Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5195

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (1):** 568-572 (2018)

International Journal of Pure & Applied Bioscience

Research Article

OPEN ACCESS

Effect of Integrated Nutrient Management on Growth and Flower Yield of African Marigold (*Tagetes erecta* L.)

Vaishali D. Patel[1*], Patel G. D.[1], Desai, K. D.[1], Patel D. J.[2] and Mangave B. D.[2]

[1]Department of Floriculture and Landscape Architecture, ASPEE Collage Horticulture and Forestry, Navsari Agricultural University, Navsari

[2]ASPEE Agriculture Research and Development Foundation, Tansa (Maharashtra)

*Corresponding Author E-mail: vaishalipatel151193@gmail.com

Received: 12.07.2017 | Revised: 22.08.2017 | Accepted: 26.08.2017

ABSTRACT

The present investigation entitled Integrated Nutrient Management in African Marigold (Tagetes erecta L.) during 2015-16 at ASPEE Agriculture Research and Development Foundation, Tansa (Maharashtra). The experiment was laid out in Randomized Block Design with ten treatments with three replications. Maximum plant height (80.16 cm), during 4th month after transplanting, No. of primary branches (16.25) and No. of secondary branches (25.50) were observed during 2nd month after transplanting were recorded in treatment T_{10} (FYM @ 5 t/ha + 100% RDF (150:100:100 kg NPK/ ha) + Azotobacter + PSB + KMB + 1% foliar spray of NAUROJI Novel organic liquid fertilizer). Whereas the maximum total duration of flowering (77.37 days), flower diameter (6.86 cm), No. of flowers per plant (87.23), flower yield (396.42 g/plant and 11.36 t/ha), with flower longevity (7.27 days) and B:C ratio (3.20) were noted in treatment T_{10} (FYM @ 5 t/ha + 100% RDF (150:100:100 kg NPK/ ha) + Azotobacter + PSB + KMB + 1% foliar spray of NAUROJI Novel organic liquid fertilizer).

Key word: *African Marigold, Azotobacter, Phoshorus Solubilising Bacteria, Potash Mobilizing Bacteria, INM, NAUROJI Novel organic liquid fertilizer and foliar application.*

INTRODUCTION

Marigold (*Tagetes erecta* L.) occupies a prominent place in ornamental horticulture, is one of the commercially exploited flower crops belongs to family Asteraceae. *Tagetes erecta* L. and *Tagetes patula* L. owe their origin to Mexico and South Africa, respectively. There are several other important species *viz. Tagetes tenuifolia* L. (Striped marigold), *Tagetes lucida* L. (Sweet scented marigold) and *Tagetes minuta* L. (Perfume marigold). Though it is an introduction, considering its acceptability under Indian conditions and habit of free flowering, short duration to produce marketable flowers, wide spectrum of attractive colours, shape, size and good keeping quality has attracted the attention of flower growers.

Cite this article: Patel, V.D., Patel, G.D., Desai, K.D., Patel, D.J. and Mangave, B.D., Effect of Integrated Nutrient Management on Growth and Flower Yield of African Marigold (*Tagetes erecta* L.), *Int. J. Pure App. Biosci.* **6(1):** 568-572 (2018). doi: http://dx.doi.org/10.18782/2320-7051.5195

Nutrient plays very important role for determining the growth and yielding ability of crop. But, the indiscriminate application of chemical fertilizers alter the soil fertility, leading to the pollution of soil and water bodies. There is big gap between demands, requirements of nutrients deriving food production and supply of nutrients through chemical fertilizers. This deficit will have to be met through supplementary and complementary use of organic and biological sources of nutrient in integrated nutrient management system.

Biofertilizers are microbial inoculants of selective micro organisms like bacteria, algae, fungi which already have been existing in nature. They may help for improving soil fertility by the way of accelerating biological nitrogen fixation from atmosphere, solubilization of the insoluble nutrient in soil, generate little quantity of PGRs decomposing plant residues and stimulating plant growth and production.

Keeping the above fact in view, the present investigation has been carried out to find the suitable INM treatment to get maximum vegetative growth, flowering quality and yield of African marigold.

