GROWTH AND FLOWERING ON ANTHURIUM (*Anthurium andreanum*) PLANTS TREATED WITH FOLIAR APPLICATION OF GROWTH REGULATORS cv. Tropical.

Ajish Muraleedharan[1]*, S. Ramesh kumar[1], S. Kousika[1] and J. L. Joshi[2]

[1]Department of Horticulture, [2] Department of Genetics and plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai nagar, Tamil nadu, India - 608002.

*Author for correspondence- ajishm1000@gmail.com.

ABSTRACT

As a cut flower, anthurium is one of the main tropical species due to its beauty and increased postharvest life. Anthurium is the largest and diverse genus of the Araceae family. Present experiment was carried out in completely randomized design with three replications to study the response of growth regulators on the growth, yield and quality of flowers in anthurium plants. The present experiment was conducted with eleven different treatments by using three growth regulators *i.e.* Benzyladenine, Gibberellic acid, and Cycocel in four different concentrations 50, 100, 150 and 200 ppm and one control without using growth regulator. From the present investigation, foliar application of (T_8) Gibberellic acid 200 ppm gives maximum results in growth, flowering and quality characters on *Anthurium andraeanum* plants followed by cycocel 200 ppm. Days taken for flower bud appearance was earlier and flowers remain fresh for more number of days in Gibberellic acid 200 ppm.

Keywords: growth regulator, anthurium, growth, flowering.

INTRODUCTION

Anthuriums are tropical plants grown for their showy cut flowers and attractive foliage (Laws and Galinsky, 1996). They were very popular with flower arrangers because of bold effect and long lasting qualities of flowers (Higaki, *et al*., 1994). Anthurium is a slow growing perennial that requires shady, humid conditions as found in tropical forests (Prasad e*t al*., 1997). Growth regulators are the chemical substance which alters the growth and development in plants and regulate the physiological process in an appreciable manner when used in small concentrations. The application of growth regulators show difference in the production, developmental process, yield and quality of flowers (Swapna, 2000 and Havale *et al*., 2008).

Plant growth regulators are not nutrients, but chemical substances that are used in small amount to promote and influence the growth, development and differentiation of cells and tissues

(Opik Helgi, *et al*., 2005). Plant growth regulators function as chemical messengers for intercellular communication. Plant hormones are signal molecules produced within the plant, and occur in extremely low concentrations (Opik Helgi, *et al.*, 2005). They affect tissues which grow upward and which grow downward, leaf formation, stem growth, fruit development and ripening, plant longevity and even plant death (Lindsey, *et al*., 2002). Not all plant cells respond to hormones, but those cells that are programmed to respond at specific points in their growth cycle. Plants need this hormones at very specific times during plant growth and at specific locations. Although studies on the effect of growth regulators in anthurium plants has been done earlier, but information available about their effect on anthurium growth and development is limited. Hence, the present investigation was conducted to evaluate the effect of growth regulators *i.e.* Benzyladenine, Gibberellic acid, and cycocel on growth, flowering and postharvest characteristics of *Anthurium andreanum* plants.

MATERIALS AND METHODS

The present study was carried out in Flora-tech floriculture unit at Kottarakara, Kollam Dist, Kerala state, India during 2012 - 2016. The treatments with three replications were carried out in completely randomized design. The plants used for the present experiment were maintained with 75 per cent shade net and a growing medium mixture of rise husk + cocopeat + FYM. The variety of Anthurium (*Anthurium andreanum*) used in the experiment is 'Tropical'. Four months old tissue cultured uniform size plants were planted in 12 inch pots. The present experiment was conducted with thirteen different treatments by using three growth regulators *i.e.* Benzyladenine, Gibberellic acid, and Cycocel acid in four different concentrations 50, 100, 150 and 200 ppm and one control without using growth regulator. Growth regulators were applied as foliar spray using knapsack sprayer as per treatment schedule at monthly intervals. Observations were recorded on Plant height, plant spread, number of flowers per plant, flower stalk length, spathe length, spathe breadth and other characters like vase life, flower longevity and days taken for flower bud appearance were also recorded at 240 and 360 days after planting.

