The Pharma Innovation Journal 2022; 11(5): 1969-1972

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(5): 1969-1972

www.thepharmajournal.com
Received: 20-02-2022
Accepted: 15-04-2022

Aditi B Hande
M.Sc., Department of Floriculture and Landscape Architecture, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Sudhir R Dalal
Head, Horticulture section, College of Agriculture, Akola Dr. PDKV Akola, Maharashtra, India

Anuradha A Watane
Ph.D. Scholar, Department of Floriculture and Landscape Architecture, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Atul D Warade
Assistant professor, Horticulture section, College of Agriculture, Dr. PDKV Akola, Maharashtra, India

Corresponding Author:
Aditi B Hande
M.Sc, Department of Floriculture and Landscape Architecture, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Response of plant growth regulators on growth, flowering and yield of China aster (*Callistephus chinensis* (L) Nees.)

Aditi B Hande, Sudhir R Dalal, Anuradha A Watane and Atul D Warade

Abstract
A field investigation entitled "Response of plant growth regulators on growth, flower yield and quality of China aster (*Callistephus chinensis* (L) Nees)" was carried out during the year 2020-21 at Department of Floriculture and Landscape Architecture, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the objectives to study the effect of different growth regulators on growth, flowering, yield and flower quality of China aster cv. Phule Ganesh White and to find out the suitable concentration of growth regulators for higher and quality production of China aster. The experiment was laid out in Randomized Block Design with ten (10) growth regulator treatments which were replicated thrice. The treatment comprised three levels each of GA_3 (50,100 and 150 ppm), Salicylic acid (50,100 and 150 ppm) and Triacontanol (1500, 2000 and 2500 ppm) along with control (water spray).

The result of the present investigation indicated that, the growth regulator treatments significantly influenced the growth, flowering and yield of China aster. Maximum vegetative growth of China aster plant *viz*. plant height (70.36 cm), number of branches per plant (11.18), plant spread (39.88 cm) and leaf area (46.21 cm^2) were recorded with GA_3 @ 150 ppm spray. However, flowering parameters *viz*, minimum days for emergence of first flower bud (49.78 days), 50 per cent flowering (61.03 days) and first harvesting (64.25 days) were recorded with Triacontanol @ 1500 ppm and maximum duration (36.02 days) of flowering was recorded with Triacontanol @ 2000 ppm spray. In respect to yield parameters, maximum flower yield per plant (318.42 g), per plot (8.91 kg) and per hectare (3.53 t) were recorded with GA_3 @ 150 ppm spray.

Keywords: China aster, GA_3, Salicylic acid, Triacontanol.

Introduction

China aster (*Callistephus chinensis* L. Nees.) is an important flowering annual crop belonging to family Asteraceae. The main stay of Indian floriculture is growing of traditional flowers in open field conditions. The area under sector is expanding at a rate of 7% while the trade in the sector is growing at a steady pace of 10% per annum. Only 1.5% of area is under the cut flower crops grown primarily under the polyhouses to cater to the export markets. In Maharashtra, total area under floriculture was 11.36 thousand hectares during the year 2018-2019 with the production of 57.61 and 0.11 thousand MT of loose and cut flowers, respectively (Anon, 2018) [2]. China aster as a cut flowers last for long and are used in vases and floral decoration and loose flowers are used in garland. Aster also make very showy bedding plants when grown in large masses and are valuable for filling up the gap in mixed herbaceous border, the dwarf type are put in front and the taller behind. Some strains are used as pot plants. Dwarf cultivars are also suitable for edging and window boxes. Plant growth regulators play an important role in flower production, which in small amount promotes or inhibits or quantitatively modifies growth and development. Growth regulators find their extensive use in ornamental crops for modifying their developmental process. Plants growth and flowering depend on PGRs equilibrium and plants its quickly response to change of hormonal balance (Khangoli, 2001) [6]. Plant growth regulators *viz*. Gibberellic acid, Salicylic acid and Triacontanol are widely used physiological manipulators which can be used for productivity and quality enhancement of growth, flowering and yield of flower crop. Plant growth substances have been used as an effective tool to improve vegetative as well as reproductive function of plant (Meena *et al*., 2017) [10]. Even the same growth regulator at different dose can bring about different results. Hence, attempt has been made to undertake the experiment on Response of plant growth regulators on growth, flowering and yield of China aster.

