Journal of Advances in Biology & Biotechnology

Volume 27, Issue 12, Page 917-922, 2024; Article no.JABB.127340
ISSN: 2394-1081

Impact of Bio-fertilizers and Inorganic Manures on Flower Yield Attributes of China Aster (*Callistephus chinensis* L. Nees) cv. Kamini

Nileema Pandey [a++*], Jitendra Singh [b#] and Akhileshwar Sahu [c++]

[a] Department of Floriculture and Landscape Architecture, CoA, IGKV, Raipur – 492012 (C.G.), India.
[b] Department of Vegetable Science, MGUVV, Durg (C.G.), India.
[c] Department of Floriculture and Landscape Architecture, Indira Gandhi Krishi Vishwavidyalaya Raipur (C.G.), India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jabb/2024/v27i121838

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers,peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/127340

Original Research Article

Received: 04/10/2024
Accepted: 06/12/2024
Published: 30/12/2024

ABSTRACT

The impact of bio-fertilizers and inorganic manures on China aster was studied during 2019-2020 at Horticultural Research Farm, Department of floriculture and Landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G) in Rabi period. The China aster has become one of the most popular garden flowers. Among the colours present in all of the many

---

[++]M.Sc. Horticulture;
[#]Professor;
**Corresponding author: E-mail: nileemapandey94@gmail.com;*

Cite as: *Pandey, Nileema, Jitendra Singh, and Akhileshwar Sahu. 2024. "Impact of Bio-Fertilizers and Inorganic Manures on Flower Yield Attributes of China Aster (Callistephus Chinensis L. Nees) Cv. Kamini". Journal of Advances in Biology & Biotechnology 27 (12):917-22. https://doi.org/10.9734/jabb/2024/v27i121838.*

variations are pure white, purple, dark blue, numerous shades of pink, pastel blue, and red.Treatments comprised of 50, 75 and 100% of the recommended dose in combination with bio-fertilizers Azotobacter, Vermicompost, PSB and FYM proved to be the most effective in increasing the weight of individual flower (g), flower yield per plant (g), flower yield per plot (kg) and flower yield per hectare (q). Flower yield per plant recorded significant variations among the different treatments, the maximum flower yield (39.36g) per plant was obtained in treatment T9 (75%RDF +25% Vermicompost +PSB + Azotobacter) which exhibited similar result with the treatment T8 (75% RDF + 25% FYM + PSB +Azotobacter).

Keywords: FYM; azotobacter; vermicompost and China aster.

1. INTRODUCTION

“China aster [*Callistephus chinensis* (L). Nees] belongs to one of the largest families of flowering plants, ‘Asteraceae’. It’s diploid (2n) chromosome number is 18” (Huziwara, 1954). “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).“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). “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” (Huziwara, 1954).

It is native to China has spread to Europe and other tropical countries during 1731 A.D. (Desai, 1967). “The China aster has become one of the most popular garden flowers. Among the colours present in all of the many variations are pure white, purple, dark blue, numerous shades of pink, pastel blue, and red. Aster does not have a pure golden color. Flower with more petals are ideal for use as loose flowers in garlands, buttonholes and veni for hair ornamentation. Aster flower plants are a popular bedding plant in landscape gardening and use as a pot plant, as well as in a mixed herbaceous border and are ideal for window boxes and edging” (Singh et al., 2023; David et al., 2023). The China aster is now widely regarded as one of the most beautiful garden flowers (Kirar et al., 2009 and Kumar et al., 2018).

“India's overall floriculture area was 313 thousand hectares 2019-20, with a production of 2865 thousand metric tons of cut and loose flower. In Madhya Pradesh, total area under flower cultivation in 2019-20 was 30.80 thousand hectares, with a total production of 363.83 thousand metric tons of loose and cut flowers” (NHB 2nd advance estimate 2019-20).

