www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(6): 4946-4948

www.thepharmajournal.com
Received: 28-04-2023
Accepted: 25-05-2023

Iram Akhter
Division of Floriculture and Landscaping, SKUAST-Jammu, Chatha, Jammu, Jammu and Kashmir, India

Sheetal Dogra
Division of Floriculture and Landscaping, SKUAST-Jammu, Chatha, Jammu, Jammu and Kashmir, India

RK Pandey
Division of Floriculture and Landscaping, SKUAST-Jammu, Chatha, Jammu, Jammu and Kashmir, India

PK Rai
Division of Soil Science, SKUAST-Jammu, Chatha, Jammu, Jammu and Kashmir, India

Parveen Singh
Division of Plant Breeding, SKUAST-Jammu, Chatha, Jammu, Jammu and Kashmir, India

Ashutosh Sharma
Division of Floriculture and Landscaping, SKUAST-Jammu, Chatha, Jammu, Jammu and Kashmir, India

Arvinder Singh
Division of Floriculture and Landscaping, SKUAST-Jammu, Chatha, Jammu, Jammu and Kashmir, India

Nomita Laishram
Division of Floriculture and Landscaping, SKUAST-Jammu, Chatha, Jammu, Jammu and Kashmir, India

Corresponding Author:
Sheetal Dogra
Division of Floriculture and Landscaping, SKUAST-Jammu, Chatha, Jammu, Jammu and Kashmir, India

Effect of INM on growth, flowering and yield of African marigold (*Tagetes erecta* L.) variety 'Pusa Narangi Gainda'

Iram Akhter, Sheetal Dogra, RK Pandey, PK Rai, Parveen Singh, Ashutosh Sharma, Arvinder Singh and Nomita Laishram

Abstract
A field experiment on effect of Integrated nutrient management on growth, flowering and yield of African marigold (*Tagetes erecta* L.) variety 'Pusa Narangi Gainda' was studied at ACHR, Udheywala, SKUAST-Jammu during 2021-22. Twelve treatment combinations of RDF (100% and 75%), in combination with vermicompost, FYM, Azotobacter and PSB were tested in Randomized Block Design with three replications. The analyzed data indicated that the values of plant height, plant spread and number of leaves per plant, flower diameter, average flower weight, flower yield per plant, flower yield per plot and flower yield per hectare was obtained maximum when plants were treated with 100% RDF + FYM + Azotobacter + PSB whereas earliest bud initiation, days to first flower appearance and maximum flower duration was observed at 75% RDF+ Azotobacter +PSB.

Keywords: Marigold, FYM, fertilizers, vermicompost, azotobacter, PSB

Introduction
Tagetes erecta is commonly known as "African marigold". It belongs to family Asteraceae. There are 33 species of genus *Tagetes*. The cultivated types of marigold are African marigold and French marigold. In India, the marigold occupies area 55.89 thousand hectare and with production 511.39 thousand metric tonnes as loose flower (NHB 2013-14). African marigold (*Tagetes erecta* L.) is one of the most popular flowering annuals cultivated commercially in various parts of India including Jammu and Kashmir. Cultivation of marigold has picked-up in the Jammu and Kashmir as the demand for its flowers exists throughout the year. In last few years, the price of chemical fertilizers has doubled, which increased the cost of production. Continuous use of chemicals is not only burden for the farmer's or growers but also responsible to deplete the soil fertility and productivity also affected. The best productivity could be achieved through periodic addition of organic manures and biofertilizers as fewer prices and the universe is going now on the way of clean agriculture and minimizing pollution effect.

Great attention has been directed towards the use of organic fertilizers to reduce plant and soil contaminations with mineral fertilizers, improve the fertility of soil and reduce nutrient losses. Addition of organic matter can improve all soil properties; such as water-holding capacity, soil aggregation, aggregation stability, soil fertility, and cation exchange capacity. Biofertilizer usually consists of live cells of micro-organisms which include biological nitrogen fixers, P-solubilizing, mineralization of nitrogen, and transformation of several elements into available forms. Azotobacter and phosphate solubilizing bacteria are commonly applied biofertilizers. Bio-fertilizers are not only eco-friendly and cost-effective but also increase phosphorus uptake, promotes growth and yield of plants by supplying nutrients in available form, provide resistance against pests and diseases and strengthens soil structure (Sharma *et al.* 2006) [7] in horticultural crops.

Hence, efficient and judicious use of chemical fertilizers along with organic manure is imperative not only for obtaining more yield per unit area on a sustainable basis but also to conserve the energy and to avoid the problem of environmental quality. Thus, the present studies was conducted to study the effect of integrated nutrient management on the growth and flower yield of African marigold.

