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PERFORMANCE OF ANTHURIUM PLANTS TO FOLIAR APPLICATION OF ORGANIC NUTRIENTS IN COMBINATION WITH GIBBERELLIC ACID

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Abstract

The Present research work was designed to study the response of Anthurium plants on different organic nutrients such as Sea Weed Extract, Vermiwash, compost, bone meal, well decomposed Farm Yard Manure, Panchakavya, and humic acid in combination with gibberellic acid 200 ppm on the growth, yield and quality of flowers. The selected nutrients and gibberellic acid were applied as foliar spray in every 30 days during the treatment period by manual spraying on the leaves using hand sprayer. The plants selected for experiment were maintained under 75 per cent shade net and coco peat was used as growing medium. Among the treatments (T_7) Humic acid + GA 200 ppm recorded maximum results followed by (T_1) SWE + GA 200 ppm in vegetative growth and yield characters on *Anthurium andreanum* plants. Days taken for flower bud appearance was earlier and flowers remain fresh for more number of days in the treatment applied with humic acid in combination with gibberellic acid 200 ppm.

Key words: Anthurium, humic acid, gibberellic acid, yield, organic nutrients

Introduction

Anthurium is a genus of herbs often growing as epiphytes, some are terrestrial. Anthuriums are tropical plants grown for their showy cut flowers and attractive foliage. It has gained the importance as major cut flower and it makes best use of ready market for cut flowers with high returns both for its cut flower and whole plant. Anthurium is a slow growing perennial that requires shady, humid conditions as found in tropical forests. Plant nutrition is the chemical elements and compounds necessary for plant growth, plant metabolism and their external supply. Emanuel Epstein (1972) defined two criteria for an element to be essential for plant growth, in its absence the plant is unable to complete a normal life cycle and that the element is part of some essential plant constituent or metabolite. The productivity and quality of flowers are closely related to nutrient supplement. Nitrogen, phosphorus and potassium are the three important nutrients that play very important role in altering growth, yield and quality attributes (Abdussamed, 1999). Plants require nutrients for their growth and development. These nutrients may be applied to the soil or they may be applied to the foliage of the plants. When applied to the foliage, they are known as foliar sprays (Wade, 1980). Nutrients applied to the foliage are generally absorbed more rapidly than when applied to the soil. Foliar feeding is a technique of feeding plants by applying liquid fertilizer directly to their leaves (George Kuepper, 2003). Plants are able to absorb essential elements through their stomata and also their epidermis.

The productivity and quality of flowers are closely related to nutrient supplement. In anthurium, nutritional status affects yield and quality (Sakai, 2004 and Dufour and Gue'rin, 2005). Nitrogen, phosphorus and potassium

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are the three important nutrients that play very important role in altering growth, yield and quality attributes along with micro nutrients. Gibberellins (GA) are plant hormones that regulate growth and influence various developmental process. The major areas where GA have successfully played their role in commercial flowers are growth control, prevention of bud dormancy, promotes flowering, prolonging the vase life of the flower and retarding the senescence (Vettakkorumakankav, 1999 and Sanap, 2000). Since plants are composed of single cells stacked on top of one another, this elongation of thousands of individual cells results in the overall growth of the plant (Hedden, 2012). Although studies on effect of nutrients and growth regulators 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 organic nutrients in combination with nutrient spray of gibbereillic acid on growth, flowering and quality characteristics of Anthurium plants.

Materials and Methods

The present study was carried out in Flora-tech floriculture unit at kottarakara, kollam Dist, kerala state, India during 2015-2017. The treatments with three replications were carried out in completely randomized design. The plants selected for experiment were maintained under 75 percent shade net and coco peat was used as growing medium. 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. There are 9 different treatment used for the experiment. Foliar application of nutrients and gibberellic acid at every 30 days during the treatment period by manual spraying on the leaves using hand sprayer. Plant height, plant spread, number of flowers per plant, flower stalk length, spathe length, spathe breadth and other growth and yield characters were observed and recorded at 360 and 480 days.

Treatment Details	
T_1	SWE + GA 200 ppm
T_2	Vermiwash + GA 200 ppm
T_3	Compost + GA 200 ppm
T_4	Bone meal + GA 200 ppm
T_5	FYM + GA 200 ppm
T_6	Panchakavya + GA 200 ppm
T_7	Humic acid + GA 200 ppm
T_8	Vermicompost + GA 200 ppm
T_9	GA 200 ppm

Results and Discussion

Growth Characters

From the experimental results of the different treatments, the vegetative characters like plant height, plant spread, number of leaves, number of suckers were recorded maximum result in the treatment applied with foliar application of Humic acid in combination with GA 200 ppm (Table 1 & 2) followed by SWE + GA 200 ppm may be due to the effect of gibberellin which stimulates the expression of enzymes and also stimulates microtubule rearrangements associated with cell expansion and humic acid influences plant growth through modifying the physiology of plants and improving the physical, chemical and biological properties of soil . Srinivasa (2006) and Srinivasa *et al*., (2008) recorded that anthurium plants treated with GA_3 at 200 ppm produced significantly the maximum plant height, leaf length, number of lateral shoots per plant and induced early flowering. Among the various growth regulators tested, GA_3 was found to reduce the time taken for flowering in *Anthurium andreanum* var. Temptation under 75 % shade net house conditions.

