International Journal of Plant & Soil Science

20(2): 1-5, 2017; Article no.IJPSS.38005
ISSN: 2320-7035

Efficacy of Biostimulants on Growth, Flowering and Quality of China aster cv. Kamini

D. B. Vinutha[1*], B. Hemla Naik[2], S. Y. Chandrashekar[1], G. N. Thippeshappa[3] and Y. Kantharaj[4]

[1]Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, India.
[2]Department of Horticulture, College of Agriculture, Shivamogga, India.
[3]Department of Soil Science and Agriculture Chemistry, College of Agriculture, Shivamogga, India.
[4]Department of Post Harvest Technology, College of Horticulture, Mudigere, India.

Authors' contributions

This work was carried out in collaboration between all authors. Author DBV wrote the manuscript and performed the statistical analysis. Author BHN designed the study and wrote the protocol. Authors SYC, GNT and YK managed the analyses of the study and literature works. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2017/38005
Editor(s):
(1) L. S. Ayeni, Adeyemi College of Education, Ondo State, Nigeria.
Reviewers:
(1) Ahmet Sivacioğlu, Kastamonu University, Turkey.
(2) Amit Kumar, Rama University, India.
Complete Peer review History: http://www.sciencedomain.org/review-history/21983

Original Research Article

Received 6th November 2017
Accepted 13th November 2017
Published 20th November 2017

ABSTRACT

This study was conducted to determine the effect of biostimulants on growth, flowering and quality of China aster cv. Kamini with thirteen treatments such as two concentrations of biostimulants sprayed at four frequencies (first, second, third and fourth spray at 45, 60, 75, 90 days after transplanting) and untreated control. Each treatment was replicated thrice in randomized complete block design (RCBD). The parameters such as plant height (cm) no. of leaves, leaf area (cm^2), stem girth(mm), no. of primary branches, no. of secondary branches and total dry weight of plant(g) were checked as growth parameters. Moreover, days taken for first flowering, days to 50% flowering and duration of flowering are the checked flowering parameters whereas shelf life of loose flowers (hrs), vase life of cut flowers (days), stalk length (cm), flower weight (g) and flower diameter (cm) are the flower quality parameters. Among the different treatments, GA_3 @ 200 ppm (T_1) registered maximum plant height (65.07 cm), number of leaves (115.67) and leaf area per plant

**Corresponding author: E-mail: vinutha.keerthi29@gmail.com;*

(4259.30 cm^2), stem girth (12.71 mm), number of primary (9.73) and secondary branches (13.00), total dry weight per plant (45.03 g). Regarding the flowering parameters; among different treatments, minimum number of days to first flower bud initiation (59.00) and 50 per cent flowering (73) was recorded with GA_3 @ 200 ppm (T_1). However, control (T_{13}) recorded minimum. As to the flower quality parameters, shelf life and vase life was recorded maximum (41.00 hours and 8.17 days) by Azospirillum @ 8 per cent (T_{12}) and Biovita @ 1 per cent (T_8), respectively. Also, the maximum stalk length (27.50 cm) was observed with GA_3 @ 200 ppm (T_1). The highest flower weight (2.40 g) and flower diameter (7.39 cm) was observed with Azospirillum @ 8 per cent (T_{12}).

Keywords: Biostimulants; China aster; RCBD; GA_3.

1. INTRODUCTION

India is bestowed with diverse geographical location, having varied types of climate besides scientific expertise, skilled and unskilled manpower. Hence, there is greater potential for the production of flowers on commercial scale. China aster (*Callistephus chinensis* Nees.L.) an annual flower crop belongs to the family Asteraceae used commercially as loose flowers, cut flowers and also grown in garden as herbaceous borders and formal beds. The lucrative and flourishing business of flowers has led to uncontrolled and indiscriminate use of chemical fertilizers, insecticides and fungicides. In this context, sustainable crop production using biostimulants is an important step towards successful horticulture which in turn will ensure profitable crop production in a cost effective and eco-friendly manner. Biostimulants are the materials other than the fertilizers that promote the plant growth when applied in minute quantities and are also referred as 'metabolic enhancers'. They promote the plant growth besides improving yield and quality. Since there is scanty information on the use of biostimulants on China aster crop, need was felt to study the effect of biostimulants.