RESULTS AND DISCUSSION

The results of the experiment revealed that the treatments significantly influenced the growth characters of *anthurium andreanum* plants. The treatment applied with Gibberellic acid 200 ppm (T_8) recorded the highest value in the growth characters like plant height and plant spread, this was followed by cycocel 200 ppm at 240 and 360 days after planting (Table 1 & 2). The maximum growth attributes in this study might be due to the interaction effect of suitable shade, appropriate growing media along with application of growth regulator on the various stages of plant growth.

The increased results by gibberellic acid spray @ 200 ppm may be due to its cells begin a process of elongation. 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 have been reported by Hedden and Thomas, 2012. Konl and kofranek (1957) reported that application of GA resulted into maximum plant height, plant spread and number of leaves per plant of flower crops. Similar findings were done by Aytoun and Hay (1958). Gibberellins are extremely significant for growth characters in the greenhouse and florist industry throughout the world (Srinivasa, 2006).

Among the treatments, foliar application of gibberellic acid @ 200 ppm resulted effectively on the yield characteristics like number of flowers per plant, flower stalk length, spathe length and spathe breadth, this was followed by cycocel @ 200 ppm at 240 & 360 days after planting (Table 1& 2). The best flowering attributes of anthurium might be due to appropriate combination of shade, growing media composed of rice husk + cocopeat + FYM and growth regulator performance. The treatments are significantly influenced by the application of growth regulators on flowering characters in anthurium plants. According to Anand and Jawaharlal (2004) flowering behaviour of Anthurium plants has been drastically modified by the foliar spray of growth regulators. Among the various growth regulators tested gibberellic acid was found to reduce the time taken for flowering in *Anthurium andreanum* var. Temptation under 75 % shade net house conditions (Von Henting, 1960). Henny and Hamilton (1992) reported that *Anthurium scherzeranum* 'Renate' produced significantly more number of flowers per plot at gibberellic acid spray compared to lower concentrations. Application of foliar spray of 0 - 1000 ppm gibberellic acid to s*pathiphyllum* cv. Similar results were recorded by Syamal *et al*. (1990) and Rana *et al*. (2005), Shibata and Endo, (1990).

Foliar application of gibberellic acid @ 200 recorded the best results in early flowering characters like minimum number of days for flower bud appearance and number of days taken for flower opening (Fig.1). The early flowering in anthurium might be due to the appropriate combination of growth conditions along with the flowering hormone gibberellic acid. *Anthurium andreanum* cv. Temptation plants grown under 75 % shade and sprayed with gibberellic acid 100 ppm took the minimum number of days to emerge first flower Jawaharlal *et al.* (2001). Henny *et al.*, (1999) reported that a single foliar spray of GA 250 ppm to 2000 ppm helped the *Syngonium podophyllum* variety 'White butterfly' belonging to araceae family to flower early. Data and Ramdas (1997) confirmed that chrysanthemum showed significant difference to the growth regulators and among the different growth regulators and gibberellic acid was found to be most effective.

Among the treatments, appropriate shade and ideal growing media along with proper growth regulation of gibberellic acid @ 200 ppm was found to be effective in prolonging the vase life in anthurium cv. Tropical (Fig. 3). Dhaduk *et al*. (2007) reported the application of gibberellic acid can increase the postharvest life. Sharma *et al*. (2006) revealed that gibberellic acid @ 200 ppm in gladiolus variety Red beauty showed the highest vase life. Julita, (2015) concluded that gibberellic acid prolonged the vase life of lily hybrid 'Richmond'.

Based on the performance of *Anthurium andreanum* cv. Tropical during the experiment, it can be concluded that the foliar application of gibberellic acid @ 200 ppm (T_8) along with 75 % shade and growing medium combination of rise husk + cocopeat + FYM are significantly influencing the growth, flowering, yield and vase life followed by cycocel 200 PPM (T_{13}).