“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 farthest part of the spreading phosphorus stays still in the soil and quickly transforms into something that plant approval cannot reach. In order to accumulate soil nutrient reserves, we increase chemical fertilizers to satisfy the nutritious food of plants” (Marak et al., 2020). The present study investigated the impact of bio-fertilizers and inorganic manures on flower yield attributes of China aster (*Callistephus chinensis* L. Nees) cv. Kamini.

2. MATERIALS AND METHODS

The experiment was conducted in the Horticultural Research Farm, Department of Horticulture and landscape architecture, College of Agriculture, IGKV, Raipur, (C.G.) during Rabi season of the year 2019-20. The experiment was conducted on China aster with eleven treatment and three replications in Randomized Block Design. The total number of Plants per plot was 35 which were spaced at 30 cm x 30 cm. The seeds of China aster cv. Kamini were sown in pro-trays and kept in germination chamber for proper germination.

List 1. Treatment combinations

S. No.	Treatments	Notations to be used
1.	100% RDF (Control)	T_1
2.	75% RDF + PSB + Azotobacter	T_2
3.	50% RDF + PSB + Azotobacter	T_3
4.	75% RDF + 25% FYM	T_4
5.	50% RDF + 50% FYM	T_5
6.	75% RDF + 25% Vermicompost	T_6
7.	50% RDF + 50% Vermicompost	T_7
8.	75% RDF + 25% FYM + PSB + Azotobacter	T_8
9.	75% RDF + 25% Vermicompost + PSB+ Azotobacter	T_9
10.	50% RDF + 50% Vermicompost + PSB+ Azotobacter	T_{10}
11.	50% RDF + 50% FYM+ PSB + Azotobacter	T_{11}

3. RESULT AND DISCUSSION

3.1 Flower Weight (g) of Individual Flower

Effect of bio-fertilizers and inorganic manures on the flower weight (g) varied from 1.01 to 1.63 g. The maximum average weight of flower (1.63 g) was found in Treatment T_9 (75% RDF + 25% Vermicompost + PSB+ *Azotobacter*) which was found at par with treatment T_{10} (50% RDF + 50% Vermicompost + PSB+ *Azotobacter*). However, it was significantly different from rest of other treatments. The minimum average weight of flower was (1.01 g) observed with Treatment T_1 control (100% RDF). *Azotobacter* and phosphorous solubilizing bacteria supplied available plant nutrients direct to the plant and similarly solubilizing outcome on stable usage of plant nutrition in the soil provided further nutrition to the plants along with enhanced plant growth furthermore flower yield. The result can be supported by the findings of Agrawal et al*.,* (2002), Panchal et al*.,* (2010) in annual chrysanthemum.

3.2 Flower Yield per Plant (g)

Flower yield per plant recorded significant variations among the different treatments, the maximum flower yield (39.36g) per plant was obtained in treatment T_9 (75%RDF +25% Vermicompost +PSB + *Azotobacter*) which exhibited similar result with the treatment T_8 (75% RDF + 25% FYM + PSB +*Azotobacter*). The result showed significant differences with rest of the all other treatments. Similar results were also reported by Gupta et al., (1999) in marigold. Fixation of nitrogen and production of growth encouraging materials like indole acetic acid and gibberellins increased the branches number in each plant. The outcomes are added in with finding of Chaitra and Patil (2007) who reported that maximum flower yield per plant with inoculation of *Azotobacter* and PSB in China Aster.

3.3 Flower Yield per Plot (kg)

Effect of bio-fertilizers and inorganic manures on flower yield per plot after analysis the data presented refers that by the applying the different doses of NPK, organic manure and biofertilizer with or without combinations affect the flower yield per plot. The maximum flower yield per plot (1.37 kg) was obtained with treatment T_9 (75% RDF + 25% Vermicompost + PSB + *Azotobacter*) which was showed *at par* with treatment T_8 (75% RDF + 25% FYM + PSB +*Azotobacter)*. However, it was exhibited significant difference with rest other treatments. “The minimum yield of flower per plot (0.83 kg) were found in T_1 (100% RDF control). Similar results were also reported by Gupta et al., (1999) in marigold.

