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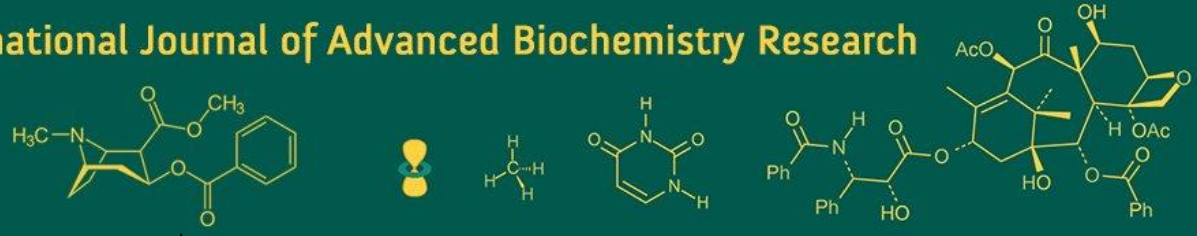

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Response of bio-fertilizers and inorganic manures on floral character of China aster (*Callistephus chinensis* L. Nees) cv. Kamini

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Abstract
The present investigation the response of bio-fertilizers and inorganic manures on floral character of China aster (*Callistephus chinensis* L. Nees) cv. Kamini under at Horticultural Research Farm, Department of floriculture and Landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G) during the year 2019-2020 in Rabi period. The experiment was laid out in a Randomized Block Design with eleven treatments with three replications. The results indicate that the floral character *viz*., days to bud initiation, days to flower opening, number of flowers per plant, number of flowers per plot, flower diameter and length of flower stalk of china aster were significantly influenced by the different bio-fertilizers and inorganic manures. The results revealed that maximum floral character were recorded at the application of T_9 - 75% RDF + 25% Vermicompost + PSB + *Azotobacter* followed by T_8 - 75% RDF + 25% FYM + PSB + *Azotobacter*. While the minimum were observed under T_0 100% RDF (Control).

Keywords: Kamini, bio-fertilizers and China aster

Introduction
China aster [*Callistephus chinensis* (L.) Nees.], a member of the family Asteraceae, is one of the most important annual flower crops grown in many parts of the world. Among annual flowers, its rank third next only to chrysanthemum and marigold. The genus *Callistephus* has only a single species *Callistephus chinensis*. Linnaeus named it *Aster chinensis* at first, but it was renamed to *Callistephus chinensis* by Nees. The single species chinensis belong to the genus Callistephus (Munikrishnappa and Chandrasheker, 2014) [12]. The name *Callistephus* is derivative from two Greek words: Kalistos, which means most attractive and Stephus, which means crown. It symbolizes purity, love, peace, beauty and passion (Naikwad *et al*., 2018) [13]. The colours are varied, including natural pink shades of white, pink, primrose, light blue, lavender, fuchsia, purple, dark blue and scarlet. Kamini variety was derived by crossing two pure lines (AST 6 x AST- 36) and was developed through pedigree method of breeding with the intent of obtaining pink coloured flowering variety for cut flower purpose, which is exceptional to the Local Pink variety.

It is native to China has spread to Europe and other tropical countries during 1731 A.D. It is also an important flower crop of Siberia, USSR, Japan, North America, Switzerland and Europe. It is grown successfully in open conditions for year round production in kharif, rabi and summer to have continuous supply of flowers to the market. In India, China aster is widely cultivated in Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh and West Bengal. However, it is estimated to be grown in an area of 3,500 hectares in India. In Maharashtra, total area under floriculture is 22,000 ha with a total production of 7914 lakh numbers cut flowers and 119 MT loose flowers. Among this, area under China aster is 1,020 ha with a production of flower 800 million tonnes (Bhondave, 2015) [3].

The plant was around 60 cm tall and single blooming type and branching type. There are two types of florets in an aster bloom: 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 feature for the classification of China aster is the form of ray florets. Since its arrival to Europe, the plants form, size and colour of bloom have changed significantly (Sindhuja and Prasad, 2018) [15].

China aster is an economically important seasonal flower. Conventional nutritional applications create threat to soil health. Biofertilizers if effective in this crop can be safer and more economic choice. Hence, the present investigation with Vermicompost + PSB + Azotobacter China aster was taken up. Biofertilizer maintains living cells or latent cells of effective microbial strains. When they are spread through nucleoli or dirt, they help crops absorb nutrients through cooperation in the rhizosphere. They promote the active development of microorganisms in the soil, thereby supplementing the range of nutrient availability in a form that plants can easily adapt. The production of qualified nominated microorganisms with dramatic reproduction is a powerful part of promoting the growth of microorganisms in the soil.