Table.1 Growth regulator effects Anthurium plants on the development and yield at 240 days

Treatments	Plant height	Plant spread	Number of flowers per plant	Flower stalk length	Spathe length	Spathe breadth
T_1 – Benzyladenine 50 ppm	17.22	22.39	1.81	17.81	3.18	3.28
T_2 – Benzyladenine 100 ppm	17.29	22.44	1.59	17.79	3.82	3.91
T_3 - Benzyladenine 150 ppm	16.47	23.51	2.13	18.35	4.02	3.98
T_4 - Benzyladenine 200 ppm	17.21	22.19	1.56	19.58	3.67	3.61
T_5 - Gibberellic acid 50 ppm	18.62	23.67	1.74	19.47	3.23	3.31
T_6 - Gibberellic acid 100 ppm	16.32	23.31	2.16	18.68	3.46	3.58
T_7 - Gibberellic acid 150 ppm	17.28	23.28	2.13	19.23	4.13	4.15
T_8 - Gibberellic acid 200 ppm	19.23	24.62	2.94	20.24	4.34	4.52
T_9 - cycocel 50 ppm	16.23	23.45	2.03	18.33	3.81	3.79
T_{10} - cycocel 100 ppm	15.47	22.87	1.47	17.48	4.01	4.11
T_{11} - cycocel 150 ppm	16.37	23.46	1.92	19.59	3.67	3.62
T_{12} - cycocel 200 ppm	19.02	23.66	2.43	19.27	4.19	4.21
T_{13} - Control (No growth regulator).	9.17	13.78	1.11	13.39	1.98	2.04
SE (d)	0.68	1.13	0.12	1.15	0.16	0.18
CD (p=0.05)	1.27	2.28	0.21	2.21	0.24	0.24

Table.2 Growth regulator effects Anthurium plants on the development and yield at 360 days

Treatments	Plant height	Plant spread	Number of flowers per plant	Flower stalk length	Spathe length	Spathe breadth
T_1 – Benzyladenine 50 ppm	26.87	49.25	2.16	22.97	6.32	6.41
T_2 – Benzyladenine 100 ppm	27.79	50.58	2.71	21.53	6.58	6.66
T_3 - Benzyladenine 150 ppm	28.86	49.23	2.82	22.53	6.38	6.43
T_4 - Benzyladenine 200 ppm	28.21	50.37	2.38	22.91	7.03	6.98
T_5 - Gibberellic acid 50 ppm	27.93	50.68	3.12	23.86	6.43	6.55
T_6 - Gibberellic acid 100 ppm	27.82	52.12	2.91	24.91	6.92	7.01
T_7 - Gibberellic acid 150 ppm	29.02	51.58	3.03	23.64	7.11	7.15
T_8 - Gibberellic acid 200 ppm	29.21	52.67	3.26	25.28	7.38	7.42
T_9 - cycocel 50 ppm	28.59	50.32	2.71	21.34	6.44	6.51
T_{10} - cycocel 100 ppm	27.38	49.86	2.39	22.55	7.01	7.12
T_{11} - cycocel 150 ppm	27.19	50.65	3.04	21.98	6.38	6.46
T_{12} - cycocel 200 ppm	28.97	52.12	3.03	23.81	6.95	7.02
T_{13} - Control (No growth regulator).	15.92	25.29	1.24	14.67	2.49	2.53
SE (d)	1.14	1.35	0.13	1.16	0.14	0.13
CD (p=0.05)	2.29	2.71	0.25	2.24	0.29	0.27

Fig. 1. Growth regulator effects Anthurium plants on the number of days taken for flower bud appearance