Materials and Methods

The research was conducted at the Experimental Farm of Advanced Centre for horticultural research, Udheywala, SKUAST-Jammu during 2021-2022. The experimental farm was situated at 32°74'N latitude and 74°81'E longitude at an elevation of 327 m above mean sea level. The field was well prepared through deep plough, good harrowing, leveling and thereafter, the experimental land was divided into main and sub plots. Tweleve treatment combinations consisting of 100% and 75% RDF in combination with FYM, Vermicompost and Biofertilizers *viz*., Azotobacter and PSB. Fertilizers were incorporated at the time of bed preparation. Nitrogen through urea was applied in two split doses, i.e., half dose of total nitrogen was applied at the time of transplanting and the remaining dose of nitrogen was applied at 30 days after transplanting as top dressing.For azotobacter treatment, roots of marigold were dipped for 30 minutes berfore transplanting. The experiment was laid out in randomized block design with three replications. Seeds of marigold variety 'Pusa Narangi Gainda' were procured from IARI, New Delhi. Nursery was raised in mid September and seedlings were transplanted at 4-5 leaf stage after one month of sowing (mid October). The data obtained during the experiment was subjected to statistical analysis.

Results and Discussion

The findings revealed that maximum plant height (57.05 cm), plant spread (42.07 cm E-W and 41.07 cm N-S) and number of primary branches per plant (10.07) was recorded in treatment T_5 containing 100% RDF +FYM + Azotobacter + PSB. These results suggest that the combined application of organic compost and inorganic fertilizer give the best result on growth parameters and proved to be beneficial for robust growth of plant as compared to other treatments. This might be due to nitrogen and phosphorus fertilization in combination of bioinoculants (Azotobacter and PSB) and FYM proved to be beneficial to fix the atmospheric nitrogen and solubilize fixed phosphorus in soil and it also secrete growth substances like auxins, which stimulated the plant metabolic activities and photosynthetic efficacy leading better growth and development of plant. These results are in conformity with the findings of Kumar *et al*. (2009) [5] in African marigold.

In flowering parameters, earliest days taken to flower bud initiation (52.60), days taken to first flower appearance (20.61) and maximum flowering duration (69.80) were recorded in the treatment T_9. This might be due to early completion of vegetative growth and changing of vegetative primordia to reproductive primordia, probably due to the secretion growth promoting substances like auxins, gibberellins, vitamins and organic acids (Kumar *et al*. 2009) [5], which promoted faster vegetative growth and ultimately induced early flower bud initiation and prolonged flowering span. Similar observations have been recorded by Chandrikapure *et al*. (1999) [1] and Gupta *et al* (2006) [8] in marigold.

In the case of flower diameter, number of flowers per plant, average flower weight, and shelf life. The integration of organic manures and biofertilizers with inorganic fertilizers showed a significant response towards yield attributes and yield of African marigold. The flower diameter (7.49 cm), number of flowers per plant (37.10), average flower weight (10.00 gm) and shelf life in days (8.73) were highest under treatment T_5. The significant increase in these parameters might be due to high nitrogen and phosphorus assimilation from FYM and nitrogen and phosphorus in association with more nitrogen fixing and phosphorus solubilizing proficiency and secretion of hormones. These findings corroborate with that of Kumar *et al*. (2009) [5], Yadav *et al* (2004) [11] in marigold and Gangadharan and Gopinath (2000) [2].

Plants supplied with T_5 (100% RDF+ FYM + Azotobacter + PSB) revealed maximum flower yield per plant (0.371 Kg), flower yield per plot (9.27 kg), flower yield per hectare (185.44 q) and found significantly superior to all other treatments. The increase in flower yield in the forms of various terms may be due to the possible role of Azotobacter through atmospheric nitrogen fixation, better root proliferation, uptake of nutrients and water, higher leaf number and beneficial effects of organic manures. These resultsare in close conformity with the findings of Singh and Kumar (2016), Chandrikapure (1999) [1], Krol (2004) [4], Sunitha *et al*. (2007) [10] and Ahmad (2007).

Table 1: Effect of integrated nutrient management on vegetative parameters of African marigold (*Tagetes erecta* L.) variety Pusa Narangi Gainda.

Treatments	Treatment Combinations	Plant Height	Plant Spread		Number of branches per plant
			E-W	N-S	
T_1	100% RDF + FYM (Control)	50.11	32.07	31.06	9.24
T_2	100% RDF + Vermicompost	51.07	33.05	32.07	9.44
T_3	100% RDF + Azotobacter + PSB	50.06	32.05	31.06	8.71
T_4	100% RDF + FYM + Vermicompost	55.06	38.09	37.07	9.71
T_5	100% RDF +FYM + Azotobacter + PSB	57.05	42.07	41.07	10.07
T_6	100% RDF + Vermicompost + Azotobacter + PSB	56.08	41.08	40.06	9.77
T_7	75% RDF + FYM	50.02	31.11	30.08	8.62
T_8	75% RDF + Vermicompost	48.07	31.07	30.07	8.53
T_9	75% RDF + Azotobacter + PSB	47.10	30.07	29.07	8.40
T_{10}	75% RDF + FYM + Vermicompost	52.08	36.08	35.06	9.53
T_{11}	75% RDF +FYM + Azotobacter + PSB	54.06	38.06	37.06	9.59
T_{12}	75% RDF + Vermicompost + Azotobacter + PSB	53.06	37.08	36.05	9.56
	C.D.	0.05	0.04	0.08	0.31

