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Effect of Integrated Nutrient Management on Yield of China Aster (*Callistephus chinensis)* cv. Arka Archana

Shubham Verma[1]*, Neelima Netam[1], Toran Lal Sahu[2], M. S. Paikra[3], Dikeshwar Nishad[4], S. P. Sharma[3] and Surendra Kumar[1]

[1]Department of Floriculture and Landscape Architecture, Pt. Kishori Lal Shukla College of Horticulture and Research Station, Rajnandgaon, IGKV, Raipur Chhattisgarh, India
[2]Department of Floriculture and Landscape Architecture, College of Horticulture and Research Station, Sankara, Patan, Durg, IGKV, Raipur Chhattisgarh, India
[3]Departmentof Fruit Science, Pt. Kishori Lal Shukla College of Horticulture and Research Station, Rajnandgaon, IGKV, Raipur Chhattisgarh, India
[4]Department of Agricultural Statistics and Social Science, Pt. Shiv Kumar Shastri College of Agriculture and Research Station, Rajnandgaon, IGKV, Raipur, Chhattisgarh, India

**Corresponding author*

A B S T R A C T

The present investigation entitled "Effect of integrated nutrient management on yield of China aster (*Callistephus chinensis)* cv. Arka Archana" will be carried out during the year 2021-22 at collage farm under Pt KLS College of Horticulture and Research Station, Pendri, Rajnandgaon (C.G.). The experiment was conducted in Randomized Block Design (RBD) with 3 replication and 13 treatment combination comprising of FYM, Vermicompost and bio fertilizer, Azo and PSB. All combination show significant response in yield parameter during entire experiments. The yield parameters like Flower yield per plant (gm), Flower yield per plot (kg) and Flower yield per hectare (q) were significantly superior in the treatment T_9(RDF50%+VC50%+Azo+PSB), and similar trend find with treatment T_5(RDF 50% + FYM 50% + Azo + PSB) and T_1(RDF 100%(control)). Therefore, it may be concluded that treatment T_9(RDF50% +VC50%+Azo+PSB) may be prefer for higher yield in China aster.

Keywords

Integrated nutrient management, Arka Archana, Randomized Block Design, Azospirillum

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Introduction

China aster is one of the most important annual flower crops used commercially as cut flower, loose flower and for interior decoration. It is also used for edges, herbaceous border, bedding and potting purpose in home garden, landscaping and window boxes. It's hardy free blooming, nature, wide spectrum of forms, colours and their long vase life have made it as popular cut flower (Janakiram, 1997). The commercial importance of China aster is increasing in India especially in Karnataka, Tamil Nadu, West Bengal and Maharashtra. The climate condition is more abundant for China aster cultivation in Chhattisgarh. China aster climatic components like temperature, photoperiod, relative stickiness and further more soil dampness impact both vegetative and conceptive periods of the plant (Singh and Sisodia, 2017).

The successful commercial cultivation of China aster depends on many factors such as climate, soil, irrigation, fertilization especially with nitrogen has major effects on plant growth and development. Nitrogen is one of the most important elements as well as expensive input in agricultural production. An adequate supply of nitrogen is associated with vigorous vegetative growth and healthy green color. Its deficiency retards growth and root development, plant become twisted and foliage chloratic, hastens maturity and cause lowers the crop yields.

Phosphorus is a structural component of the cell membrane system, the chloroplast and the mitochondria. It plays a vital role in photosynthesis, respiration, energy storage, transfer, cell division, cell elongation in the living plants. Potassium is a third major element for all living organism. It increases resistance in plants against moisture stress, heat, frost, lodging and against insect-pest and diseases (Singh, 2014). Vermicompost has low C:N ratio, high porosity, aeration, drainage, water holding capacity, microbial activity (Atiyeh *et al.*, 2000). *Azospirillum* is a symbiotic N-fixing bacterium. It can fix atmospheric nitrogen when inoculated to plants, which help to save the application of N-fertilizers to an extent of 20-25 per cent. Phosphate solubilizing bacteria (PSB) are the main contributors of plant nutrition in agriculture and could play a pivotal role in making soluble phosphorus available to plants (Khan *et al.*, 2010).

Materials and Methods

The field experiment was carried out during the year 2021-22 at collage farm under Pt KLS College of Horticulture and Research Station, Pendri, Rajnandgaon (C.G.).

Experiment was designed with Randmized Block Design replicated with trice. The soil of the experimental site was black sandy loamneutral in reaction, medium in organic carbon, low in nitrogen and medium in phosphorus and potash content.

