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INFLUENCE OF SEA WEED EXTRACT ALONG WITH GROWTH REGULATORS ON THE GROWTH, FLOWERING AND YIELD OF ANTHURIUM PLANTS

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Abstract

Anthurium is the largest and most morphologically diverse genus of the Araceae family, composed of over 1000 species. The majority of these species are perennial herbaceous plants, cultivated for ornamental purposes due to their attractive inflorescences. *Anthurium andraeanum* which has high commercial value as a garden plant, potted plant and for its cut flowers. As a cut flower, anthurium is one of the main tropical species due to its beauty and increased postharvest life. The growth and development of plants can be manipulated by the use of plant growth regulators, for this reason the use of these substances in floriculture has increased. 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. Considering the recent concept of eco technology and increased cost of fertilizers, organic fertilizer application needs to be an extent in the flower crops. Present research work was carried out to study the effect and response of Anthurium plants to growth regulators along with sea weed extract on the growth, yield and quality of flowers. The experiment was conducted by using Giberillic Acid and Napthelene Acetic Acid, with five different concentrations of 300, 400, 500, 600 and 700 ppm respectively along with sea weed extract applied as foliar spray in every 30 days during the treatment period by manual spraying on the leaves using hand sprayer. One treatment only with sea weed extract and control without using growth regulator and SWE were also maintained. From the present investigation, foliar application of gibberillic acid @ 700 ppm along with SWE gives maximum results in flowering characters and Napthelene Acetic Acid along with SWE recorded maximum results in vegetative growth characters on *Anthurium andraeanum* plants**.** Days taken for flower bud appearance was earlier and flowers remain fresh for more number of days in the treatment applied with gibberillic acid along with sea weed extract.

Keywords **:** Anthuriums, growth regulators, weed extract, yield.

Introduction

Anthuriums are tropical plants gaining popularity for their showy cut flowers, attractive foliage, long lasting flowers, attractive foliage and due to higher returns per unit area (Laws and Galinsky. 1996). They were very popular with flower arrangers because of bold effect and long lasting qualities of flowers. Flowers are usually harvested once a week at three quarters maturity. The application of growth regulators show difference in the production, developmental process, yield and quality of flowers (Swapna, 2000 and Havale *et al*., 2008). Growth regulators are the chemical substance which alters the growth and development in plants and regulate the physiological process such as formation of leaves, flowers, stem elongation, development and ripening of fruit in an appreciable manner in plants when used in small concentrations. Plant hormones 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, 2005). Gibberellins have so many number of effects on plant development. They can stimulate fast stem and root growth, induce mitotic division in the leaves of certain plants, and can increase seed germination rate.

Auxins are essential for plant body development and have a cardinal role in coordination of many growth and behavioural processes in the plant's life cycle. Auxin (namely NAA) is present in all parts of a plant, although in very different concentrations. The dynamic and environmental responsive pattern of auxin distribution within the plant is a main factor for plant growth (Friml, 2003 and Benkova, 2003). Seaweed products exhibit growth stimulating activities, and seaweed formulations are used as biostimulants in crop production. Biostimulants are also referred to as metabolic enhancers which can promote plant growth when applied in small quantities and (Zhang and Schmidt, 1997). The present work was carried out with a view to find the effective growth regulator in a combination with sea weed extract on Anthurium plants for enhancing the growth, flowering and postharvest behaviour of flowers.