3.4 Flower Yield per Hectare (q/h)

The flower yield was varied from 26.86 to 44.44 q per ha. The maximum flower yield per ha (44.44 q/ha) was found in treatment T_9 (75% RDF + 25% Vermicompost + PSB + *Azotobacter*) which was exhibited at par with treatment T_8 (75% RDF + 25% FYM + PSB + *Azotobacter*). However, it was showed significantly differ with rest of other treatments. The minimum flower yield per hawas (26.83 q/ha) observed with treatment T_1 (100% RDF control). Application of vermicompost along with RDF, provided accessible nutrients promptly to the plant and also had solubilizing consequence on immobile form of nutrients in the soil provided supplementary nutrients to the plants as well as amended the physical and biological properties of soil and increase yield. It may also be due to the production of plant hormone by the biofertilizers, which encouraged

Table 1. Impact of bio-fertilizers and inorganic manures on flower yield attributes of China aster (*Callistephus chinensis* L. Nees) cv.Kamini

Treatments	Flower weight (g) of individual flower	Flower yield per plant (g)	Flower yield per plot (kg)	Flower yield per hectare (q/ha)
T_1 - 100% RDF (Control)	1.01	23.79	0.83	26.86
T_2 - - 75% RDF + PSB + Azotobacter	1.02	26.82	0.94	30.28
T_3 - 50% RDF + PSB + Azotobacter	1.03	26.51	0.92	29.23
T_4 - 75% RDF + 25% FYM	1.05	27.15	0.95	30.65
T_5 .50% RDF + 50% FYM	1.04	26.01	0.91	29.36
T_6 - 75% RDF + 25% Vermicompost	1.07	28.43	1.00	32.10
T_7 - 50% RDF + 50% Vermicompost	1.08	28.30	0.99	31.94
T_8 - 75% RDF + 25% FYM + PSB + Azotobacter	1.16	33.46	1.17	37.44
T_9 .75% RDF + 25% Vermicompost + PSB+ Azotobacter	1.63	39.36	1.37	44.44
T_{10} - 50% RDF + 50% Vermicompost + PSB+ Azotobacter	1.31	32.09	1.12	36.23
T_{11} - 50% RDF + 50% FYM+ PSB + Azotobacter	1.08	28.32	0.99	31.97
SEm±	**0.33**	**2.00**	**0.92**	**2.59**
CD at 5% level	**0.11**	**5.91**	**2.73**	**7.67**

root development and resulted variations in rhizosphere, which it turns stimulated the absorption of the nutritious. Increase in the yield of the flower per plant and per plot as well as per hectare might also be due to probable function of *Azotobacter* and PSB through atmospheric fixation, augmented accessibility of phosphorous and its enhanced absorption, improved root development and absorption of nutritious. These results are in accordance with the finding of Sunitha et al. (2005)and Kumar et al. (2009) in African marigold; Panchal et al. (2010) and Verma et al. (2011) in annual chrysanthemum.

4. 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 flower yield of china aster. The majority of the flower yield attributes characteristics of weight of individual flower (g), flower yield per plant (g), flower yield per plot (kg) and flower yield per hectare (q) were found to respond best to treatment T_9 - 75% RDF + 25% Vermicompost + PSB+ Azotobacter followed by T_8 (75% RDF + 25% FYM + PSB + Azotobacter).

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Agrawal, S., Agrawal, N., Dixit, A. and Yadav, R.N. 2002. Effect of N and K_2O on African Marigold in Chhattisgarh region. Journal of ornamental Horticulture New Series. 5(1):86.