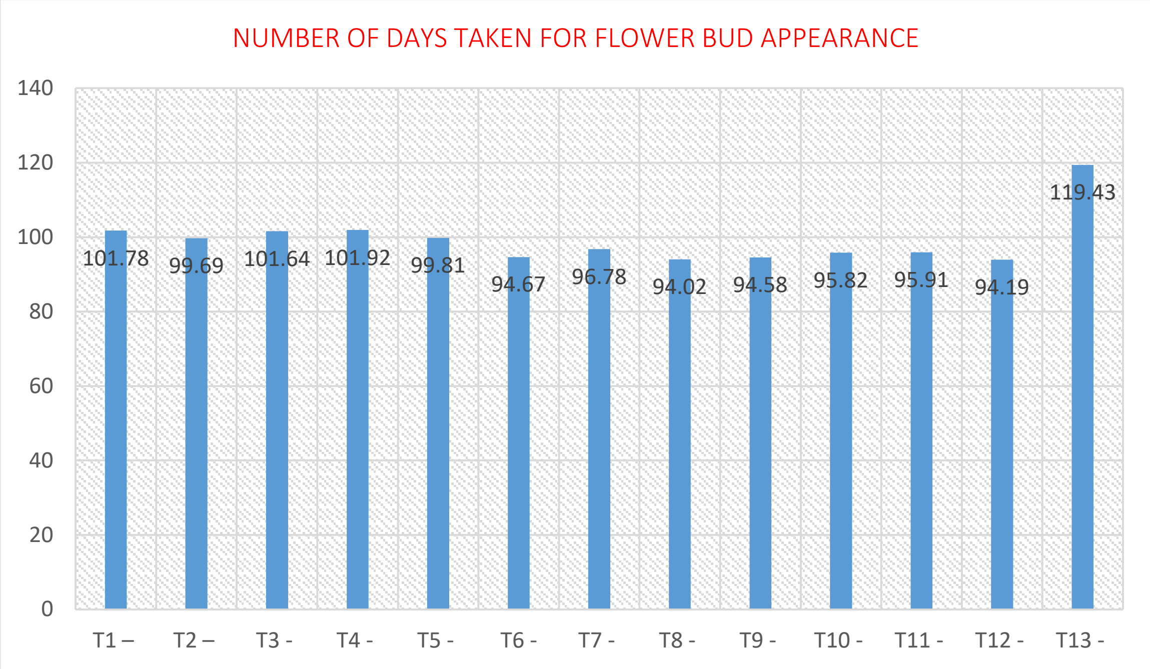


Fig. 2 Growth regulator effects Anthurium plants on the Flower longevity on plants at 240 and 360 days