Materials and Methods

The present study was carried out in Flora-tech floriculture unit at kottarakara, kollam Dist, kerala state, India during 2014-2016. The treatments with three replications were carried out in completely randomized design. Anthuriums are shade loving plants require 60 to 80 per cent relative humidity, an excessively low relative humidity will reduce the rate of photosynthesis. The plant thrives best at temperature range between 18 ^{o}C and 28 ^{o}C. Bright but filtered light is essential for abundant flowering. The plants selected for experiment were maintained under 75 per cent shade net and with a growing medium mixture of cocopeat + FYM. The variety of Anthurium (*Anthurium andreanum* L.) used in the experiment is 'Tropical'. The colour of the spathe is red, smooth, blistered, leathery and wavy in texture. The colour of the spadix is lemon yellow. Four months old tissue cultured uniform size plants were planted in 12 inch pots. During the study two different growth regulators ie, Giberillic Acid and Napthelene Acetic Acid, with five different concentrations of 300, 400, 500, 600 and 700 ppm respectively in combination with sea weed extract have been applied as foliar spray in every 30 days during the treatment period by manual spraying on the leaves using hand sprayer. One treatment with sea weed extract without using growth regulator and one control without using SWE and growth regulators was also maintained. Plant height, plant spread, number of flowers per plant, flower stalk, length, spathe length, spathe breadth and other yield

characters were also observed and recorded at 360 and 480 days after planting.

Results and Discussion

The experimental results were significantly influenced by the *per se* effects of growth regulator and sea weed extract, among the different treatments, the yield characters like Number of flowers per plant, Flower stalk length, Spathe length, Spadix length, Number of days taken for flower opening, Flower longevity on plant (Fig. 2 & 3) were recorded maximum result by the foliar application of Gibberellic acid @ 700 ppm in combination with SWE (Table 1 & 2). Vase life of the flowers was also prolonged in this treatment (Fig. 1). The increased results may be due to its cells begin a process of elongation. Gibberellins are group of plant hormones that are responsible for growth and development in plants. Gibberellin stimulates the expression of enzymes involved in cell wall loosening and genes controlling cell division and also stimulates microtubule rearrangements associated with cell expansion. 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 and yield of the plant (Hedden, 2012).

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 sea weed extracts are excellent sources of major elements such as N, P, K, Ca and Mg as well as many micronutrients, vitamins and plant hormones required for growth and development of plants. Sea weed components are macro and micro element nutrients, amino acids, vitamins like growth substances affect cellular metabolism when treated on plants, leading enhanced growth and yield (Crouch *et al*., 1992, Crouch and Van Staden, 1993). Gibberellins are extremely significant in the greenhouse and florist industry throughout the world (Srinivasa, 2006). 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 by Von Henting (1960) 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.

From the experimental results among 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 Napthelene Acetic Acid @ 700 ppm in combination with SWE (Table 1&2) may be due to the dynamic and environment responsive pattern of auxin distribution within the plant is a major factor for plant growth and its reaction to environment and specifically for development of plant organs. Increased amounts can actually cause growth inhibition to the development of plant crops. It is achieved through very complex, coordinated and active transport of auxin molecules from cell to cell throughout the plant body is called polar auxin transport (Friml, 2003). Increased shoot growth and lateral shoot development (Metting *et al*., 1990), improved nutrient uptake (Yan, 1993) was reported. Roy and Chowdhury (1989) observed that NAA increased plant height, number and size of leaves, thickness and width of shoots in gladiolus cv. Eurovision. Suresh Kumar *et al*. (2008) reported that significantly higher number of leaves, leaf length and leaf area were observed due to application of NAA when compared to other growth regulators in gladiolus. Foliar application of growth regulators with NAA @ 300 ppm significantly increased leaves per plant per year in gladiolus (Neha Chopde, 2012).

Conclusion

Considering the above facts and results of the present investigation, it can be concluded that the treatments given with foliar spray of Gibberellic acid @ 700 ppm in combination with SWE shown the best results in flowering characters and NAA @ 700 ppm shows maximum results in growth characters along with sea weed extracts. Least results were recorded in control i.e., without applying growth regulators and nutrient sea weed extract.

