Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(6): 1490-1492
Received: 22-09-2018
Accepted: 24-10-2018

Mamilla Sindhuja
Agricultural Horticulture, Floriculture and Landscaping, Department of Horticulture, SHUATS, Allahabad, Uttar Pradesh, India

VM Prasad
Department of Horticulture, SHUATS, Allahabad, Uttar Pradesh, India

Correspondence
Mamilla Sindhuja
Agricultural Horticulture, Floriculture and Landscaping, Department of Horticulture, SHUATS, Allahabad, Uttar Pradesh India

Effect of different plant growth regulators and their levels on vegetative growth, floral yield and vase life of China aster [*Callistephus chinensis* (L.) Nees]: A review

Mamilla Sindhuja and VM Prasad

Abstract

The present investigation entitled "Effect of different plant growth regulators and their levels on vegetative growth, floral yield and vase life of China aster [*Callistephus chinensis* (L.) Nees] cv. Shashank" was under taken at Department of Horticulture, Naini Agriculture Institute, Sam Higginbottom university of Agriculture, Technology and Sciences (SHUATS), during the year 2016-17 with thirteen treatments which replicated thrice in a Randomized Complete Block Design. The treatments comprising of GA_3, NAA, CCC and their different concentrations along with control. The results of the study revealed that maximum growth attributes like plant height (75.74 cm), plant spread (37.7 cm), number of leaves per plant (168.15), number of branches per plant (32.01), floral attributes like number of flowers per plant (71.54), flower diameter (6.21 cm), flower weight (5.5 g), flower yield per hectare (12.58 t) was recorded by the application of GA_3 at 200 ppm. The minimum duration for bud initiation (51.67), minimum days to flowering (65.86) with maximum vase life (9.0 days) were recorded in CCC @ 1500 pm.

Keywords: China aster, GA_3, NAA, CCC

Introduction

Callistephus chinensis is to be considered as one of the important commercial flower (2n=18) belongs to family Asteraceae and native to China. Its generic name Callistephus is derived from two Greek words Kallos-beauty and stephonusa crown allowing large colourful flower heads. Asters have been developed from single form of wild species *Callistephus chinensis* (Nandre *et al.*, 2009) [10]. The commercial importance of china aster increasing day by day in India specially in Karnataka, Tamil Nadu, West Bengal and Maharashtra. Its cultivation has been found to be a profitable enterprise for eastern Uttar Pradesh. In periurban surroundings of Bangalore (Karnataka) and Pune (Maharashtra) alone, it is being grown in an area of 500 and 400 ha, respectively (Sonu kumar *et al.*, 2018) [14].

Among annual flowers it ranks next to chrysanthemum and marigold (Sheela 2008) [13]. China aster is a free blooming, half hardy, easy growing, and winter annual, grown for cut flower as well as loose flower. The plant was a single flowering and branching type having a height of about 60cm. Since its introduction to Europe the plant has undergone a remarkable change in form, size and colour of flowers. Now the plat range in height from 15cm to about 1m with pompon flowers about size of a button to large flower heads having single, double, anemone-flowered, peony- flowered, incurved, quilled or shaggy flower types. The aster bloom contains two kinds of florets: ray florets and disc florets. The bloom type depends mainly upon the relative number of the two kinds of florets and their shapes. The most suitable character for the classification of China aster is the shape of ray florets.

Exogenous application of plant growth regulators in fact has revolutionized agriculture, more particularly horticulture in developed countries. Application of plant growth regulators are playing a leading role in production and post-harvest handling of cut flowers. Application of growth regulators have been an essential part of floriculture and utilization of growth substances constituted one of the most important advances in agro-technology for improving the yield and quality parameters of flowers. The plant growth regulators have been used in floriculture to manipulate plant growth in a desire direction (Sharma *et al.*, 2001) [12].

The growth and yield of the plant is mainly influenced by two principle factors *viz.*, genetic and management factors. In recent years, scientists have paid due attention to the idea of regulating plant growth by means of growth regulators as third most important factor in improving growth, yield and flowers quality in various ways.

