floriculture unit at kottarakara, kollam Dist, kerala state, India. The treatments with three replications were carried out in completely randomized design. The plants selected for experiment were maintained under 75 per cent shade net during the experimental period. The variety of Anthurium (*Anthurium andreanum*) used in the experiment was 'Tropical'. Data analysis over the period of experiment revealed that the growth characters recorded highest plant height of 48.89 cm, plant spread of 74.76, 8.63 number of leaves, 89.21 g fresh weight were found in treatment T_2 (coco peat + azospirillum + Humic Acid) which is followed by T_7 (coco peat + FYM+ Humic Acid). Among the yield characters treatment T_2 (coco peat + azospirillum + Humic Acid) recorded, 9.83 flowers with highest stalk length of 41.34 cm and quality characters of flowers like spathe length, spathe breadth and spadix length of 9.53, 9.62 and 7.39 respectively. Hence considering the positive effects on growth, flowering, yield and quality, T_2 and T_7 can be considered for adopting in the field level for good economic yield with better quality and high net return.

Keywords: Azospirillum, FYM, HA, Coco peat.

INTRODUCTION

Anthurium (*Anthurium andreanum*) is one of the most important ornamental evergreen flower crops which are grown in many parts of the world for its showy cut flowers, long lasting flowers, attractive foliage and due to higher returns per unit area (Laws and Galinsky. 1996). The name anthurium is derived from Greek word 'anthos' means flower and 'oura' means tail referring to the spadix. Thus, anthurium is also known as 'tail flower' (Tajuddin and Prakash, 1996), 'flamingo flower' and 'laceleaf" (Govaerts and Frodin, 2002 and Nadruz *et al*., 2009). Anthuriums were very popular with flower arrangers because of bold effect and long

lasting qualities of flowers. The growth and development of plants can be modified by exogenous application of growth substances. The continuous and unbalanced use of conventional fertilizers leads to decreased nutrient uptake efficiency of plants resulting in decreased crop yield. Eco-friendly, cost-effective and organic-based inputs such as botanical pesticides, biofertilizers, disease and pest-resistant varieties in cultivation of horticultural crops will be safeguarding the soil health, environment and quality production.

Humic acid (HA) substance originate from chemical and biological degradation of plant and animal residues and from synthetic activities of microorganisms. Humic acid influences plant growth through modifying the physiology of plants and improving the physical, chemical and biological properties of soil (Stevenson, 1994). As a factor of improving physical properties of soil, it promotes good soil structure, there by improves tilth, aeration and moisture retention. Vaughan (1974) proposed that, humic acids may primarily increase root growth by increasing cell elongation or root cell membrane permeability, therefore increased water uptake by increased plant roots. It can produce root systems with branching and number of fine roots, as a result nutrients uptake is increased by root surface (Rauthan and Schnitzer, 1981). Although studies on effect of growing media and humic Acid has been done earlier, but information available about their effect on Anthurium is limited. Hence, the present investigation was conducted to evaluate the effect of growing media combinations along with nutrient spray of humic acid on growth, flowering and quality characteristics of Anthurium.

MATERIALS AND METHODS

The present study was carried out in Flora-tech floriculture unit at kottarakara, kollam Dist, kerala state, India during 2015- 2016. The treatments with three replications were carried out in completely randomized design. The plants selected for experiment were maintained under 75 per cent shade net during the experimental period. The variety of Anthurium (*Anthurium andreanum* L.) used in the experiment is 'Tropical'. Four months old tissue cultured uniform size plants were planted in 12 inch pots. The present study was conducted using different growing media combinations and humic acid has been applied as foliar spray in every 30 days during the treatment period by manual spraying on the leaves using hand sprayer. The treatment details were given in Table 1. Observations recorded on plant height, plant spread, number of flowers per plant, flower stalk length, spathe length, spathe breadth, spadix length, vase life, number of days taken for flower bud appearance and flower opening observed and recorded at 360 days after planting.