Table 1 : Influence of growth regulators in combination with SWE on anthurium plants 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 300 ppm)	37.52	61.91	7.77	3.53	70.02	3.22	32.19	7.45	7.48	4.89
T_2 (SWE + GA 400 ppm)	40.05	62.30	7.35	3.22	70.19	3.56	34.96	8.09	8.12	5.39
T_3 (SWE + GA 500 ppm)	40.29	61.61	7.56	3.38	71.28	4.21	36.74	8.34	8.47	5.32
T_4 (SWE + GA 600 ppm)	42.64	64.58	7.18	3.47	71.81	4.76	36.81	8.78	8.71	5.98
T_5 (SWE + GA 700 ppm)	46.35	63.09	8.27	3.88	72.23	5.07	37.62	9.07	9.18	6.13
T_6 (SWE + NAA 300 ppm)	41.90	62.51	7.85	3.57	69.45	3.01	31.23	7.43	7.41	4.99
T_7 (SWE + NAA 400 ppm)	39.13	60.80	8.06	3.72	69.19	3.26	30.45	7.56	7.48	5.14
T_8 (SWE + NAA 500 ppm)	33.83	63.84	8.38	3.32	70.43	3.98	33.92	7.98	8.03	5.54
T_9 (SWE + NAA 600 ppm)	46.55	64.45	8.23	4.12	71.13	4.34	36.32	8.56	8.71	5.32
T_{10} (SWE + NAA700 ppm)	47.25	65.35	8.64	4.65	72.35	4.64	37.18	8.64	8.69	5.95
T_{11} (Sea Weed Extract)	34.10	57.03	7.16	2.67	57.98	2.51	26.21	6.36	6.43	4.04
T_{12} (Control)	26.00	46.07	6.08	1.77	46.91	1.96	20.23	5.12	5.15	3.31
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

Table 2 : Influence of growth regulators in combination with SWE on anthurium plants 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 300 ppm)	49.89	72.69	7.14	5.15	82.01	7.01	47.23	9.28	9.31	7.49
T_2 (SWE + GA 400 ppm)	51.71	72.18	7.91	4.93	81.89	7.23	47.98	10.18	10.23	7.56
T_3 (SWE + GA 500 ppm)	53.29	73.20	7.56	5.14	82.67	7.79	49.32	11.03	11.21	8.24
T_4 (SWE + GA 600 ppm)	55.98	75.11	8.34	4.90	83.27	8.02	50.21	11.58	12.03	8.32
T_5 (SWE + GA 700 ppm)	57.83	77.02	8.91	5.61	84.12	8.18	51.49	12.14	12.34	8.48
T_6 (SWE + NAA 300 ppm)	53.01	74.23	6.91	5.40	80.17	6.59	45.14	9.32	9.45	7.04
T_7 (SWE + NAA 400 ppm)	53.11	74.39	6.97	5.61	81.97	6.97	46.29	10.12	10.24	7.23
T_8 (SWE + NAA 500 ppm)	55.19	75.87	9.01	5.10	82.19	7.31	48.12	10.97	10.99	7.87
T_9 (SWE + NAA 600 ppm)	57.12	76.10	9.19	5.29	83.67	7.27	49.23	11.21	11.37	8.03
T_{10} (SWE + NAA700 ppm)	59.17	77.27	10.88	5.67	84.56	7.94	50.79	11.58	12.09	8.12
T_{11} (Sea Weed Extract)	42.89	61.49	5.54	4.48	68.76	5.79	37.85	8.09	8.12	6.03
T_{12} (Control)	34.81	47.81	4.18	3.13	57.23	4.12	29.36	6.76	6.81	5.01
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