2. MATERIALS AND METHODS

Studies were carried out at the Department of Horticulture, College of Agriculture, Shivamogga, Karnataka, during 2016 - 2017. The soil was prepared to fine tilth and raised beds of 2.5 m X 2.5 m were prepared under open field condition. 45 days old seedlings of China aster cv. Kamini (deep pink) were planted at a spacing of 30 cm X 30 cm. The experiment was laid out in randomized complete block design (RCBD) with thirteen treatments and three replications. Treatments included T_1 -GA_3 @ 100 ppm, T_2 – GA_3 @ 200 ppm, T_3 – NAA @ 100 ppm, T_4 – NAA @ 150 ppm, T_5 – Boron @ 0.2%, T_6 – Boron @ 0.3%, T_7 – Biovita @ 0.5%, T_8 – Biovita @ 1%, T_9 – Humicil @ 0.5%, T_{10} – Humicil @ 1%, T_{11} – Azospirillum @ 4%, T_{12} – Azospirillum @ 8%, T_{13} – control. These biostimulants were sprayed at 4 intervals viz., 45, 60, 75 and 90 days after transplanting (DAT). Following observations were recorded at 105 DAT and were statistically analyzed.

3. RESULTS AND DISCUSSION

The data pertaining to growth parameters are presented in Table 1. All the parameters varied significantly with the foliar application of biostimulants. Among the different treatments, GA_3 @ 200 ppm (T_1) registered maximum plant height (65.07 cm), number of leaves (115.67) and leaf area per plant (4259.30 cm2), stem girth (12.71 mm), number of primary (9.73) and secondary branches (13.00), total dry weight per plant (45.03 g). However, minimum was recorded by control (T_{13}). The increase in vegetative growth might be due to increase in plasticity of cell wall and formation of energy rich phosphates which stimulates cell division and cell elongation. Also might be due to the increased osmotic uptake of water and nutrients under the influence of biostimulants and in turn improving nutrient metabolism of plant system. These findings are in line with Patra et al. [1] in gerbera and Kumar et al. [2] in China aster.

A perusal of data on flowering parameters is presented in Table 2. Among different treatments, Minimum number of days to first flower bud initiation (59.00) and 50 per cent flowering (73) was recorded with GA_3 @ 200 ppm (T_1). However, control (T_{13}) recorded minimum. This might be due to the effect of GA_3 that might have caused flower bud initiation and lead to early flowering by decreasing the concentration of ABA in plant shoot (Phengphachanh et al. [3]. The findings are in line with Sharifuzzaman et al. [4] in chrysanthemum and Kumar et al. [5] in carnation. Regarding flower duration, maximum (70.33) was recorded with Humicil 1 per cent (T_{10}). This might be due to presence of humates which enhanced

nutrient uptake, improved soil structure. The present findings are in conformity with Gupta et al. [6] in chrysanthemum.

The data with respect to flower quality parameters are presented in Table 3. Shelf life and vase life was recorded maximum (41.00 hours and 8.17 days) by Azospirillum @ 8 per cent (T_{12}) and Biovita @ 1 per cent (T_8), respectively. This might be due to sea weed extract containing cytokinin and auxin that might have increased the antioxidant levels and resistance to senescence leading to enhanced longevity of stem. A similar trend also obtained by Pruthvi [7] in chrysanthemum. The maximum stalk length (27.50 cm) was observed with GA_3 @ 200 ppm (T_1). This might be due to the fact that, GA_3 promoted the efficacy of plants in terms of photosynthetic activity, uptake of nutrients and their translocation, better partitioning of assimilates into reproductive parts. These results are in agreement with those reported by Rakesh et al. [8] and Gautam et al. [9] in chrysanthemum. The highest flower weight (2.40 g) and flower diameter (7.39 cm) was observed with Azospirillum @ 8 per cent (T_{12}). This may be due to better nitrogen fixation from atmosphere, better root proliferation, uptake of nutrients and water which influences more photosynthesis and enhanced food accumulation. The results are in accordance with Chaudhari et al. [10] in rose.