These substances modify the plant system, which ultimately affects plant growth and development. Synthetic growth regulating chemicals are become very popular in order to enhance the growth and development of flower crops (Kumar *et al*., 2017) [15].

Effect of GA_3 on growth of China aster

(Sonu kumar *et al*., 2018) [14] Reported that the application of GA_3 @ 300ppm showed maximum plant height (52.27cm), plant spread (33.60cm) and number of leaves (90.00). (Vijay kumar *et al*., 2017) [15] Observed that spraying of GA_3 at 150ppm showed increased plant height (69.03cm), plant spread (37.64 cm), number branches per plant (9.25) and number of nodes per plant (11.47) at 90 DAP in China aster. (Kuri *et al*., 2018) [4] revealed that the maximum plant height (9.55, 39.29, 53.23 and 77.03cm), plant spread (12.65, 20.52, 31.89 and 39.75cm), number of leaves per plant (29.72, 74.32, 126.058 and 170.4) at 30, 60, 90 and 120 days intervals after transplanting, and number of branches per plant (14.39, 23.78 and 33.30) 60, 90 and 120 days intervals after transplanting was recorded GA_3 @ 200ppm in China aster. (Maurya and Singh 2018) [7] reported that among all the treatments GA_3 @ 150ppm resulted maximum plant height (34.56cm and 69.77cm), number of branches per plant (11.90 and 14.00) at 30 and 60 DAP respectively. Leaf area (53.16cm^2). GA_3 @ 75ppm recorded maximum leaf length (6.80cm) and leaf width (5.60cm) in China aster. (Nandre *et al*., 2009) [10] revealed that spraying of GA_3 at 200ppm recorded more plant height, number of branches per plant, number of leaves per plant in China aster. (Kiran kumar 2012) [3] Observed that among the vegetative parameters, the treatments GA_3 200ppm recorded maximum values for plant height, number of branches, internodal length, number of leaves and leaf area over other treatments. (Naik and Katakar 2004) [9] Noticed that foliar spray of GA_3 at 200ppm was effective in increasing plant height in China aster. This is may be due to the factor that GA_3 increased the growth of plant by increasing internodal length which might be due to enhance cell division and cell enlargement and also due to increase in plasticity of cell, promotion of protein synthesis coupled with higher apical dominance. Another probable reason might be due to the effect of gibberellins on photosynthetic activity resulted in efficiently utilizing photosynthetic products by plants. Maximum plant spread might be due to the application of GA_3 which increase cell division and cell elongation in plants resulting in more number of cells and increase in cell length which ultimately affect the number of dormant buds from where primary branches originated which resulting optimum plant spread. Application of GA_3 increase in number of leaves and number of branches per plant might have been resulted due to promontory action and enhanced cell division in shoot tip and cell elongation.

Effect of GA_3 on yield and vase life of China aster

(Kiran Kumar 2012) [3] reported that spraying of GA_3 at 200ppm enhanced the duration of flowering (90.33), number of flowers per plant (68.54), diameter (4.86cm), yield per hectare (30.87q) and vase life (22.88days) in China aster. (Maurya and Singh 2018) [7] reported that among all the treatments GA_3 @ 150ppm showed maximum flower yield (244.26 g/plant). (Kumar *et al*., 2018) [14] Reported that the application of GA_3 @ 300ppm showed maximum number of flowers (12.74) and flower weight (11.20g). (Kuri *et al*., 2018) [4] revealed that the maximum flower weight (6.79g), flower diameter (7.50cm), number of flowers per plant (72.83), flower yield per plant (395.71g) and vase life (10.25days). **(**Munikrishnappa 2014) [8] Spraying of GA_3 at 200 ppm enhanced the duration of flowering (90.33), number of flowers per plant (68.54), flower diameter (4.86 cm), flower weight (3.26 g), flower yield per plant (111.2 g) and vase life (22.88days) in China aster. (Nandre *et al*., 2009) [10] Reported that early flowering and 50 percent flowering were noticed in the treatment of GA_3 @ 100ppm. Whereas, yield in terms of per plant, per plot and per hectare were noticed the maximum in the treatment of GA_3 @ 200ppm in China aster. (Sonu Kumar *et al*., 2018) [14] reported that the minimum days for opening of first flower (58.27days) and maximum flower weight (11.20g) was recorded with GA_3 300ppm followed by GA_3 200ppm, number of flowers were recorded with the application of GA_3 200ppm followed by GA_3 300ppm. The role of GA_3 which optimum level improving the bud size ascribed to the translocation of metabolites at the site of bud development increase in diameter of florets might be due to cell elongation in the flower. Gibberellins are also known to increase the sink strength of actively growing parts. Number of flowers might be due to greater dry matter accumulation which is certainly suggestive to better photosynthesis activity, other metabolic activities and uptake of nutrients from soil. Therefore, the growth promoting substances might have positive influence on the yield of flowers. Increase in weight of flower in treated plants may be attributed to the fact that GA_3 promote the efficacy of plants in terms of photosynthetic activity, uptake of nutrients and their translocation, better partitioning of assimilates into reproductive parts.

