EFFECT OF VARIOUS PLANT GROWTH REGULATORS ON VEGETATIVE AND FLOWERING PARAMETERS OF CHRYSANTHEMUM CV. THAI CHEN QUEEN

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ABSTRACT

The experiment was conducted at Agriculture Farm, School of Agricultural Sciences & Technology, RIMT University, Mandi Gobindgarh, Punjab, India. The trial was done to find out in plant growth regulators effect on vegetative and flowering parameters of chrysanthemum cv. Thai-Chen-Queen in during 2019-20. The finding revealed that overall performance of chrysanthemum was better in treatment having T₇ (GA₃ 300 ppm). Maximal plant height (42.60 cm), number of leaves/plant (43.00), plant spread (11.36 cm), number of suckers/plant (6.33) and flower diameter (10.12 cm) were observed in T₇ (GA₃ 300 ppm). Whereas, T₈ (IAA 100 ppm) rustled utmost number of flowers/plant (12.00), leaf length (5.06 cm) fresh weight of chrysanthemum flower (9.56 g) & duration of flowering (60.66 days). On the basis of obtained results, the conclusion may be drawn that plant growth regulators at various concentrations enhanced growth and flowering characters for chrysanthemum cultivar Thai Chen Queen.

KEYWORDS: *Chrysanthemum, PGR, growth characters, flowering parameters and Thai Chen Queen.*

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INTRODUCTION

Chrysanthemum (Chrysos mean golden and Anthemom mean flower) is the commercial importance demotic ornamental flower crop. It is commonly known as “Queen of the East”, Guldaudi or Autumn Queen, which behaves as an annual as well as perennial herb; leaves are alternate and inflorescence heads are many flowered. Chrysanthemums (*Dendranthema grandiflora*) sometimes called mums or chrysanth is a perennial flowering plant of the genus *Dendranthema* in the family Asteraceae. Most of the species originated from East Asia and centre of diversity in China. It is short day herbaceous plant. A cut chrysanthemum ranks next to rose among the flower crops in the international market. In India, Chrysanthemum making arch for both as a commercial cut flower crop and demotic loose flower for garland making, offering in the temples, decorating temples, marriage pandals and landscaping either in beds or in pots. There are about 40 species in genus Chrysanthemum (Liu *et al.*, 2012 and Britannica, 2019).

PGR are chemicals used to achieve best result for plant development and plant growth such as increasing the plant parts to grow as if branching, shoot growth, fruit maturity and increasing flowering. Plant growth retardants represent the commercially most important group of PGR. In other horticultural uses such as height reducer and anti-lodging agent in fruit-set promoter as also turf growth inhibitor and PGR. The plant growth regulators are synthetic compounds, which are used to may increase or reduce the endogenous levels of plant hormone when their endogenous levels are below that needed to change the plant development. The plant growth hormone is an organic compound and plays an integral role in control the growth and development of plant. And synthesized in one part of the plant to translocate to another part in low concentrations it elicits a physiological response. (Davies, 2010).

MATERIALS AND METHODS

The field experiment was carried out to see the repose of PGRs on Chrysanthemum cv. Thai Chen Queen at Agriculture Farm, School of Agricultural Sciences and Technology, RIMT University, Mandi Gobindgarh (Punjab) during 2019-20. Mandi Gobindgarh is situated at 30.6642 °North latitude, 76.2914 °East longitude and altitude of 268 meters above the mean sea level. Climate condition of the site is designated as sub-tropical and semi-arid with hot and dry summer in April to June, monsoon season in very hot summer in July to September, mild winter in October to November and cold winter in December to February. The experiment was laid out under completely randomized design (CRD) in three replication and 10 treatments i.e., NAA (100 ppm, 200 ppm, 300 ppm), GA₃ (100 ppm, 200 ppm, 300 ppm) and IAA (100 ppm, 200 ppm, 300 ppm) along with control were applied. Various growth and flowering parameters were observed characters recorded from two selected plants in each pot and data was subjected for statistical analysis.