Anonymous, 2020. Indian Horticulture Database, http:www.nhb.gov.in

Chaitra, R. and Patil, V.S. 2007. Integrated nutrient management studied in growth, yield and flower quality in China Aster (*Callistephus chinensis* (L) Ness). Karnataka journal of Agriculture Science. 20(3):689-690.

David, Florence, Annjoe V. Joseph, and Nini R. Kuotsu. 2023. “Effect of Seaweed Extracts on Growth and Yield of China Aster Cv. Arka Archana under Prayagraj Agro Climatic Conditions”. International Journal of Plant & Soil Science 35 (16):157-65. https://doi.org/10.9734/ijpss/2023/v35i163141.

Gupta, N.S., Sadavarte, K.L., Mahorkar, V.K., Jadhav, B.J.and Dorak, S.V. 1999. Effect of graded levels of nitrogen and bio inoculants on growth and yield of marigold, Journal of soil crop. 9(1):80-83.

Huziawara, R. 1954. Seasonal flowers, ICAR publications, New Delhi, 2(2): 5-15.

Kirar, K.P.S., Lekhi, R., Sharma, S. and Sharma, R. 2014. Effect of integrated nutrient management practices on growth and flower yield of China Aster (*Callistephus chinensis* (L.) Ness) CV. Princess. In: Agriculture Towersds a New Paradigm of Sustainabnility, Mishra GC (Ed.) Excellent publishing house, New Delhi. 3(2):234-237.

Kumar, S., Agrawal, N., Dixit, A. and Yadav, R.N. 2009. Effect of N and K_2O on African Marigold in Chhattisgarh region. Journal of ornamental Horticulture New Series. 5(1):86.

Marak B.S., Kumar S., Momin K.C. (2020 Dec 31) Effects of organic manures and bio-fertilizers on growth, flowering and yield of China aster (*Callistephus chinensis* L. Nees var. Kamini). Bangladesh Journal of Botany. 49(4): 1111-7.

Munikrishnappa, V. and Chandrashekhar, S. 2014. Influence of micronutrients on growth, flowering and yield of African marigold (*Tagetes erecta* L.) Journal of pharmacognosy and phytochemistny,10(3): 461-463.

Naikwad, D.K., Kandpal, M.G., Patil, A. and Kulkarni, V. 2018. Correlation and Path Analysis in China aster (*Callistephus chinensis* L.). International Journal of Current Microbiology and Applied Sciences, 7(2): 3353-3362.

Panchal, R.V., Parekh, N.S., Parmar, A.B. and Patel, H.C. 2010. Effect of biofertilizer and nitrogenous Fertilizer on growth flowering and yield of annual white chrysanthemum (*Chrysanthemum coronarium* L). Asian Journal of Horticulture. 5(1):22-25.

Patil, V.S., Agasimani, A.D. 2013.Effect of integrated nutrient management on growth and yield parametes in China Aster (*Callistephus chinensis* (L.) Ness). Mysore

Journal of Agricultural Science.;47(2):267-277.

Singh, Aman., Samir E., Topno. and Anita Kerketta., 2023. "Effect of Different Sowing Dates and Planting Distance on Growth, Yield and Quality of China Aster (Callistephus Chinensis L.)". International Journal of Environment and Climate Change 13 (10): 1447-55. https://doi.org/10.9734/ijecc/2023/v13i102799.

Sunitha, H.M., Ravi, Vyakaranatial, B.S. and Ablad, H.B. 2005. Effect of Plant spacing and integrated nutrient management on yield and quality of seed and vegetable growth parameters in African marigold (*Tagetes erecta* L.). Journal of ornamental Horticulture. 10(4):245 - 249.

Verma, S.K, Angadi, S.G., Patil, V.S., Mokashi, A.N., Mathad, J.C. and Mummigatti, U.V. 2011. Growth yield and quality of chrysanthemum (*Chrysanthemum morifolium* Ramat) CV Raja as influenced by integrated nutrient management. KarnatakaJournal of Agricultural Science. 24(5):681– 683.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/127340