Table 1- **Treatment details**

T_1	Rice husk + Azospirillum + Humic Acid
T_2	Coco peat + Azospirillum + Humic Acid
T_3	Perlite + Azospirillum + Humic Acid
T_4	Vermiculite + Azospirillum + Humic Acid
T_5	Leaf mould + Azospirillum + Humic Acid
T_6	Rice husk + FYM+ Humic Acid
T_7	Coco peat + FYM+ Humic Acid
T_8	Perlite + FYM+ Humic Acid
T_9	Vermiculite + FYM+ Humic Acid
T_{10}	Leaf mould + FYM+ Humic Acid
T_{11}	Soil media + Humic Acid
T_{12}	Soil media

RESULTS AND DISCUSSION

GROWTH PARAMETERS

The experimental results were significantly influenced by the effect of growing media combination along with HA foliar spray in every 30 day intervals. Among the different treatments, coco peat + azospirillum + humic acid (T_2) significantly influenced overall growth performances of anthurium plants at 360 th day with maximum plant height (48.89 cm), plant spread (74.76), number of leaves (8.63), 4.35 number of suckers and fresh weight of plant (89.21 g) followed by coco peat + FYM+ Humic Acid (T_7) and the least was recorded in T_{12} soil media (Table 2). Evans *et al*., 1996 and Chaudhary and Das, 1996 noted that the application of composted coir pith increase the plants growth characters. *Anthurium andreanum* cultivars produced significantly higher yield in medium of coconut fibre compared to other medium and the growth parameters like plant height, leaf area, number of leaves, number of roots and suckers were the maximum in coco peat medium (Smitha, 1999 and Rajamani *et al*., 2000).

Azospirillum provided a more balanced nutrition for plants as well as optimum absorption of more nutrition by roots accelerated the physiological process and improved the general growth phenomenon. The increase in plant height was due to the presence of a readily available form of nitrogen (Sankari *et al.*, 2015). Bio-fertilizers increase the absorption of the macro and micro nutrients of plants.

Humic acid has beneficial effects on nutrient uptake by plants and was particularly important for transportation and availability of micronutrients (Bohme and Thilua, 1997). In *Jasminum sambac*, Sundar *et al.* (2010) indicated that foliar spray of humic acid (0.4 %) recorded the highest plant height and plant spread. This might be due to the role of humic acid in increasing soil fertility and availability of nutrient elements as reported by David *et al*., (1994).

YIELD PARAMETERS

The number of flowers per plant is the major yield contributing factor in anthurium and was significantly influenced by the treatments. The treatment T_2 (coco peat + Azospirillum + Humic Acid) resulted in highest number of flower *i.e.* 9.83 (Table 2). The highest spathe length, spathe breadth and spadix length were noticed as 9.53, 9.62 and 7.39 respectively in T_2 and the second highest spathe length, spathe breadth and spadix length were noticed for T_7 (Table 2). This may be also due to effect of HA application, growing media and Azospirillum. Similar results were reported by Jawaharlal and Padmadevi (2004) in Anthurium. Paramveer Singh *et al*., (2009) confirmed that the combination of growing media significantly influences the flowering pattern and flower production in anthurium cv. 'Flame'. The application of decomposed coir compost significantly increased the leaf length, number of suckers, number of spikes, spathe length, stalk length and longevity of anthurium cv. Verdum Red (Nagalakshmi *et al*., 2010).

Azospirillum which might have stimulated the rate of multiplication of lateral roots and root surface area so as to absorb more nutrients from media for flower production. Application of humic acid @ 10 kg/ha enhanced the yield in rose and hibiscus and the yield was increased upto 14.05 per cent (Khungar and

Manoharan, 2000). The highest value of flowering parameters such as number of flowers per plant, flower diameter, pedicel length, fresh weight and dry weight were recorded in 2% humic acid treatments (Azza *et al*., 2012).

The most important quality parameter like flower stalk length was greatly influenced by the application of coco peat + Azospirillum + Humic Acid. The highest stalk length was recorded 41.43 cm. Days taken for flower bud appearance (Fig. 1) and days taken for flower opening (Fig 2) was early in T_2 (coco peat + Azospirillum + Humic Acid) followed by T_7 (coco peat + FYM+ Humic Acid). This may be due to application of biofertilizer better nutrient uptake, photosynthesis, source-sink relationship along with excellent physiological and biochemical activities prevail in the root zone. Humic acid has beneficial effects on nutrient uptake by plants and was particularly important for transportation and availability of micronutrients and thus increase the quality of flowers (Bohme and Thilua, 1997). Khalaj *et al.*, (2011) confirmed that the selection of appropriate growth medium for cut flower was very important for yield and quality. The application of decomposed coir compost significantly increases stalk length and longevity of anthurium cv. Verdum Red (Nagalakshmi *et al*., 2010).