Materials and Methods

The experiment was conducted during 2019-2020 in the Horticultural Research Farm, Department of Horticulture and landscape architecture, College of Agriculture, IGKV, Raipur, (C.G.). The biofertilizers used were Vermicompost, PSB, *Azotobacter*, FYM and the variety of China aster subjected to treatment was Kamini. The treatments were T_1 - control 100% RDF, T_2 - 75% RDF + PSB + *Azotobacter*, T_3 - 50% RDF + PSB + *Azotobacte*r, T_4 - 75% RDF + 25% FYM, T_5 – 50% RDF + 50% FYM , T_6 - 75% RDF + 25% Vermicompost, T_7 - 50% RDF + 50% Vermicompost, T_8 - 75% RDF + 25% FYM + PSB + *Azotobacter*, T_9 - 75% RDF + 25% Vermicompost + PSB+ *Azotobacter*, T_{10} - 50% RDF + 50% Vermicompost + PSB+ *Azotobacter*, T_{11} - 50% RDF + 50% FYM+ PSB + *Azotobacter* The study was carried out in RBD with three replications. Data were recorded on various parameters of floral attributes.

Result and Discussion

Number of days to bud initiation

Number of days to bud initiation exhibited significant differences amongst the treatments. Number of days to bud initiation effect of biofertilizer and inorganic manure. The earliest to bud initiation (69.00 days) was observed in treatment T_9 (75% RDF + 25% Vermicompost + PSB + *Azotobacter*) followed treatment $T_{8,}$ - 75% RDF + 25% FYM + PSB + *Azotobacte*r, T_{10} - 50% RDF + 50% Vermicompost + PSB+ *Azotobacte*r (70.70 days) and maximum days to bud initiation (87.00 days) were taken in treatment T_1 (100% RDF control).

By inoculating *Azotobacter* and phosphate solubilizing bacteria with 75% RDF + 25% Vermicompost observed early days to bud initiation in the plants fertilized with 70% RDF + *Azotobacter* + PSB 0.5 g each in gerbera and an application of Azospirillum + PSB + 50% vermicompost equivalent to RDF + 50% recommended NPK resulted in improvement in bud initiation in garland chrysanthemum Airadevi (2012) [2]. Kumari *et al*., (2017) [9] reported that early bud initiation with application of PSB + 15g phosphorus/m^2 in chrysanthemum.

Number of days taken to flower opening

The days taken to flower opening was varied from 75.67 to 94.01 days. The minimum days to flower opening (75.67 days) was found in treatment T_9 (75% RDF + 25% Vermicompost + PSB + *Azotobacter*) which was found at par with treatment T_6 (75% RDF + 25% Vermicompost) and T_8 (75% RDF + 25% FYM + PSB + *Azotobacter*). However it was showed significantly differ with rest of other treatments. The maximum days taken to flower opening was (94.01 days) observed with treatment T_1 control (100% RDF).

Phosphorus is a vital component and crucial for the induction of flowering and phosphorous solubilizing bacteria is known to intensification the accessibility of phosphorus resultant in earliness in flowering. Related results of earlier flowering by integrate use of nitrogen, phosphorous, potassium and biofertilizers are reported by Chaitra and Patil (2007) [4] and Kirar *et al*. (2014) [7] in China aster. Kumari *et al*. (2017) [9] observed early flowering in chrysanthemum with inoculation of PSB.

Number of flowers per plant

Statistically analyzed data revealed the results for number of flowers per plant. The maximum number of flower per plant (30.51) was noted in treatment T_{12} (75% RDF + 25% Vermicompost + PSB + *Azotobacter*) which was found at par with treatment T_8 (75% RDF + 25% Vermicompost + PSB + *Azotobacter*) and T_6 (75% RDF + 25% Vermicompost). However it was showed significantly differ with rest of other treatments. The minimum number of flower noted plant was (23.60) observed with treatment T_1 control (100% RDF).

The maximum flowers number per plant might be due to suitable nitrogen, phosphorus and potassium adaptation with extra nitrogen fixing and P2O5solubilizing capability and excretion of growth regulator by the organic manure. Similar results were also reported by Gupta *et al*. (1999) [6] in marigold, Mittal *et al*. (2010) [11] and Kumar *et al*. (2009) [8] in African marigold, Meshram *et al*. (2008) [10] in annual chrysanthemum and Chougala *et al*. (2014) [5] in double daisy.