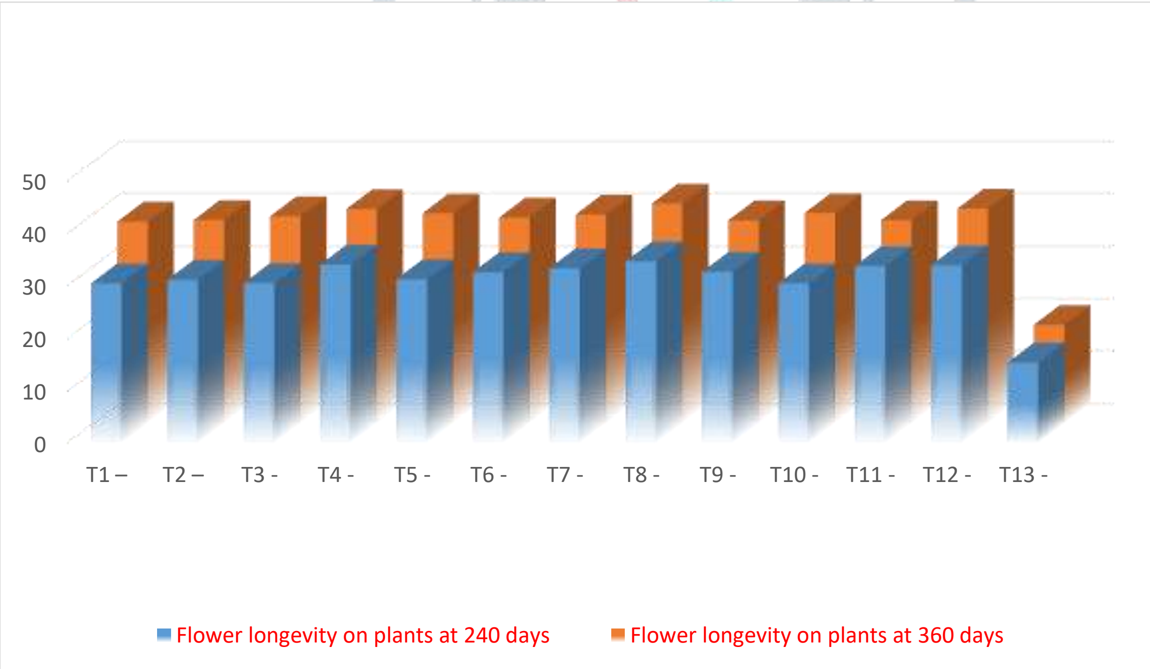
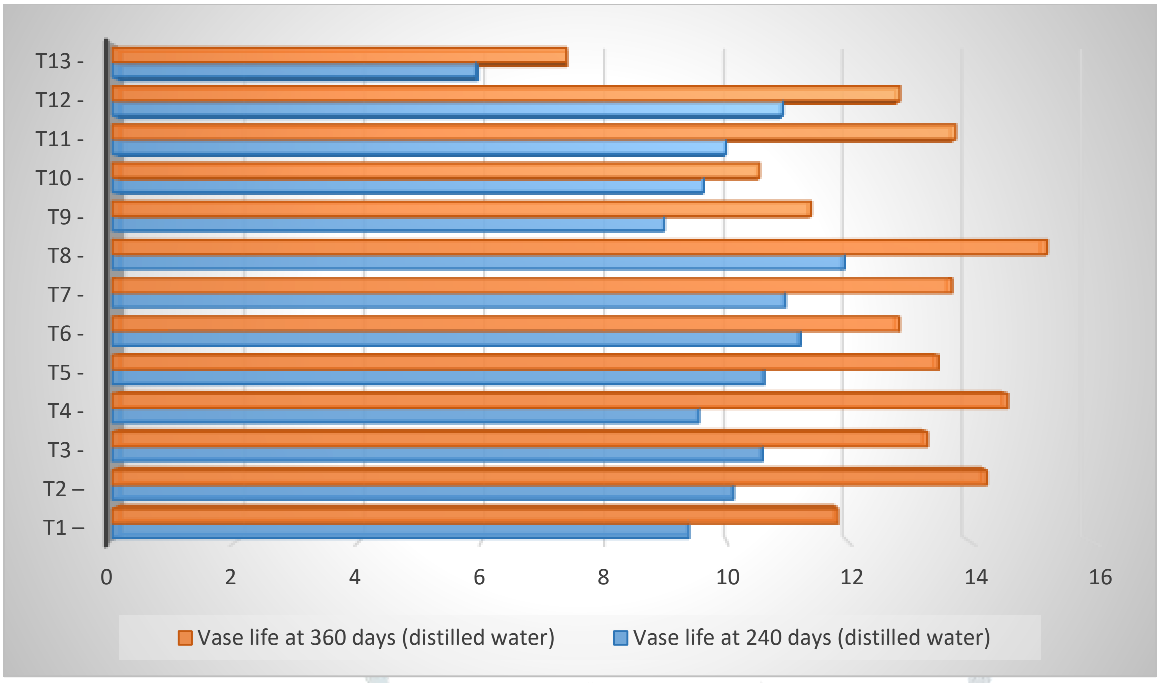


Fig. 3 Growth regulator effects Anthurium plants on the Vase life of flowers (distilled water) at 240 and 360 days



REFERENCES

Anand, S and M. Jawaharlal, 2004. Effect of foliar spray of nutrients and growth regulators on inflorescence and spathe unfurling in *Anthurium andreanum* var. Temptation. *J of Ornamental Horticulture*., 7(3-4): 117-121.

Aytoun, R.S.C and G.L. Hey, 1958. Gibberellins can help and this is how. *Grower*., 416 – 421.

Data, M.J. and S. Ramdas. 1997. Growth and flowering response of chrysanthemum to growth regulator treatments. *The Orissa J. Hort*., 25 (2): 81 – 86.