Effect of NAA on plant growth and flowering of China aster

(Katkar *et al*., 2005) [2] reported that spraying of NAA at 45, 60 and 75ppm delayed first bud initiation and days to 50% flowering in China aster. (Mankar *et al*., 2006) [6] Revealed that spraying of NAA with different concentrations showed maximum plant height, plant spread, number of leaves, number of branches, leaf area and leaf area index in china aster. (Nandre *et al*., 2009) [10] reported that application of NAA at 100 ppm increased plant height (64.2cm), number of days to first flower bud appearance were lowest with NAA at 100ppm (58.33) compared to NAA 200ppm, days to 50% flowering were lowest with NAA at 100ppm (71.33days) compared with NAA 200ppm and flower yield per plant was highest with NAA at 100ppm (85.25g) in china aster.

Effect of CCC on growth, flowering and vase life of China aster

(Kiran Kumar 2012) [3] Reported that spraying of CCC at 1500ppm recorded minimum number of days to first floret appearance (51.68) and 50 percent flowering (60.25). (Joshi veena and Amarnath Reddy 2006) [1] Reported that reduction in plant height with increase in concentration (500 to 2000ppm) of cycocel application over control. (Ramesh *et al*. 2001) [11] Conducted an experiment on China aster cv. Kamini with different growth substances and concluded that the least duration of 88 days for full flowering was observed with 500 ppm cycocel treatment over the untreated plants (94.5 days). (Katkar *et al*. 2005) [2] Reported that foliar spray with Cycocel at 750 ppm recorded maximum vase life followed by 500 ppm in China aster. Early flowering with Cycocel treated plants might due to the fact that such plants have built up sufficient food reserves at initial stages due to increased number of leaves and leaf area. This reserve food has been utilized for the reproductive purpose with a restriction on vegetative growth by altering C:N and thus earliness in flowering and also due to anti gibberellin action of Cycocel. and thus earliness in flowering and also due to anti gibberellin action of Cycocel. A reduction in the level of endogenous gibberellins might be a pre- requisite for floral induction which was achieved by Cycocel sprays. (Ramesh *et al*., 2001) [11]. Maximum number of flowers per plant with Cycocel treatment than the control might be due to suppression of vegetative growth, which might have resulted in diversion of photosynthates for reproductive growth. Exogenous application of Cycocel might have accelerated the assimilation of photosynthates by changing or altering source/ sink rates which might have direct bearing on synthesis of flowering hormone (Florigen) and thus might be responsible for change of plant from vegetative to reproductive phase thus producing more number of flowers per branch and plant. One of the greatest problem is post-harvest flower physiology is the blockage of the vascular system. This blockage might be due to air or bacterial growth. Another cause of vascular blockage is the plants reaction to the actual cut. Even in the flower stem that is removed from the mother plant, certain enzymes are mobilized to the wounded area where chemicals are released in order to try to seal the wound (Loub and Van Doorn 2004) [5].

Conclusion

The growth regulators GA_3 and CCC have played significant role in inducing or retarding growth of China aster which ultimately results in better quality and increased flower yield also enhancing the vase life of cut flowers.