RESULTS AND DISCUSSION

Vegetative Parameters

The results on the vegetative effect showed in table 1. The obtained results show that different PGRs have released a significant effect on growth of chrysanthemum. The highest plant height (42.60 cm) was recorded with the treatment T₆ (GA₃ 200 ppm) whereas, minimum plant height (28.32 cm) was produced with T₁ (control). GA₃ might be enhancing protein synthesis which ultimately caused increase in plant height. Same outcome was determined by Dalal *et al.*, 2009 in *Dendranthema grandiflora*. Where rapid cell division takes. The application of GA₃ promotes protein synthesis which might have caused vegetative growth. Same result is determined in findings by Rakesh *et al.*, 2003 & Girisha *et al.*, 2012. The maximal number of leaves/plants recorded in (43.00) were observed in T₇ GA₃ (300 ppm) and minimum number of leaves/plant (21.00) was produced under T₁. The GA₃ influence cell division and cell enlargement which outcome increases number of laves. The formation of new leaves and chloroplast. These results observed by Tyagi *et al.*, 2008, and the similar results finding by Dahiya & Rana, 2001 and Dutta *et al.*, 1998). Maximal plant spread (11.36 cm) were observed in T₇ GA₃ (300 ppm) whereas, minimum plant spread (7.85 cm) was produced by T₁ (control). It was noticed that plant spread was significantly affected due to the application of GA₃ 300 ppm and observed in maximal plant spread in chrysanthemum. The GA₃ might have an effect or increase on cell elongation, apical dominance and cell division resulting in enhanced growth of *Dendranthema grandiflora* (Verma *et al.*, 1995). Maximal number of primary branches/plant (18.33) were counted in T₅ (GA₃ 100 ppm) and T₈ (IAA100 ppm). Whereas, minimum number of primary branches/plant (11.00) were produced with T₄ (NAA 300 ppm) and T₁ (control). These results were observed by (Shinde *et al.*, 2010) in *Dendranthema grandiflora*. (Delvadia *et al.*, 2009, Ghadage *et al.*, 2010 Kanwar and Khandewal, 2013). GA₃ treatment is increased in inhibit plant growth, metabolism, seed germination, seed development and maturation (Kumar and Ughreja, 1998). Maximal leaf length (5.06 cm) was measured in T₈ (IAA100 ppm) while, minimum leaf length (3.53 cm) was found under T₁ (control). Due to the fact that, GA plays a vital role in the improvement of leaf length and number of leaves characters of the plants. Further, GA₃ is known to enhance the axis length in plants such as grape stalks. This would have resulted in better leaf length of China aster plants. The findings are in close settlement with the findings by (Sainath *et al.*, 2012 & Badge *et al.*, 2014). The utmost count of suckers/pot (6.33) were counted under T₂ (NAA 100 ppm) and minimum count of suckers \ pot at this (4.00) was observed under T₁ (control) and T₃ (NAA 200 ppm). The higher number of suckers by using NAA and GA₃ might be due to increasing new leaves and lateral growth as observed of best translocation of the (Yadav *et al.*, 2014) reported same results.

Flowering Parameters

The results regarding flowering parameters are shown in table 2. The results show that different PGR have released a significant effect on the flowering of chrysanthemum. The days to first bud opening (initiation) was influenced significantly by PGR. Minimum count of days taken to first bud initiation (40.33 D) was observed in under T₇ (GA₃ 300 ppm) while, T₁ (control) recorded for maximal count of days taken to first bud opening (55.00 D). Treatment T₇ (GA₃ 300 ppm) recorded for minimum days taken to first colour shown (60.00) while, maximal days taken to first colour shown (71.33) were observed T₁ (control). Early flowering opening to GA₃ was gibberellins important for seed development and maturation and apical meristem. Similar results were recorded by Gautam *et al.*, 2006 and Dalal *et al.*, 2009). The present finding confirms the reports made by Dutta *et al.*, 1998) in chrysanthemum. Minimum days to half bloom flower (88.66 days) were observed in T₇ (GA₃ 300 ppm), whereas, maximal days to half bloom flower (98.66 days) were observed under T₁ (control). The gibberellins level in the plant was increasing early flowering in plants, as gibberellins are known for inducing quick seed production and flowering in plant. The same outgrowth has been observed by Dutta, 1992; Singh and Kumar, 2009 and Shinde *et al.*, 2010) in *Dendranthema grandiflora*. Maximal count of flowers/plant (12.00) was observed under treatment T₈ (IAA 100 ppm) whereas, minimum count of flowers\ plant (7.66) was produced by T₂ (NAA 100 ppm). The same outcome was also finding by Girwani *et al.*, 1987 and Gowda and Jayanthi, 1991 (Dalal *et al.*, 2009) in *Dendranthema grandiflora*. Maximal flower diameter (10.12 cm) was recorded under the treatment T₄ (NAA 300 ppm) whereas, treatment T₁ resulted in minimum flower diameter (8.66 cm). The gibberellins are known for their promontory increase on cell elongation and cell division. Therefore, an increase in the diameter of flower obtained with an application of GA₃ might be due increase in auxin activity in floral buds. A similar result was revealed by Ramdevputra *et al.*, 2009). Highest weight of full bloomed flower (9.56 g) was recorded with the treatment T₈ (IAA 100 ppm) whereas, T₁ (control) resulted in highest weight of full bloomed flower (7.82 g). Since, flower weight being a cumulative effect of flower diameter, therefore, flower weight might have increased on account of flower length as it was found significantly more in GA₃ treatment over the control. For flower weight, similar findings by Tripathi *et al.*, 2003 and Ramdevputra *et al.*, 2009) in Tagetes. Maximal number of florets/flower (282.33) was reported that treatment T₇ (GA₃ 300 ppm) whereas, treatment T₁ resulted in minimum number of florets per flower (220.00). From the above results, it is seen that the treatment of GA₃ was significantly superior in increasing the number of florets over NAA treatments. The availability of carbohydrates for photosynthetic activity and other metabolic activities to increase the weight and ultimately the number of florets per flower (Leena *et al.*, 1992). Maximal duration for flower senescence (122.00 days) was recorded under T₂ (NAA100 ppm) whereas, minimum duration for flower senescence (116.33 days) was observed T₅ (GA₃ 100 ppm). The same outcome was also finding by Kumar *et al.*, 2010). Highest flower duration (60.66 days) was observed in T₈ (IAA 100 ppm) while, T₁ (control) recorded for minimum flower duration (50.00 days). The findings were confirmed with the results of (Yadav *et al.*, 2015). This might be due to the availability of more photosynthates for a longer time, so as to prolong reproductive phase. These findings in by Gautam *et al.*, 2006 and Shinde *et al.*, 2010) in *Dendranthema grandiflora*.