Dhaduk, B.K., S. Kumari, A. Singh and J.R. Desai, 2007. Response of gibberellic acid on growth and flowering attributes in anthurium. *J of Ornamental Horticulture*., 10(3): 187 – 189.

Havale, V.B., R.V. Tawar., N.D. Hage., G.J. Kakad., S.C. Fatherurkar and A.S. Sable, 2008. Effect of growth regulators and chemicals on growth and flowering of gladiolus. *Asian J. Hort*., 3(1): 93 – 94.

Hedden, G. and S. Thomas. 2012. Gibberellin biosynthesis and its regulation. *The Biochemical Journal*., 444 (11–25).

Henny, R. J., D. J. Norman and M. E. Kane. 1999. Gibberellic acid induced flowering of *Syngonium podophyllum* Schott ‘White butterfly’.*Hort Science*., 34(4): 676 – 677.

Henny, R.J and R.L. Hamilton. 1992. Flowering of anthurium following treatment with gibberellic acid. *Hort Sci*., 27 (12): 1328.

Higaki, T., J.S. Lichty, Moniz.D. 1994. Anthurium culture in Hawaii. University of Hawaii, *Hitahr Res. Ext. Ser*., 152: P 22.

Jawaharlal, M., K. Rajamani, D. Muthumanickam and G. Balakrishnamurthy. 2001. Potting media for Vanda. *Journal of Ornamental Horticulture*., New series, 4 (1): 55 - 56.

Julita Rabiza-Swider, Ewa Skutnik, Agata Jędrzejuk, Aleksandra Łukaszewska and Katarzyna Lewandowska. 2015. The effect of GA_3 and the standard preservative on keeping qualities of hybrid Lily 'Richmond'. *Acta Sci. Pol. Hortorum Cultus*., 14(4): 51-64.

Kohl, H.C, and A.M. Kofranek. 1957. Gibberellins of flower crops. *Calif Agric*., 11(S): 9.

Laws. N and R. Galinsky. 1996. Cut flowers. Anthurium world market survey. *Flora Culture International*., 6: 21 – 23.

Lindsey Keith., Casson Stuart and Chilley Paul. 2002. Peptides:new signalling molecules in plants. Trends in Plant Science., 7 (2): 78–83.

Opik Helgi, A., Rolfe Stephen, Willis Arthur John and Street Herbert Edward. 2005. The physiology of flowering plants (4th ed.). *Cambridge University Press*., pp: 191.

Prasad, K.V., P. Devinder, C. Aswath and M.L. Choudhary. 1997. Know about Anthurium. *Indian Institute of Horticulture Research*. Bangalore.

Rana. P., J. Kumar and M. Kumar. 2005. Response of GA_3, plant spacing and planting depth on growth, flowering and corm production in gladiolus. *Journal of Ornamental Horticulture*., 8(1): 41-44.

Sharma, D.P., Y.K. Chattar and N. Gupta. 2006. Effect of gibberellic acid on growth, flowering and corm yield in three cultivars of gladiolus. *Journal of Ornamental Horticulture*., 9 (2): 106 – 109.

Shibata, T and M. Endo. 1990. The effect of gibberellic acid, night temperature and shading on the flowering of *Spathiphyllum*. *Bulletin of the Chiba Prefectural – Agricultural Experimental Station*. 31: 85 – 93.

Srinivasa, V. 2006. GA_3 induced lateral branching in anthurium cv. Pasricha. *Crop. Res*., 31(1): 81 - 82.

Swapna, S. 2000. Regulation of growth and flowering in *Dendrobium* hybrid Sonia-17. Ph D Thesis. Kerala Agricultural University, Vellanikkara, Thrissur, Kerala, India.

Syamal, M.M., C.B.S. Rajput, R.K. Upadhyay and J.N. Singh. 1990. Effect of GA and MH on growth, flowering and seed yield of Marigold and China aster. Indian J. Hort., 47 (4): 439 – 441.

Von Henting.W.U. 1960. The application of gibberellins to *primula Obconica garton melt*., 60: 142 – 144.