Table 1. Effect of biostimulants on growth parameters of China aster cv. Kamini

Treatments	Plant height (cm)	No. of leaves	Leaf area (cm^2)	Stem girth (mm)	No. of primary branches	No. of secondary branches	Total dry weight of plant (g)
T_1 - GA_3 @ 100 ppm	62.67	107.00	4143.80	11.24	9.42	12.33	44.32
T_2 - GA_3 @ 200 ppm	65.07	115.67	4259.30	12.71	9.73	13.00	45.03
T_3 - NAA @ 100 ppm	36.87	78.00	3409.37	8.30	3.97	8.33	35.37
T_4 - NAA @ 150 ppm	39.47	78.07	3532.07	8.68	5.40	8.67	35.89
T_5 - Boron @ 0.2%	50.27	84.00	3958.44	9.39	8.85	9.67	37.56
T_6 - Boron @ 0.3%	50.93	89.00	3987.63	9.57	8.20	10.00	37.80
T_7 - Biovita @ 0.5%	50.23	93.00	4048.22	9.29	9.20	12.67	38.87
T_8 - Biovita @ 1%	52.53	101.00	4103.07	10.92	6.70	11.33	39.10
T_9 - Humicil @ 0.5%	51.73	98.00	3983.20	11.29	8.22	11.00	38.55
T_{10} - Humicil @ 1%	51.20	108.13	4058.55	12.45	9.07	12.83	39.50
T_{11} - Azospirillum @ 4%	54.00	83.67	3860.79	11.37	7.80	10.00	39.99
T_{12}- Azospirillum @ 8%	55.07	102.67	4107.29	11.49	9.25	11.67	41.62
T_{13} – Control	35.73	71.33	3359.35	8.28	4.50	7.67	35.06
SEm ±	**1.42**	**0.64**	**18.79**	**0.17**	**0.40**	**0.41**	**0.02**
CD @ 0.05	**4.15**	**1.87**	**54.83**	**0.23**	**1.17**	**1.21**	**0.05**

Table 2. Effect of biostimulants on flowering parameters of China aster cv. Kamini

Treatments	Days taken for first flowering	Days to 50% flowering	Duration of flowering
T_1 - GA_3 @ 100 ppm	60.33	75.00	68.67
T_2 - GA_3 @ 200 ppm	59.00	73.00	70.00
T_3 - NAA @ 100 ppm	64.00	79.33	58.67
T_4 - NAA @ 150 ppm	63.00	79.00	62.67
T_5 - Boron @ 0.2%	62.67	77.67	63.67
T_6 - Boron @ 0.3%	61.67	74.00	65.00
T_7 - Biovita @ 0.5%	62.33	73.67	64.00
T_8 - Biovita @ 1%	59.67	73.67	65.67
T_9 - Humicil @ 0.5%	60.67	73.67	66.67
T_{10} - Humicil @ 1%	60.00	73.33	70.33
T_{11} - Azospirillum @ 4%	62.33	73.33	68.33
T_{12}- Azospirillum @ 8%	63.67	73.67	68.67
T_{13} – Control	65.00	83.33	58.67
SEm ±	**0.47**	**5.29**	**1.10**
CD @ 0.05	**1.37**	**15.44**	**3.22**

Table 3. Effect of biostimulants on flower quality parameters of China aster cv. Kamini