The fertilizers in the form of RDF, *Azospirillum* @ 2 kg/ha, Farm Yard Manure @ 20 t/ha, Phosphorous Solubilizing Bacteria @ 2 kg/ha and Vermicompost @ 10 t/ha (Nethra *et al.*, 1999) were applied in different quantities as per the treatment.

Half dose of nitrogen along with full doses of phosphorus and potassium (N:P:K) (180:60:60 kg/ha.) were incorporated in soil after bed formation and before the transplanting of seedlings. The remaining half dose of nitrogen (N:P:K) (180:60:60 kg/ha.) for respective treatments was given after 15 days of transplanting. (TNAU, Hort, 2021).

Ten plants were selected at random and tagged in each treatment. Significantly difference were observed for yield parameters. The data obtain was statistically analyzed by Panse and Sukhatme (1985).

Results and Discussion

Data pertaining to yield parameters of China aster cv. Arka Archana differed significantly under different treatments at various stages of growth, were recorded and it is presented in Table 1.1 and depicted in Fig 1.1, 1.2 & 1.3.

Number of flowers per plant

Number of flowers per plant of China aster varied significantly by integrated nutrient management. Number of flowers per plant increased significantly from maximum of 45.93 in treatment receiving RDF 50% + VC 50% + Azo + PSB (T_9) and it was at par with the treatments T_5(RDF 50% + FYM 50% + Azo + PSB) (42.60), T_1RDF100%(Control)(42.40) and T_{13}(RDF50%+FYM25%+VC25%+Azo+PSB) (42.20) and. However, minimum number of flowers per plant (28.67) was recorded in the treatment receiving RDF 50% + FYM 50% (T_2).

The reason behind use of vermicompost, FYM and biofertilizer with chemical fertilizer are availability of primary and secondary plant nutrient elements such as NPK and Ca and Mg, and their interaction is helpful to increase the number of flowers per plant by activating the enzymatic activities which promotes cell mitosis, division and elongation.

Both nutrients play important role in the growth and improvement of new cells. Similar results in China aster were also observed by Kumar *et al.,* (2016).

Flower weight (g)

Flower weight (g) of China aster varied significantly by integrated nutrient management. Flower weight increased significantly from maximum of 2.93 g in treatment receiving RDF 50% + VC 50% + Azo + PSB (T_9) and it was at par with the treatment T_5(RDF 50% + FYM 50% + Azo + PSB) (2.79 g), T_1RDF 100% (control) (2.60 g) and T_{13}(RDF 50% + FYM 25% +VC 25% + Azo + PSB) (2.58 g). However, minimum flower weight (1.83 g) was recorded in the treatment receiving RDF 50% + FYM 50% (T_2).

An overall improvement in the growth of China aster crop due to application of chemical fertilizers in combination with vermicompost, FYM and biofertilizer with chemical fertilizer was possibly through increase in nitrogenase activity as these which is an essential nutrient for plant growth and development increase in flower weight (g) of China aster. Also similar results were reported by Rinu (2020).

Flower yield per plant

Flower yield per plant (gm) of China aster varied significantly by integrated nutrient management. Flower yield per plant increased significantly from maximum of 97.22 gm in treatment receiving RDF50%+VC50% + Azo+PSB(T_9) and it was at par with the treatments T_5(RDF 50% + FYM 50% + Azo + PSB) (95.52 gm), (T_1) RDF 100% (control)(92.46gm) and (T_{13})RDF50%+FYM25%+VC25%+Azo+PSB(91.81 gm). However, minimum flower yield per plant (78.14 gm) was recorded in the treatment receiving RDF 50 % + FYM 50%(T_2).

The increased flower yield per plant (gm) might be due to enhanced uptake chemical and organic manure with biofertilizer of nutrients from soil resulting in assimilation of carbohydrates and other metabolic activity which led to an increase in various plant metabolites responsible for cell division and cell elongation, the two critical aspects of plant height determination. The results obtained in China aster the present study are supported by the works of Singh *et al.,* (2017).

Flower yield per plot(kg)

Flower yield per plot (kg) of China aster varied significantly by integrated nutrient management. Flower yield per plot increased significantly from maximum of 2.82 kg in treatment receiving RDF50%+VC50%+Azo+PSB (T_9) and it was at par with the treatments T_5 (RDF50%+ FYM50%+ Azo+PSB) (2.77kg), T_1(RDF100% (control) 2.68 kg) and T_{13} (RDF 50% + FYM 25% +VC 25% + Azo + PSB) (2.66 kg). However, minimum flower yield per plot (2.27 kg) was recorded in the treatment receiving RDF 50% + FYM 50%(T_2).