CONCLUSIONS

On the basis of the obtained result, it is concluded that the flower of chrysanthemum cv. Thai-Chen-Queen was significantly influenced by T₇ (GA₃ 300 ppm) which indicated maximal vegetative growth in plant spread (cm) and number of leaves/plant. Whereas greater plant height (cm) was recorded with T₆ GA₃, highest number of primary branches/plants was observed with T₅ (GA₃ 100 ppm), highest leaf length was observed in T₈ (IAA100 ppm), a greater count of suckers

was observed in T₂ (NAA 100 ppm) and in flowering parameters, minimum days to bud opening, days to first colour shown, days of half bloom flower and flower senescence and more maximal number florets of flower was found in T₇ (GA₃ 300 ppm). While, highest number of flowers /pots, full bloom and flower duration was observed in T₈ (IAA 100 ppm) and flower diameter was highest with T₄ (NAA 300 ppm).

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Table 1: Effect of PGR on Vegetative Parameters in *Chrysanthemum* cv. Thai Chen Queen

Treatments	Plant Height (cm)	Number of Leaves Per Plant	Plant Spread (cm)	Number of Primary Branches Per Plant	Leaf Length (cm)	Number of Suckers Per Pot
Control	28.3	21.00	7.85	13.66	3.53	4.00
NAA (100 ppm)	34.68	25.66	10.51	14.00	3.83	6.33
NAA (200 ppm)	37.04	30.33	9.65	13.66	3.96	4.00
NAA (300 ppm)	33.73	34.00	9.80	11.00	4.83	5.66
GA ₃ (100 ppm)	40.30	40.66	9.37	18.33	5.00	5.66
GA ₃ (200 ppm)	42.60	41.33	10.21	15.66	3.90	4.33
GA ₃ (300 ppm)	37.56	43.00	11.36	16.33	5.00	4.66
IAA (100 ppm)	40.80	41.66	11.28	18.33	5.06	5.66
IAA (200 ppm)	34.11	34.33	10.05	14.66	4.50	5.33
IAA (300 ppm)	36.01	30.33	10.72	16.33	4.96	5.33
C.D. at 1%	2.88	2.87	0.76	1.58	1.02	1.89

Table 2: Effect of PGR on Flowering Parameters in *Dendranthema grandiflora* cv. Thai Chen Queen

Treatments	Days to First Bud Initiation	Days to First Colour Shown	Days to Half Bloom Flower	Number of Flowers/Plant	Flower Diameter (cm)	Weight of Full Bloomed Flower (g)	Number of Florets/Flower	Flower Senescence (Days)	Flowering Duration (Days)
Control	55.00	71.33	98.66	8.66	8.66	7.82	220.00	121.33	50.00
NAA (100 ppm)	53.66	67.67	91.66	7.66	9.13	8.58	235.00	122.00	54.33
NAA (200 ppm)	46.66	62.33	92.33	9.33	9.33	8.33	257.66	121.00	59.66
NAA (300 ppm)	45.33	65.67	93.00	8.66	10.12	8.20	250.33	121.33	56.00
GA ₃ (100 ppm)	45.66	64.33	91.33	9.66	9.27	9.08	281.33	116.33	51.66
GA ₃ (200 ppm)	44.33	62.33	90.66	10.00	8.99	8.34	268.00	117.00	56.33
GA ₃ (300 ppm)	40.33	60.00	88.66	11.00	8.93	8.18	282.33	120.66	60.33
IAA (100 ppm)	42.33	60.33	89.66	12.00	9.93	9.56	280.33	120.33	60.66
IAA (200 ppm)	45.33	65.33	90.00	9.33	8.96	8.06	270.00	119.33	54.66
IAA (300 ppm)	44.00	63.33	90.33	10.33	9.61	8.54	271.66	120.00	57.00
C.D. at 1%	2.28	2.64	2.90	1.84	1.10	1.17	2.07	2.43	2.47