Number of flowers per plot

The data recorded on average number of flowers per plot revealed that the higher count of flower each plot (1068.70) was noted in the treatment T_9 (75% RDF + 25% Vermicompost + PSB + *Azotobacter*) which was statistically similar with treatment (1008.00) T_8 (75% RDF + 25% FYM + PSB + *Azotobacter*). However, it differed significantly with rest of the other treatments. The minimum number of flower per plot noted plant was (826.00) observed with treatment T_1 control (100% RDF). This results in accordance with findings of Chaitra and Patil (2007) [4], Kirar *et al*., (2014) [7] in China Aster; Mittal *et al*., (2010) [11] in African Marigold; Panchal *et al*., (2010) [14] in annual chrysanthemum.

Table 1: Response of bio-fertilizers and inorganic manures on floral character of China aster (*Callistephus chinensis* L. Nees) cv. Kamini

Treatments	Number of days to bud initiation	Number of days to flower opening	Number of flowers per plant
T_1 - 100% RDF (Control)	87.00	94.01	23.60
T_2 - 75% RDF + PSB + Azotobacter	75.00	81.67	26.41
T_3 - 50% RDF + PSB + Azotobacter	82.30	89.50	25.7
T_4 - 75% RDF + 25% FYM	71.70	78.20	25.71
T_5 - 50% RDF + 50% FYM	75.30	82.94	25.00
T_6 - 75% RDF + 25% Vermicompost	71.30	77.33	26.52
T_7 - 50% RDF + 50% Vermicompost	79.00	85.52	26.21
T_8 - 75% RDF + 25% FYM + PSB + Azotobacter	70.70	77.45	28.80
T_9 -75% RDF + 25% Vermicompost + PSB+ Azotobacter	69.00	75.67	30.51
T_{10} - 50% RDF + 50% Vermicompost + PSB+ Azotobacter	70.70	78.60	24.52
T_{11} - 50% RDF + 50% FYM+ PSB + Azotobacter	71.70	78.32	26.11
SEm±	3.90	1.93	1.21
CD at 5% level	11.54	5.72	3.57

Table 2: Response of bio-fertilizers and inorganic manures on floral character of China aster (*Callistephus chinensis* L. Nees) cv. Kamini

Treatments	Number of flowers per plot	Flower diameter (cm)	Stalk length (cm)
T_1 - 100% RDF (Control)	826.00	3.80	33.00
T_2 - 75% RDF + PSB + Azotobacter	924.01	4.00	36.09
T_3 - 50% RDF + PSB + Azotobacter	900.71	4.00	37.30
T_4 - 75% RDF + 25% FYM	900.70	4.01	37.71
T_5 - 50% RDF + 50% FYM	875.00	4.01	37.60
T_6 - 75% RDF + 25% Vermicompost	928.70	4.02	38.10
T_7 - 50% RDF + 50% Vermicompost	917.00	4.20	37.70
T_8 - 75% RDF + 25% FYM + PSB + Azotobacter	1008.00	4.30	38.60
T_9 -75% RDF + 25% Vermicompost + PSB+ Azotobacter	1068.70	4.50	41.04
T_{10} -50% RDF + 50% Vermicompost + PSB+ Azotobacter	856.30	4.20	38.06
T_{11} -50% RDF + 50% FYM+ PSB + Azotobacter	914.70	4.20	38.09
SEm±	42.40	0.12	0.93
CD at 5% level	125.28	0.36	2.77

Flower diameter (cm)

The flower diameter was varied from 3.80 to 4.50 cm. The maximum flower diameter (4.50 cm) was found in Treatment T_9 (75% RDF + 25% Vermicompost + PSB+ *Azotobacter*) which was found at par with Treatment T_8 (75% RDF + 25% FYM + PSB + *Azotobacter*), T_7 (50% RDF + 50% Vermicompost), T_{10} (50% RDF + 50% Vermicompost + PSB+ *Azotobacter*) and T_{11} (50% RDF + 50% FYM+ PSB + *Azotobacter*). Whereas it was showed significantly differ with rest of other treatments. The minimum flower diameter was (3.80 cm) observed with treatment T_1 control (100% RDF).

This may be attributed to the proper absorption of nutrients by plants and the inoculation of biological fertilizers and their translocation to florets. The results are consistent with the findings of Kirar *et al*., (2014) [7]. The largest flower head length and width were reported in Chinese aster with RDF of 75% + vermicompost + 25% PSB + *Azotobacter*.