The vase life of the flowers depends on genetic makeup and water quality treatments, maximum vase life of 17.67 days (Table 2) was recorded in T_2 (coco peat + Azospirillum + Humic Acid) followed by T_7 (coco peat + FYM+ Humic Acid) the major factor contributing to deterioration is vascular blockage (Chandrashekaraiah, 1973). The delay in senescence may be due to presence of ethylene inhibitors in plant which delay senescence of florets. These results are in corroboration with the findings of Barreto *et al.*, (2002) in gerbera. It might also be due to overall food and nutrient status of flowers under the treatments.

CONCLUSION

The results of the present investigation revealed that treatment T_2 (coco peat + Azospirillum + Humic Acid) and T_7 (coco peat + FYM+ Humic Acid) were found to be the most efficient treatments in terms of both growth and flowering. Hence, these two treatments may be adopted by the growers for commercial cultivation of Anthurium.

Figure 1: Influence of growing media and humic acid on number of days taken for flower bud appearance

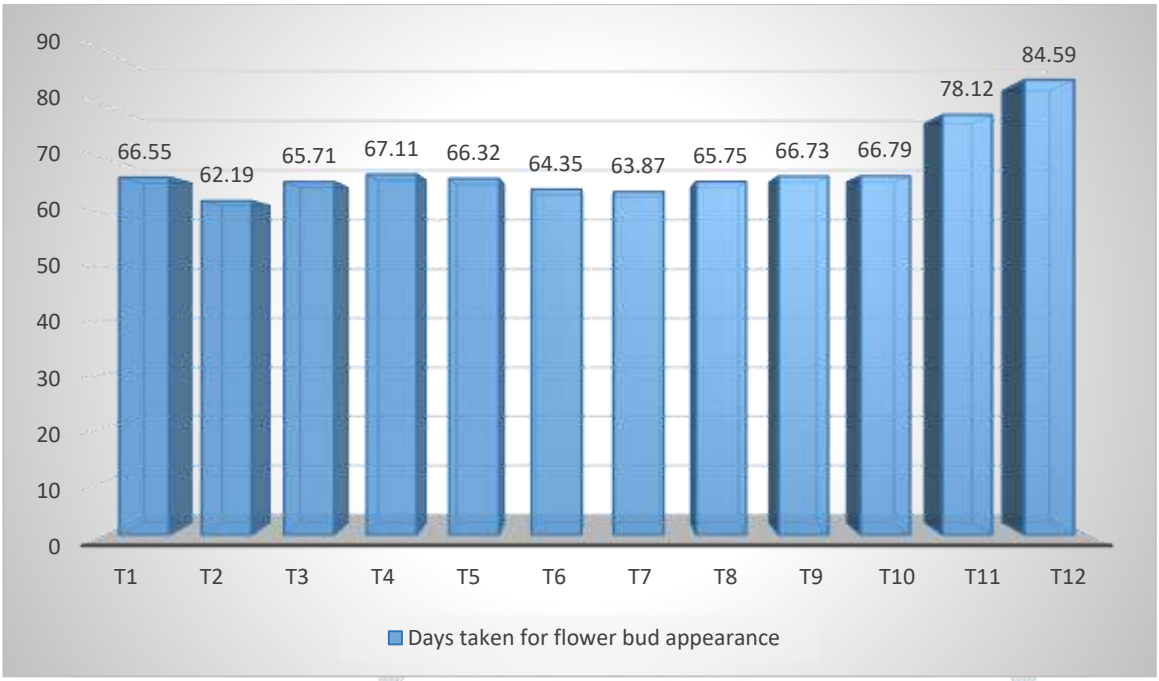
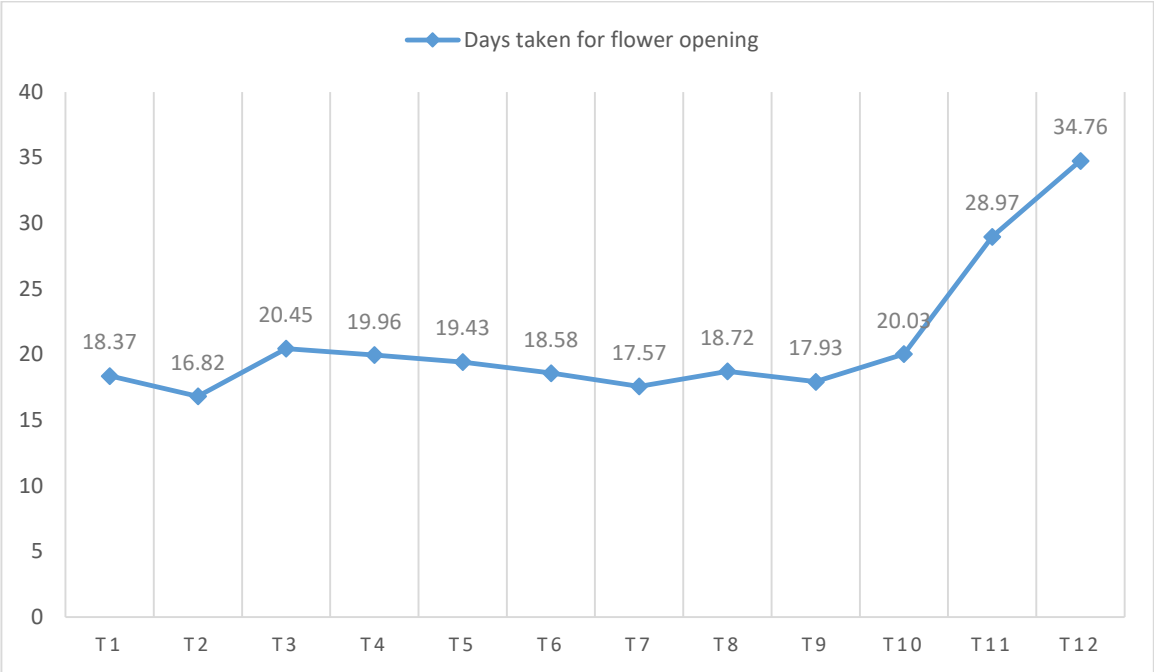