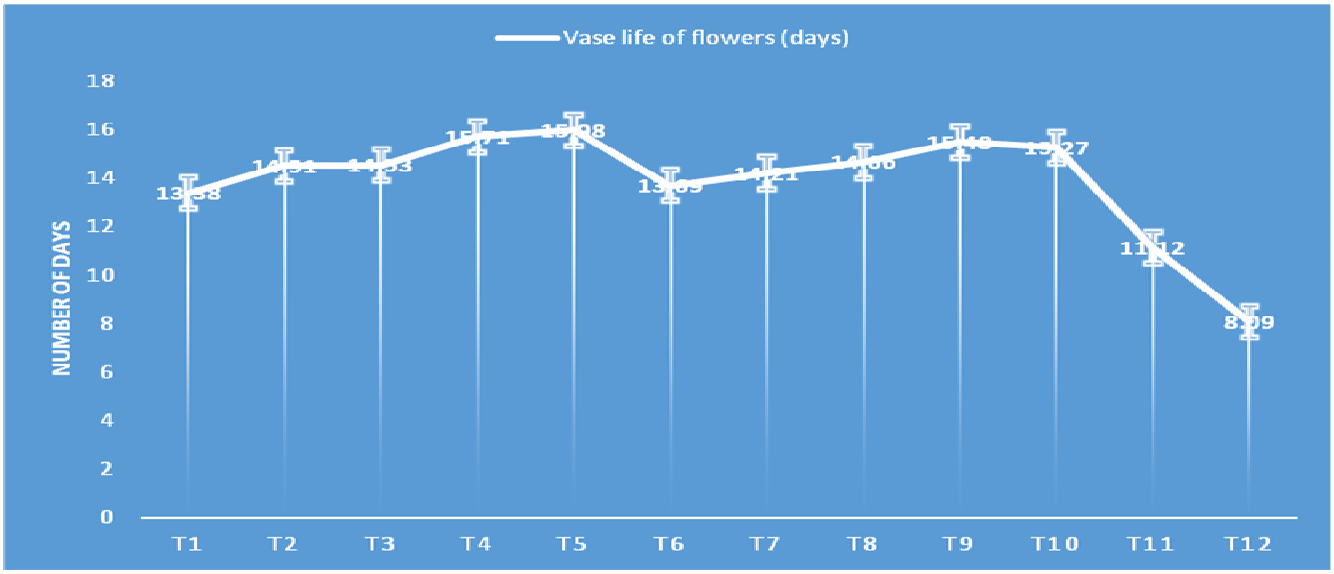

Fig. 1 : Vase life of flowers in days

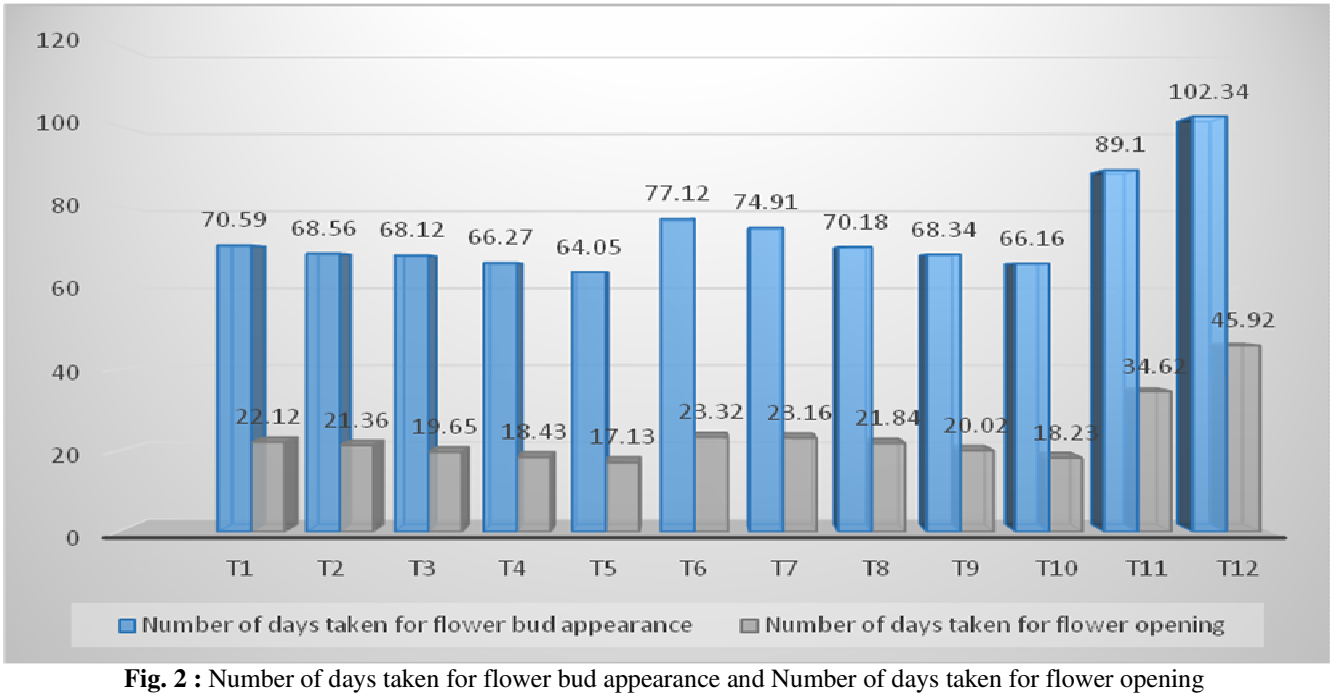

Fig. 2 : Number of days taken for flower bud appearance and