Stalk length (cm)

The data regarding average flower stalk length determined in various treatments are as follows, the length of flower stalk ranged from 33.00 cm to 41.04 cm. Longest length of flower stalk (41.04 cm) was recorded in plants receiving treatment T_9 (75% RDF + 25% vermicompost +PSB + *Azotobacter*) which was found at par with Treatment T_8 (75% RDF + 25% FYM + PSB + *Azotobacter*), T_6 (75% RDF + 25% Vermicompost), Whereas it was showed significantly differ with rest of other treatments. The shortest stalk length was (33.00 cm) observed with treatment T_1 control (100% RDF). The similar result also reported of Agrawal *et al*., (2002) [1] in African Marigold.

Conclusion

The results of the present investigation revealed that the nutritional requirement of china aster could be fulfilled with the exclusive use of different bio-fertilizers and inorganic manures on floral character of china aster. The majority of the floral characteristics of plants, including days to bud initiation, days to flower opening, number of flowers per plant, number of flowers per plot, flower diameter and length of flower stalk, were found to respond best to Treatment T_9 (75% RDF + 25% vermicompost +PSB + *Azotobacter*) which was followed by Treatment T_8 (75% RDF + 25% FYM + PSB + *Azotobacter*).

References

1. Agrawal S, Agrawal N, Dixit A, Yadav RN. Effect of N and K_2O on African Marigold in Chhattisgarh region. Journal of Ornamental Horticulture New Series. 2002;5(1):86.
2. Airadevi AP. Integrated nutrient management studies in garland chrysanthemum (*Chrysanthemum coronarium* L.). Bioinfolet. 2012;9(4A):460-434.
3. Bhondave SS. Seed set studies in China aster (*Callistephus chinensis* (L.) Nees). M. Sc. Thesis. Rahuri: MPKV; c2015.
4. Chaitra R, Patil VS. Integrated nutrient management studies in growth, yield and flower quality in China Aster (*Callistephus chinensis* (L.) Ness). Karnataka Journal of Agriculture Science. 2007;20(3):689-690.

5. Chougala V, Patil VS, Paramagoudar P. Effect of integrated nutrient management on yield and quality of double daisy (*Aster amellus* L.). Trends in Biosciences. 2014;7(14):1820-1823.
6. Gupta NS, Sadavarte KL, Mahorkar VK, Jadhav BJ, Dorak SV. Effect of graded levels of nitrogen and bio inoculants on growth and yield of marigold. Journal of Soils and Crops. 1999;9(1):80-83.
7. Kirar KPS, Lekhi R, Sharma S, Sharma R. Effect of integrated nutrient management practices on growth and flower yield of China Aster (*Callistephus chinensis* (L.) Ness) CV. Princess. In: Mishra GC, editor. Agriculture Towards a New Paradigm of Sustainability. New Delhi: Excellent Publishing House; c2014. p. 234-237.
8. Kumar S, Agrawal N, Dixit A, Yadav RN. Effect of N and K_2O on African Marigold in Chhattisgarh region. Journal of Ornamental Horticulture New Series. 2009;5(1):86.
9. Kumari S, Prasad VM. Effect of bio and biofertilizers on plant growth and yield of petunia (*Petunia hybrida*) var. Picotee. International Journal of Chemical Studies. 2017;5(4):1251-1254.
10. Meshram N, Bdge S, Bhongle SA, Khiratkar SD. Effect of bioinoculants with graded doses of NPK on flowering, yield attributes and economics of annual chrysanthemum. Journal of Soils and Crops. 2008;18(1):217-220.
11. Mittal R, Patel HC, Nayee DD, Sitapara HH. Effect of integrated nutrient management on growth and yield of African marigold (*Tagetes erecta* L.) CV 'Local' under middle Gujarat agro climatic conditions. Asian Journal of Horticulture. 2010;5(2):347-349.
12. Munikrishnappa V, Chandrashekhar S. Influence of micronutrients on growth, flowering and yield of African marigold (*Tagetes erecta* L.). Journal of Pharmacognosy and Phytochemistry. 2014;10(3):461-463.
13. Naikwad DK, Kandpal MG, Patil A, Kulkarni V. Correlation and path analysis in China aster (*Callistephus chinensis* L.). International Journal of Current Microbiology and Applied Sciences. 2018;7(2):3353-3362.
14. Panchal RV, Parekh NS, Parmar AB, Patel HC. Effect of biofertilizer and nitrogenous fertilizer on growth, flowering and yield of annual white chrysanthemum (*Chrysanthemum coronarium* L). Asian Journal of Horticulture. 2010;5(1):22-25.
15. Sindhuja M, Prasad VM. Effect of different plant growth regulators and their levels on vegetative growth, floral yield and vase life of China aster (*Callistephus chinensis* (L.) Nees). Journal of Pharmacognosy and Phytochemistry. 2018;7(6):1490-1492.