Materials and Methods

The present investigation entitled "Response of plant growth regulators on growth, flowering and yield of China aster (*Callistephus chinensis* (L) Nees.)" was carried out at Department of Floriculture and Landscape Architecture, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during October, 2020 to March 2021. A field experiment was laid out with ten treatments *viz.* GA_3 @ 50 ppm (T_1), GA_3 @ 100 ppm (T_2), GA_3 @ 150 ppm (T_3), Salicylic acid @ 50 ppm (T_4), Salicylic acid @ 100 ppm (T_5), Salicylic acid @ 150 ppm (T_6), Triacontanol @ 1500 ppm (T_7), Triacontanol @ 2000 ppm (T_8), Triacontanol @ 2500 ppm (T_9) and Water spray (T_{10}). The treatments were replicated thrice in a Randomized Block Design. The experiment was conducted in 96.6 m^2 area in which total 30 beds were plotted each having the gross plot size 1.2 m × 2.10 m. The materials of the experiment were collected from Department of Floriculture and Landscape Architecture, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. In this present investigation the growth regulators of the respective concentration were sprayed twice at 20 and 30 days after transplanting with the help of hand sprayer. The whole plants were sprayed completely by taking precaution to avoid the mixing of spray from one treatment to another.

Results and Discussion:

A) Effect of plant growth regulators on growth parameters

The data presented in Table 1 in respect of growth parameters *viz*. plant height, number of branches per plant, plant spread and leaf area of China aster was significantly influenced by different growth regulators treatments. Significantly maximum plant height (70.36 cm), number of branches per plant (11.18), plant spread (39.88 cm) and leaf area (46.21 cm^2) were recorded with the treatment T_3 (GA_3 @ 150 ppm). This was followed by the treatment T_5 (69.81 cm, 10.97, 38.74 cm and 45.89 cm^2, respectively). However, significantly minimum plant height (51.22 cm), number of branches per plant (7.65), plant spread (24.62 cm) and leaf area (36.52 cm^2) were recorded with the treatment T_{10}. This might be due to the fact that, an application of GA_3 at different concentrations might have enhanced the plant height by increasing the internodal length as a result of increased cell elongation and faster cell division. The results are in conformity with the findings of Kumar *et al.* (2018) [7] and Vijayakumar *et al.* (2017) [16, 17] in China aster. Maximum number of branches per plant be due to the fact that, GA_3 is known to influence translocation and transcription mechanism of protein biosynthesis, also stimulation of cell division and cell elongation while increasing plasticity of cell wall and formation of energy rich phosphates resulting in an increased plant height with more number of productive branches. The present study confirms the results of Kuri *et al.* (2018) [8] and Maurya and Singh (2018) [9] in China aster. Maximum plant spread might be due to the fact that, an application of gibberellic acid at different concentrations might have enhanced the plant spread by increasing the internodal length as a result of increased cell elongation and faster cell division. The results are in conformity with the findings of Vinutha *et al.* (2017) [18] in China aster and Sharifuzzaman *et al.* (2011) [14] in chrysanthemum and maximum leaf area might be due to the fact that, gibberellic acid plays a vital role in improvement of vegetative growth characters of the plants as it enhances the cell division by promoting the DNA synthesis in the cells. Further, GA_3 is also known to increase the sink strength of the actively growing plant parts. This would have resulted into the better leaf area of China aster plants. The findings are in close agreement with the findings of Palekar *et al.* (2018) [12] in China aster and Sajid *et al.* (2016) [13] in chrysanthemum.

B) Effect of plant growth regulators on flowering parameters

The data presented in Table 1 exhibited significant differences among the treatments of plant growth regulators on flowering parameters *viz*. days required for emergence of first flower bud, days to 50 per cent flowering, days to first harvesting and duration of flowering of China aster**.** The treatment T_7 (Triacontanol @ 1500 ppm) recorded significantly minimum days to first flower bud emergence (49.78 days), days to 50 per cent flowering (61.03 days) and days to first harvesting (64.25 days) which was significantly superior than rest of all the treatments. While, duration of flowering was more (36.02 days) was with the treatment T_8 (Triacontanol @ 2000 ppm). However, maximum days required for first flower bud emergence (66.91 days), days to 50 per cent flowering (76.17 days) and days to first harvesting (79.86 days) and less flowering duration were recorded with the treatment T_{10}. The reason for emergence of first flower bud might be the availability of optimum quantity of Triacontanol @ 1500 ppm under this treatment resulting in significantly reduced days for emergence of first flower bud. This is in accordance with the findings of Vijayakumar *et al.*, (2017) [16, 17] and Kuri *et al.*, (2018) [8] in China aster. Days to 50% flowering, Days required for first harvesting and duration of flowering might be due to the availability of optimum quantity of Triacontanol under this treatment resulting in significantly earlier 50% flowering, reduce days for first harvesting and increased duration of flowering. This is in accordance with the findings of Kuri *et al.* (2018) [8] in China aster.