Table 2: Influence of growing media and humic acid on *anthurium andreanum* plants at 360 DAP

Treatments	Plant height (cm)	Plant spread (cm)	Number of leaves	Number of suckers	Fresh weight of plant (g)	Flower longevity on the plant (days)	Number of flowers/ plant	Flower stalk length (cm)	Spathe length (cm)	Spathe breadth (cm)	Spadix length (cm)	Vaselife (days)
T_1	44.56	69.43	7.18	3.75	85.15	36.23	8.52	38.64	8.45	8.48	6.89	15.85
T_2	48.89	74.76	8.63	4.35	89.21	45.19	9.83	41.34	9.53	9.62	7.39	17.67
T_3	45.67	72.11	7.90	3.55	84.12	42.98	8.32	39.32	8.34	8.47	6.32	15.26
T_4	46.48	68.91	7.17	3.38	86.36	38.92	8.49	35.23	8.78	8.71	6.98	14.71
T_5	43.54	69.12	7.81	3.19	85.23	37.81	8.96	37.87	7.98	8.18	7.13	16.18
T_6	47.23	69.38	8.27	3.79	86.61	36.91	8.78	38.21	8.43	8.41	6.99	16.01
T_7	48.18	73.12	8.54	3.99	88.67	44.12	9.23	40.12	9.02	9.18	7.14	17.22
T_8	47.45	72.98	7.43	3.58	84.32	38.65	8.29	39.34	8.58	8.63	6.54	16.28
T_9	46.13	71.83	7.46	2.64	84.19	36.98	7.93	37.18	7.56	7.71	6.32	15.54
T_{10}	47.02	72.46	7.91	3.24	85.15	39.23	7.69	35.89	8.64	8.69	6.95	16.35
T_{11}	36.15	56.14	5.18	2.04	71.67	29.45	3.41	31.52	6.06	6.15	4.04	11.34
T_{12}	33.57	51.93	4.09	1.23	63.92	24.97	2.96	27.49	4.62	4.15	3.11	9.14
SE (d)	0.65	0.76	0.12	0.09	1.21	0.70	0.16	0.52	0.09	0.11	0.09	0.27
CD (p=0.05)	1.33	1.55	0.25	0.18	2.47	1.43	0.32	1.06	0.18	0.22	0.18	0.54

Figure 2: Influence of growing media and humic acid on number of days taken for flower opening



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