Table 1: Performance of anthurium to foliar application of nutrients and gibberellic acid at 360 DAP.

Treatments	Plant height (cm)	Plant spread (cm)	number of leaves	number of suckers	Fresh weight of plant (g/plant)	Number of flowers /plant	Flower stalk length (cm)	Spathe length (cm)	Spathe breadth (cm)	Spadix length (cm)
T_1 - SWE + GA 200 ppm	46.72	63.91	8.27	4.03	72.21	4.22	36.19	8.81	8.68	5.89
T_2 - Vermiwash + GA 200 ppm	35.05	55.23	6.35	2.62	59.12	3.56	34.96	8.09	8.12	5.09
T_3 - Compost + GA 200 ppm	40.29	61.61	7.56	3.38	71.28	4.11	35.14	8.34	8.47	5.12
T_4 - Bone meal + GA 200 ppm	42.64	63.18	7.18	3.47	71.81	4.16	35.41	8.48	8.61	5.38
T_5 - FYM + GA 200 ppm	46.35	63.09	8.07	3.88	72.23	4.07	36.12	8.57	8.38	5.23
T_6 - Panchakavya + GA 200 ppm	41.90	62.51	7.85	3.57	69.45	3.01	31.23	7.43	7.41	4.99
T_7 - Humic acid + GA 200 ppm	47.12	65.31	8.75	4.29	72.97	4.79	36.56	9.32	9.23	6.49
T_8 - Vermicompost + GA 200 ppm	37.83	57.28	6.38	3.12	60.24	3.98	33.92	7.98	8.03	5.54
T_9 - control	26.83	43.84	3.91	1.32	45.32	1.75	22.71	4.91	4.98	2.76
SE (d)	0.56	0.59	0.10	0.07	0.78	0.08	0.49	0.08	0.10	0.09
CD (p=0.05)	1.14	1.21	0.20	0.14	1.56	0.15	1.01	0.16	0.20	0.18

Sharma *et al*., (2004) envisaged that GA_3 at 100 ppm found most effective for enhancing vegetative growth. Porwal *et al*., (2002) found the influence of plant growth regulators on Damask Rose and GA_3 at 200 ppm recorded the maximum plant height, number of shoots per plant and plant spread.

Humic acid has beneficial effects on nutrient uptake by plants and was particularly important for transportation and availability of micronutrients (Bohme and Thilua, 1997). Humic acid is reported to increase the permeability of plant membrane resulting in higher metabolic activity. In gerbera, Nikbakht *et al*., (2008) reported that application of 500 mg/l humic acid increased the number of harvested flowers per plant besides extending the vase life of harvested flower. The macro and micronutrients content of leaves like nitrogen, phosphorus, potassium, calcium, magnesium, iron and zinc were significantly enhanced by humic acid. Application of humic acid significantly promoted the plant growth, root development and the earlier flowering in Oriental lily. Application of humic acid 30 mmol/L recorded the maximum mean diameter of corms, total number of corms, and total fresh mass of corms in gladiolus (Altoe Baldotto *et al*., 2013). These results strongly suggest positive improvement of soil physical and hydraulic properties by the addition of humic acid amendment.

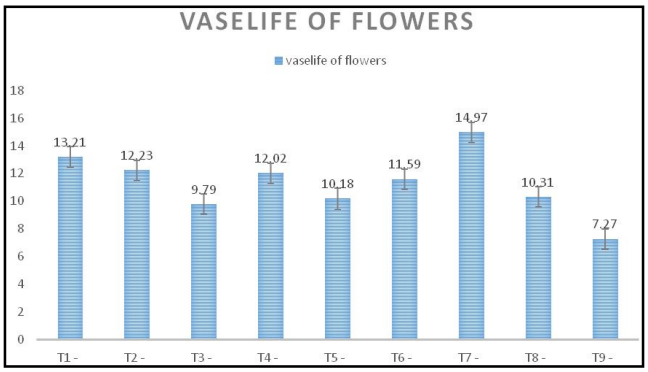

Fig. 1: Vase life of anthurium flowers to foliar application of nutrients and gibberellic acid treatments.