Acknowledgement

I wish to express my sincere gratitude to Mr. Dr. V.M. Prasad, Professor and Head, Department of Horticulture, SHUATS, Allahabad for providing me an opportunity to do my project work in Department of Horticulture, Naini Agriculture Institute, Sam Higginbottom university of Agriculture, Technology and Sciences (SHUATS), during the year 2016-17.

References

1. Joshi V, Reddy SA. Effect of Cycocel and alar on growth and flowering parameters in China aster (*Callistephus chenensis* (L) Nees.). Journal of Ornamental Horticulture. 2006; 9 (1):71-72.
2. Katakar PB, Naik DM, Bodamwad SG, Gharat SN. Influence of plant growth regulators on flowering, quality and yield of flowers in China aster (*Callistephus chinensis* (L) Nees.) cv. California Giant Mix. South Indian Horticulture. 2005; 53(1-6):378-381.
3. Kumar EK. Studies on the effect of plant growth regulators on growth, flower yield and vase life of China aster [*Callistephus chinensis* (L.) Ness.] cv. Kamini in coastal districts of Andhra Pradesh. *M.Sc. (Hort.) thesis* submitted to the Dr. Y.S.R Horticultural University, Tadepalligudem (AP), 2012.
4. Kuri S, Bahadur V, Prasad VM, Ajay NB, Niranjan R. Effect of plant growth regulators on vegetative, floral and yield characters of China aster (*Callistephus chinensis* (L.) Nees.) cv. Phule Ganesh purple, International Journal of Chemical Studies. 2018; 6(4):3165-3169.
5. Loub, M van Doorn G. Wound-induced and bacteria-induced xylem blockage in roses, Astible, and Viburnum. Postharvest Biology and Technology. 2004; 32:281-288.
6. Manker SS, Haldankar PM, Rangwala AD, Joshi GD. Effect of growth regulators and organic compounds on growth, flowering and yield of china aster (*Callistephus chinensis* (L.) Nees.) var. Ostrich Plum Mixed. South Indian Horticulture. 2006; 54(1-6):311-317.
7. Maurya R, Singh Sp. Responses of plant growth regulators on China aster (*Callistephus chinensis*) Journal of Pharmacognosy and Phytochemistry. 2018; 7(2):19-21.
8. Munikrishnappa PM, Chandrashekar SY. Effect of growth regulators on growth and flowering of China aster (*Callistephus chinensis* L. Nees) Agriculture Reviews. 2014; 35 (1):57-63.
9. Naik and Katakar. Effect of graded levels of plant growth regulators on growth and flower yield of China aster. National symposium on recent trends and future strategies in ornamental horticulture held at University of Agricultural Sciences, Dharwad during, 2004.
10. Nandre DR, Navandar UO, Archana D, Watane. Effect of growth regulators on growth, flowering and yield of China aster. The Asian Journal of Horticulture. 2009; 4(1):50-51.
11. Ramesh KM, Chezhiyan NS. Effect of certain growth substances and salicylic acid on the growth and yield of China aster (*Callistephus chinensis* L. Nees) cv. Kamini. The Orissa journal of Horticulture. 2001; 29(2):41-45.
12. Sharma CP, Maurya AN, Srivastava OP, Mishra A. Role of GA_3, Malic hydrazide and Ethrel in modifying vegetative and floral characters of *Chrysanthemum morifolium* Ram. The Orissa Journal of Horticulture. 2001; 29(2):35-38.
13. Sheela VL. China aster flowers for Trade: Vol.10.Horticulture Science Series, 2008, 113.
14. Sonu Kumar, 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 Journal of Pharmacognosy and Phytochemistry. 2018; 7(2):3149-3153
15. Vijaya Kumar S, Rajadurai KR, Pandiyaraj P, Elangaivendan A. Effect of plant growth regulators on vegetative and physiological parameters of china aster (*Callistephus chinensis* L. Nees.) cv. Local. International Journal of Agriculture Sciences 2017; 9(17):4148-4150.