Treatments	Shelf life of loose flowers (hrs)	Vase life of cut flowers (days)	Stalk length (cm)	Flower weight (g)	Flower diameter (cm)
T_1 - GA_3 @ 100 ppm	39.00	6.17	24.83	2.10	6.21
T_2 - GA_3 @ 200 ppm	40.33	6.33	27.50	2.40	6.50
T_3 - NAA @ 100 ppm	36.67	5.50	22.33	1.50	5.63
T_4 - NAA @ 150 ppm	37.00	5.33	24.00	1.52	5.65
T_5 - Boron @ 0.2%	39.00	5.33	24.17	1.92	6.12
T_6 - Boron @ 0.3%	40.00	5.50	25.17	1.97	6.62
T_7 - Biovita @ 0.5%	40.00	7.50	26.00	1.96	6.26
T_8 - Biovita @ 1%	40.33	8.17	26.50	2.08	6.74
T_9 - Humicil @ 0.5%	39.00	6.17	26.33	2.17	6.52
T_{10} - Humicil @ 1%	39.67	6.00	25.67	2.27	6.93
T_{11} - Azospirillum @ 4%	39.00	6.50	26.00	2.33	7.20
T_{12}- Azospirillum @ 8%	41.00	6.67	26.67	2.40	7.39
T_{13} – Control	36.00	5.17	22.00	1.42	5.57
SEm ±	**0.48**	**0.18**	**0.51**	**0.08**	**0.08**
CD @ 0.05	**1.40**	**0.53**	**1.50**	**0.24**	**0.22**

4. CONCLUSION

Increase in flower production both qualitatively and quantitatively are the important objectives to be reckoned in commercial flower cultivation. As overall result, the use of biostimulants affected the parameters positively and this effect is important during the flower cultivation. Thus, the biostimulants can be applied in minute quantities in flower cultivation without any harmful impact on environment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Patra SK, Beura S, Shasani T. Efficacy of GA_3 on growth and flowering regulation of *in vitro* raised hybrid gerbera under shade net. Agric. Sci. Digest. 2015;35(3):173-177.
2. Kumar V, Umrao V, Singh M. Effect of GA_3 and IAA on growth and flowering of carnation. Hort. Flora Res. Spect. 2011;1(1):69-72.
3. Phengphachanh B, Naphrom D, Bundithya W, Potapohn N. Effects of day-length and gibberellic acid (GA_3) on flowering and endogenous hormone levels in *Rhynchostylis gigantean*. J. Agric Sci. 2012;4(4):217-222.
4. Sharifuzzaman SM, Ara KA, Rahman MH, Kabir K, Talukdar MB. Effect of GA_3, CCC and MH on vegetative growth flower yield and quality of chrysanthemum. Int. J. Expt. Agric. 2011;2(1):17-20.
5. Kumar KP, Padmalatha T, Pratap M, Narendar RS. Effect of plant bio-regulators on growth, flowering and seed yield in China aster (*Callistephus chinensis* L. Nees) cv. Kamini. Ind. J. Agric. Res. 2015;49(4):348-352.
6. Gupta VN, Chakrabarty D, Datta SK. Influence of different holding solutions on post-harvest behavior of cut flowers: Chrysanthemum (*Dendranthema grandiflora* Tzevlev). J. Orn. Hort. 2013;9(2):80-84.
7. Pruthvi PH. Standardization of biostimulants for growth, yield and quality of chrysanthemum (*Dendranthema grandiflora* Tzvelev) under protected cultivation (M. Sc. Thesis). Univ. Agric. Hort. Sci. Shivamogga; 2016.
8. Rakesh, Singhrot RS, Beniwal BS. Effect of GA_3 and pinching on growth and yield in chrysanthemum. South Ind. Hort. 2003;32(2):61-63.

9. Gautam SK, Sen NL, Jain MC, Dahora LK. Effect of plant regulators on growth, flowering and yield of chrysanthemum (*Chrysanthemum morifolium* Ram.) cv. Nilima. The Orissa J. Hort. 2006;34(1):36-40.

10. Chaudhari CK, Jadav RG, Masu MM. Effect of biofertilizers and their combinations with nitrogen fertilizer on growth, yield and quality of rose. Asian J. Hort. 2009;4(2):373-376.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/21983