Number of days taken for flower opening

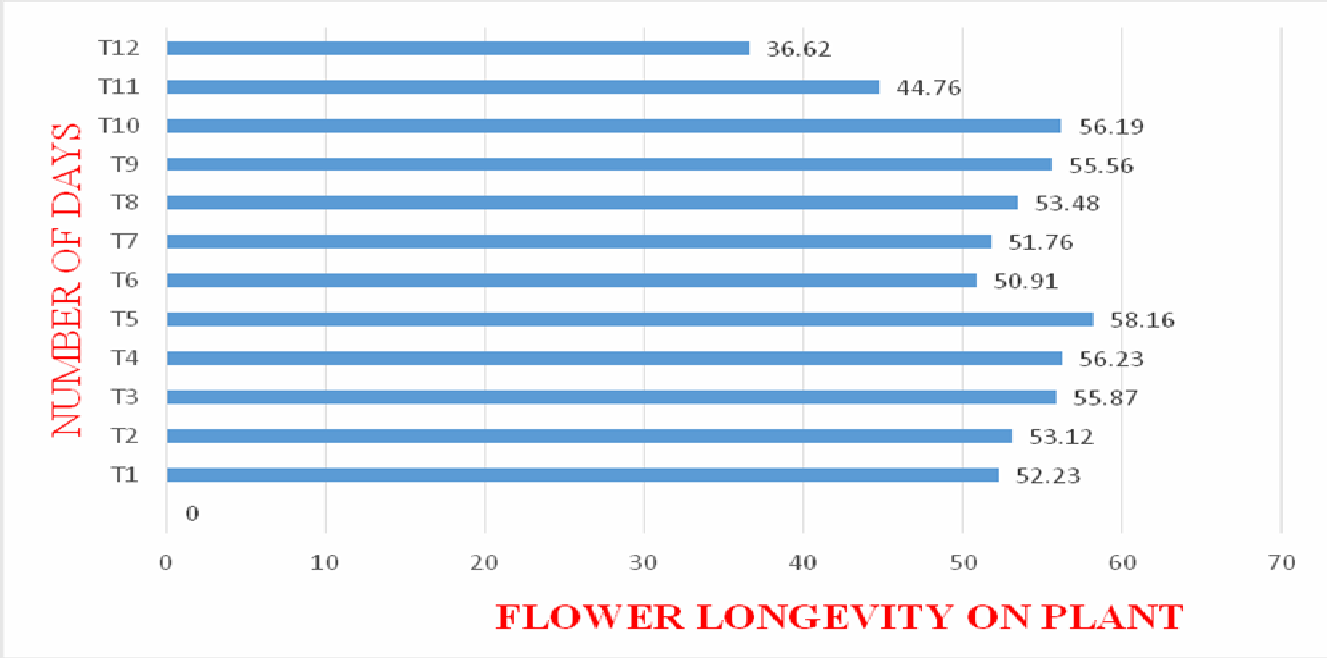

Fig. 3 : Flower longevity on the plant (days)

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