C) Effect of plant growth regulators on yield parameters

Flower yield per plant, per plot and per hectare: The data in respect of flower yield per plant (g)**,** flower yield per plot (kg), flower yield per ha (t) in China aster as influenced by different treatments of plant growth regulators is presented in Table 1 which exhibited significant differences among the different treatments exhibited significant differences among the different treatments in China aster.

Maximum flower yield per plant (318.42 g), per plot (8.91 Kg) and per hectare (3.53 t) were recorded with the treatment T_3 (GA_3 @ 150 ppm). This was followed by the treatment T_2 (307.58 g, 8.61 Kg and 3.41 t respectively). The treatments T_3 and T_2 were at par with each other. However, significantly minimum flower yield per plant (246.11 g), per plot (6.89 g) and per hectare (2.73 t) were recorded with the treatment T_{10}. An increase in flower yield per plant, per plot and per hectare in China aster with the application of gibberellic acid at concentration of 150 ppm might be due to the production of large number of laterals at early stage of growth which had sufficient time to accumulate carbohydrate for proper flower bud differentiation due to enhanced reproductive efficiency and photosynthesis restrictive plant type. The findings are in line with the results obtained by Aklade *et al.* (2009) [1] in chrysanthemum, Munikrishnappa and Chandrashekar (2014) [811], Vijayakumar *et al.* (2017) [16, 17], Imandi and Subba Reddy (2017) [4] in Marigold, Sindhuja *et al.* (2018) [15] and Kuri *et al.* (2018) [8] in China aster.

Table 1: Effect of plant growth regulators on growth, flowering and yield of China aster

Parameters	Growth parameters				Flowering parameters				Yield parameters		
Treatment	Plant height (cm) 75 DAT	Number of branches per plant 60 DAT	Plant spread (cm)	Leaf area (cm^2)	Days for emergence of first flower bud (days)	Days for 50 per cent flowering (days)	Days to first harvesting (days)	Duration of flowering (days)	Flower yield per plant (g)	Flower yield per plot (Kg)	Flower yield per ha (t)
T_1-GA_3 @ 50 ppm	59.20	8.78	29.15	41.61	62.33	72.64	75.64	29.36	297.12	8.31	3.30
T_2-GA_3 @ 100 ppm	67.55	10.36	36.56	44.07	59.14	69.47	72.12	32.61	307.58	8.61	3.41
T_3-GA_3 @ 150 ppm	70.36	11.18	39.88	46.21	57.46	68.43	71.77	33.77	318.42	8.91	3.53
T_4-Salicylic acid @ 50 ppm	58.14	8.37	27.50	41.37	63.23	74.67	77.56	27.04	264.06	7.39	2.93
T_5-Salicylic acid @ 100 ppm	69.81	10.97	38.74	45.89	61.52	71.22	74.33	28.55	279.08	7.81	3.09
T_6-Salicylic acid @ 150 ppm	64.55	9.48	32.53	43.13	64.56	75.44	78.21	26.73	273.91	7.66	3.04
T_7-Triacontanol @ 1500 ppm	65.71	9.79	35.61	44.58	49.78	61.03	64.25	35.65	301.66	8.44	3.35
T_8-Triacontanol @ 2000 ppm	62.33	9.14	31.78	40.19	53.37	64.79	67.98	36.02	291.30	8.14	3.23
T_9-Triacontanol @ 2500 ppm	56.80	8.28	26.46	38.44	55.69	66.82	69.44	34.36	286.49	8.02	3.18
T_{10}-Water spray	51.22	7.65	24.62	36.52	66.91	76.17	79.86	23.14	246.11	6.89	2.73
'F' test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE (m) ±	1.28	0.14	0.49	0.62	0.96	1.07	1.11	0.45	4.30	0.12	0.048
CD at 5%	3.81	0.43	1.46	1.86	2.85	3.20	3.30	1.35	12.79	0.36	0.14

Conclusion

From the findings of present investigation, maximum vegetative growth of China aster plant *viz*, plant height, number of branches per plant, plant spread and leaf area in growth and maximum flower yield per plant, per plot and per hectare in yield parameter were recorded with GA_3 @ 150 ppm spray. With respect to flowering parameters *viz*, minimum days for emergence of first flower bud, 50 per cent flowering and first harvesting were recorded with the treatment Triacontanol @ 1500 ppm and maximum duration of flowering was recorded with the treatment Triacontanol @ 2000 ppm spray. Among all the treatments applied the treatment GA_3 at 150 ppm registered as best in growth and yield characters than other treatments, so the application of GA_3 at 150 ppm will leads to get higher growth and yield.