Yield Characters

The experimental results were significantly influenced and among the different treatments, the treatment applied with foliar application of humic acid in combination with GA 200 ppm gives the best yield characters like number of flowers per plant, flower stalk length, spathe length and spadix length (Table 1 & 2) followed by SWE + GA 200 ppm. Vase life of the flowers was also prolonged in this treatment Fig. 1. The increased result in this treatment is due to the action of plants hormones at very specific times during plant growth and at specific locations. Plant hormones regulate cellular processes in targeted cells locally and moved to other locations, in other functional part of the plant and also determine the formation of flowers, stems, leaves, the shedding of leaves and the development of flowers. Humic acid helps in increasing cell membrane permeability, oxygen uptake, respiration, photosynthesis, phosphate uptake and root cell elongation of plant growth. Application of humic acid @ 10 kg/ha enhanced the yield in rose, hibiscus, marigold and the yield was increased upto 14.05 percent (Khungar and Manoharan, 2000). Humic acid solution of 2 percent was the most effective treatment which had the highest values of plant height, stem diameter, root length and number of branches per plant and also found that foliar application of humic acid at 2 percent significantly increased the flowering parameters. 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).

Table 2: Performance of anthurium to foliar application of nutrients and gibberellic acid at 480 DAP.

Treatments	Plant height (cm)	Plant spread (cm)	number of leaves	number of suckers	Fresh weight of plant (g/plant)	Number of flowers /plant	Flower stalk length (cm)	Spathe length (cm)	Spathe breadth (cm)	Spadix length (cm)
T_1 - SWE + GA 200 ppm	56.89	75.69	8.14	5.15	82.01	8.01	47.23	11.28	11.31	8.29
T_2 - Vermiwash + GA 200 ppm	51.71	72.18	7.91	4.93	81.89	7.23	46.98	10.18	10.23	7.56
T_3 - Compost + GA 200 ppm	53.29	73.20	7.56	5.14	82.67	7.79	46.32	11.03	11.21	8.24
T_4 - Bone meal + GA 200 ppm	55.98	75.11	8.34	4.90	83.27	7.98	50.21	10.58	11.03	8.11
T_5 - FYM + GA 200 ppm	49.89	72.69	7.14	5.15	82.01	7.01	47.13	9.28	9.31	7.49
T_6 - Panchakavya + GA 200 ppm	53.01	74.23	6.91	5.40	80.17	6.59	45.14	9.32	9.45	7.04
T_7 - Humic acid + GA 200 ppm	57.83	77.02	8.91	5.61	84.12	8.18	51.49	12.14	12.34	8.48
T_8 - Vermicompost + GA 200 ppm	55.19	75.87	8.01	5.10	82.19	7.31	48.12	10.27	10.99	7.87
T_9 - control	38.13	57.15	5.19	2.29	63.67	4.27	36.12	6.21	6.37	4.03
SE (d)	0.65	0.76	0.12	0.09	0.82	0.12	0.52	0.14	0.16	0.10
CD (p=0.05)	1.33	1.55	0.25	0.18	1.65	0.23	1.06	0.27	0.23	0.20

Gibberellic acid (GA) induces flowering of plants of various genera of the Araceae family. Therefore, it was evaluated the effect of GA on the yield of *Anthurium andraeanum*. The foliar spray of 500 ppm GA for anthurium showed significantly the highest number of flowers per plant, stalk length, spathe size and increased shoot length, number of branches and the size of flowers (Dhaduk *et al*., 2007), similar findings were done by Aytoun and Hay, (1958). According to Anand and Jawaharlal (2004), flowering behaviour of anthurium plants has been modified by the foliar application of growth regulators. The increase in flower number has been reported even at 10 ppm GA. Flowering behaviour of Anthurium plants has been drastically modified by the foliar spray of growth regulators. Among the various growth regulators tested GA was found to reduce the time taken for flowering in *Anthurium andreanum* var. Temptation under 75% shade net house conditions (Anand and Jawaharlal 2004). Henny *et al.,* 1999 reported that a single foliar spray of GA 250ppm to 2000 ppm helped the *Syngonium podophyllum* variety White butterfly belonging to Araceae family to flower within 86 days.

Conclusion

Considering the above results of the present investigation, it can be concluded that the treatments given with foliar spray of humic acid + gibberellic acid @ 200 ppm (T_1) at an interval of 30 days shown the best results, followed by SWE + gibberellic acid @ 200 ppm (T_7), least results was recorded in control. From the experiment both the treatments T_1 and T_7 can be recommended for the production of anthurium plants with better growth, yield and quality.

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