The more flower yield per plot (kg) per plant observed under present study might be due to positive effect of inorganic and organic with biofertilizer form which might have been the result of enhancement of the crop could be due might have increase the nutrient availability which in turn leads to the high production of carbohydrate might have increased the flower yield per plot (kg). Similar results in China aster were also observed by Bose *et al.,* (2019).

Table.1 Effect of integrated nutrient management on yield parameters of China aster.

Tr. no.	Treatment details	Number of flowers per plant	Flower weight (g)	Flower yield per plant (gm)	Flower yield per plot (kg)	Flower yield per hectare (q)
T1	RDF 100% (Control)	42.40	2.60	92.46	2.68	**99.31**
T2	RDF 50% + FYM 50%	28.67	1.83	78.14	2.27	**83.92**
T3	RDF 50% + FYM 50% + Azo	33.60	2.12	82.95	2.41	**89.09**
T4	RDF 50% + FYM 50% + PSB	33.27	2.05	81.12	2.35	**87.13**
T5	RDF 50% + FYM 50% + Azo + PSB	42.60	2.79	95.52	2.77	**102.60**
T6	RDF 50% + VC 50%	36.20	2.38	88.57	2.57	**95.14**
T7	RDF 50% + VC 50% + Azo	41.47	2.43	90.64	2.63	**97.35**
T8	RDF 50% + VC 50% + PSB	38.67	2.41	90.20	2.62	**96.88**
T9	RDF 50% + VC 50% + Azo + PSB	45.93	2.93	97.22	2.82	**104.42**
T10	RDF 50% + FYM 25% +VC 25%	31.67	2.00	80.22	2.33	**86.17**
T11	RDF 50% + FYM 25% +VC 25% + Azo	34.73	2.33	87.04	2.52	**93.49**
T12	RDF 50% + FYM 25% +VC 25% + PSB	34.00	2.26	84.17	2.44	**90.40**
T13	RDF 50% + FYM 25% +VC 25% + Azo + PSB	42.20	2.58	91.81	2.66	**98.62**
	SEm (±)	**1.29**	**0.12**	**3.93**	**0.11**	**4.22**
	CD (5%)	**3.78**	**0.35**	**11.54**	**0.33**	**12.39**
	CV (%)	**6.00**	**8.82**	**7.76**	**7.70**	**7.76**

Flower yield per hectare (q)

Flower yield per hectare (q) of China aster varied significantly by integrated nutrient management. Flower yield per hectare increased significantly from maximum of 104.42 q in treatment receiving RDF 50% + VC 50% + Azo + PSB (T_9) and it was followed by T_5(RDF 50% + FYM 50% + Azo + PSB) (102.60 q), T_1(RDF 100% (control) 99.31 q) and T_{13}(RDF 50% + FYM 25% +VC 25% + Azo + PSB) (98.62 q). However, minimum flower yield per hectare (83.92 q) was recorded in the treatment receiving RDF 50% + FYM 50% (T_2).

The more flower yield per hectare (q) per plant observed under present study might be due to positive effect of inorganic and organic with biofertilizer which might have been the result of enhancement of the crop could be due might have increase the nutrient availability which in turn leads to the high production of carbohydrate might have increased the flower yield per hectare (q). Similar results in China aster were also observed by Bose *et al.*, (2019).

The yield parameters like Flower yield per plant (gm), Flower yield per plot (kg) and Flower yield per hectare (q) were significantly superior in the treatment T_9(RDF50%+VC50%+Azo+PSB), and similar trend find with treatment T_5(RDF 50% + FYM 50% + Azo + PSB) and T_1(RDF 100%(control)).

It could be concluded from the present investigation that effect of integrated nutrient management on yield of China aster from the overall performance and association studies of all parameters stand could be better performance in first in position T_9(RDF 50% + VC 50% + Azo + PSB), while the treatment T_5(RDF 50% + FYM 50% + Azo + PSB) stand in second order of preference then treatment T_{13} (RDF50%+FYM25%+VC25%+Azo+PSB) comes in next in order. Therefore, it may be concluded that treatment T_9 (RDF50%+VC50% + Azo+PSB) may be prefer for higher yield in China aster.

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