Table 2: Effect of integrated nutrient management on flowering parameters of African marigold (*Tagetes erecta* L.) variety Pusa Narangi Gainda

Treatments	Treatment Combinations	Days taken to flower bud Initiation	Flower Diameter (cm)	Number of flowers per plant	Average flower weight per plant (kg)	Duration of flowering	Shelf life of flowers (days)	Flower yield per plant (Kg)	Flower yield per hectare (q)	Flower yield per plot (kg)
T_1	100% RDF + FYM (Control)	55.50	6.17	29.47	0.234	65.60	7.47	0.234	117.01	5.85
T_2	100% RDF + Vermicompost	55.40	6.26	30.07	0.249	65.87	7.60	0.249	124.20	6.21
T_3	100% RDF + Azotobacter + PSB	56.20	6.12	29.05	0.233	64.60	7.33	0.233	116.62	5.83
T_4	100% RDF + FYM + Vermicompost	53.60	6.77	34.07	0.320	69.20	8.13	0.320	159.90	8.00
T_5	100% RDF +FYM + Azotobacter + PSB	52.60	7.49	37.10	0.371	69.80	8.73	0.371	185.44	9.27
T_6	100% RDF + Vermicompost + Azotobacter + PSB	53.20	7.37	36.07	0.340	69.33	8.20	0.340	170.07	8.50
T_7	75% RDF + FYM	56.80	6.01	27.09	0.222	62.80	7.20	0.222	111.22	5.56
T_8	75% RDF + Vermicompost	57.10	5.93	20.55	0.140	59.47	7.07	0.140	70.18	3.51
T_9	75% RDF + Azotobacter + PSB	58.10	5.84	20.02	0.129	57.73	6.13	0.129	64.61	3.23
T_{10}	75% RDF + FYM + Vermicompost	54.90	6.35	31.05	0.254	66.58	7.67	0.254	127.25	6.36
T_{11}	75% RDF +FYM + Azotobacter + PSB	54.30	6.71	32.53	0.292	68.47	7.93	0.292	145.83	7.29
T_{12}	75% RDF + Vermicompost + Azotobacter + PSB	54.70	6.60	32.08	0.258	67.13	7.87	0.258	129.19	6.46
	C.D.	0.54	0.29	0.15	0.002	2.77	0.36	0.002	0.79	0.04

Conclusion

It can be concluded from the present experiment that 100% RDF + FYM+ azotobacter + PSB treatment can be recommended for better growth, flowering and yield parameters of marigold variety 'Pusa Narangi Gainda'.

References

1. Chandrikapure KR, Sadawrte KT, Panchbhait DM, Shelke BD. Effect of bio inoculants and graded dose of nitrogen on growth and flower yield of marigold. Orissa Journal of Horticulture. 1999;27(2):31-34.
2. Gangadharan GD, Gopinath G. Effect of organic and inorganic fertilizers on growth, flowering and quality of Gladiolus cv. white prosperity. Karnataka Journal of Agricultural Sciences. 2000;11(3):401-405.
3. Javid AQ, Yadeem AA, Ishfaq AH, Mughal L. Performance of zinnia (*Zinnia elegans*) Dahlia flowered Crimson shade by NPK fertilizer. International Journal of Agriculture and Biology. 2005;5(3):474-476.
4. Krol B. Yield and the chemical composition of flower heads of pot marigold (*Calendula officinalis* L. cv. Orange King) depending on nitrogen fertilization. Acta Scientiarum Polonorum - Hortorum Cultus. 2011;10(2):235-243.
5. Kumar D, Singh BP, Singh VN. Effect of integrated nutrient management on growth, flowering behavior and yield of African marigold (*Tagetes erecta* L.) cv. African Giant Double Orange. Journal of Horticulture Science. 2009;4(2):134-137.
6. Kumar M, Singh S, Sharma SK, Dahiya DS, Beniwal LS. Effect of bio fertilizers on growth and flowering of marigold cv. Pusa Narangi. Haryana Journal of Horticulture Science. 2006;35(1 & 2):71-72.
7. Sharma BP, Sharma YD, Dilta BS. Studies of NPK nutrition on growth and flowering in chrysanthemum. International Journal of Plant Sciences, Muzaffarnagar. 2006;1(1):32-35.
8. Sharma DP, Patel M, Gupta N. Influence of nitrogen, phosphorus and pinching on vegetative growth and floral attributes in African marigold (*Tagetes erecta* L.). Journal of Ornamental Horticulture. 2006;9(1):25-28.
9. Shashikant G. Effect of different sources of nutrients on growth and yield of tall marigold. M. Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad; c2005.
10. Sunitha HM, Hunje R, Vyakaranahal BS, Bablad HB. Effect of plant spacing and integrated nutrient management on yield and quality of seed and vegetative growth parameters in African marigold (*Tagetes erecta* L.). Journal of Ornamental Horticulture. 2007;10(4):245-249.
11. Yadav RM, Dubey P, Asati BS. Effect of spacing and nitrogen levels on growth, flowering and flower yield of marigold (*Tagetes erecta* L.). Orissa Journal of Horticulture. 2004;32(1):41-45.