References

1. Aklade SA, Bardhan K, Singh P, Kakade DK, Pathan AB. Effect of PGR's on growth, flowering and flower yield of chrysanthemum (*Chrysanthemum indicum* L.) cv. 'Local white'. Asian J. of Hort. 2009;4(2):491-493.
2. Anonymous. Indian Horticulture Database, 2018. http//www.nhb.gov.in.
3. Huziwara Y. Karyotype analysis in Bellis, Callistephus and Solidago. Kromosomo. 1954;21:773-76.
4. Imandi S, Reddy GV. Effect of plant growth regulators on vegetative growth, flowering, yield and shelf life of the marigold cv. Siracole. Int. J. of Agril. Sci. and Res. 2017L7(4):65-70.
5. Janakiram T. China aster. In: Advances in ornamental Horticulture. (Ed. Bhattacharjee, S. K.). Pointer Publishers, 2006, 247-266.
6. Khangoli S. Potential of growth regulators on control of size and flowering of ornamental plants. Proc First Applied Sci. Seminar on Flowering and Ornamental Plants. Mahallat, Iran, 2001.
7. Kumar S, Singh AK, Singh A, Singh A. Effect of plant growth regulators on growth and flowering characters of China aster (*Callistephus chinensis* L. Nees) cv. ostrich feather. J. of Pharmacognosy and Phytochem. 2018;7(2):3149-3153.
8. Kuri S, Bahadur V, Prasad VM, Bander AN, Niranjan R. Effect of plant growth regulators on vegetative, floral and yield characters of China aster (*Callistephus chinensis* (L.) Nees.) cv. Phule Ganesh Purple. Int. J. of Chem. Studies. 2018;6(4):3165-3169.
9. Maurya R, Singh SP. Responses of plant growth regulators on China aster (*Callistephus chinensis*). J. of Pharmacognosy and Phytochem. 2018;7(2):19-21.
10. Meena VK, Dubey AK, Jain VK, Tiwari A, Negi P. Effect of plant growth promoters on flowering and fruiting attributes of okra (*Abelmoschus esculentus* (L.) Moench). Crop research. 2017;52(1-3):37-40.
11. Munikrishnappa P, Chandrashekar SY. Effect of growth regulators on growth and flowering of China aster (*Callistephus chinensis* (L.) Nees.). Agril. Res. Communication Centre Agri. Reviews. 2014;35(1):57-63.
12. Palekar AR, Raut VU, Watane AA, Thakre SA. Growth, flowering and quality of China aster flowers influenced by various plant growth regulators. Int. J. of Chem.

Studies. 2018;6(5):1182-1184.
13. Sajid M, Amin N, Ahmad H, Khan K. Effect of Gibberellic acid on enhancing flowering time in chrysanthemum morifolium. Pak. J. Bot. 2016;48(2):477-483.
14. Sharifuzzaman S, 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. Agri. 2011;2(1):17-20.
15. Sindhuja M, Prasad VM, Vinayak Koradakera. Effect of different plant growth regulators and their levels on floral yield and vase life of China aster [*Callistephus chinensis* (L.) Nees] cv. Shashank. Int. J. Curr. Microbiol. App. Sci. 2018;7(01):3391-3396.
16. Vijayakumar S, Rajadurai KR, Pandiyaraj P. Effect of plant growth regulators on flower quality, yield and post harvest shelf life of China aster (*callistephus chinensis* L. Nees.) cv. Local. Int. J. of Agril. Sci. and Res. 2017;7(2):297-304.
17. Vijaykumar S, Rajadurai KR, Pandiaraj P, Elangaivendan A. Effect of plant growth regulators on vegetative and physiological parameters of China aster (*Callistephus chinensis* L. Nees.) cv. Local. Int. J. of Agri. Sci. 2017;9(17):4148-4150.
18. Vinutha DB, Naik BH, Chandrashekar SY, Thippeshappa GN, Kantharaj Y. Efficacy of biostimulants growth, flowering and quality of China aster cv. Kamini. 2017;20(2):1-5.