MATERIALS AND METHODS

The present investigation was carried out at ASPEE Agriculture Research and Development Foundation, Tansa (Maharashtra) during 2015-16. The experiment was laid out in Randomized Block Design with three replication and ten treatments *viz.* T_1 - 100% recommended dose of chemical fertilizer (RDF) @ 150:100:100 kg NPK per ha (without FYM), T_2 - FYM @ 5 t/ha + 100% RDF (150:100:100 kg NPK/ ha), T_3 - FYM @ 5 t/ha + 75% RDF (112.5:75:75 kg NPK/ ha), T_4 - FYM @ 10 t/ha + 50% RDF (75:50:50 75 kg NPK/ ha), T_5 - T_1 + *Azotobacter* + PSB + KMB, T_6 -T_2 + *Azotobacter* + PSB + KMB, T_7 - T_3 + *Azotobacter* + PSB + KMB, T_8 - T_4 + *Azotobacter* + PSB + KMB, T_9 - T_1 + 1 % foliar spray of *NAUROJI Novel* organic liquid fertilizer, T_{10} - T_6 + 1 % foliar spray of *NAUROJI Novel* organic liquid fertilizer.

Application of FYM in plot at time of land preparation according to the treatment and the bio-fertilizers *viz. Azotobactor*, Phosphorus Solubilising Bacteria and Potash Mobilizing Bacteria applied through slurry method at time of transplanting in plot according to the treatment. Slurry was prepared by each biofertilizer (2.0 l/ha) mixed with FYM (300 kg/ha). Furthermore, foliar application *NAUROJI Novel* organic liquid fertilizer at 45 day after transplanting (DATP). Chemical fertilizers N, P and K were applied @ 150, 100, and 100 kg/ha respectively in African marigold. Phosphorus and potash were applied as basal dose uniformly to all the plots at rate of 100 kg/ha according to treatment 10 Days after transplanting. Nitrogen was applied in two splits. Half of N was applied with basal dose and remaining half dose was applied on 30 day after transplanting. Nitrogen, Phosphorus and Potash were applied in the form of Urea, Single Super Phosphate and Murate of Potash, respectively. The cultural practices like irrigation, hoeing and weeding, plant protection measures were done as required by the crop time. The vegetative parameters and flowering parameters were recorded the period of crop. The obtained data were analyzed statistically using standard method as suggested by Panse and Sukhatme[7].

RESULTS AND DISCUSSION

Various vegetative parameters, Flowering quality and yield parameters were enhanced by Integrated Nutrient Management. The salient features of results are given below with appropriate discussion.

Vegetative parameters

It is revealed form the data presented in Table 1 that treatment T_{10} - (FYM @ 5t/ha + 100% RDF (150:100:100 kg NPK/ ha) + *Azotobacter* + PSB + KMB + 1% foliar spray of *NAUROJI Novel* organic liquid fertilizer) gave the maximum vegetative growth in case of plant height (80.16 cm) during 4th month after transplanting as well as No. of primary branches per plant (16.25) and No. of secondary branches per plant (25.50) during 2nd month after transplanting. This might be due to

high physiological activity synchronized with maximum nutrient convert in available form and increase the micro-flora due to incorporate of FYM in soil and Biofertilizer (*Azotobacter*, PSB and KMB) may enhance microbial activity may lead to proper utilization of supplied nutrient to the plants[1,6]. Similarly, INM may promote vegetative growth by increasing both the photosynthetic activity as well as area[10]. Photosynthetic activity is improved by increasing chlorophyll in cell whereas, photosynthetic area may enhance number of branches[12]. *NAUROJI Novel* organic liquid fertilizer contain major and micronutrient as well as plant hormone like GA_3 and cytokinin which enhanced plant height[5] which is sufficient for better performances.

Flowering parameters

The experiment results revealed that the flowering yield and longevity of flower significantly influenced due to Integrated Nutrient Management. Significantly maximum total duration of flowering (77.37 days) flower diameter (6.86 cm), No. of flowers per plant (87.23), flower yield per plant (396.42 g) as well as per ha (11.36 t) and flower longevity (7.27 days) were recorded with application FYM @ 5 t/ha + 100% RDF (150:100:100 kg NPK/ ha) + *Azotobacter* + PSB + KMB + 1% foliar spray of *NAUROJI Novel* organic liquid fertilizer (T_{10}). This might be attributed to better nutrient uptake, higher photosynthesis, source to sink relationship, besides excellent physiological and biological activities due to presence of helpful micro-flora in FYM and biofertilizers[4,11]. *NAUROJI Novel* organic liquid fertilizer increased the flower yield due to high amount of Potash moderate level of N, P, Ca, Mg, S, Zn and B with GA_3, cytokinin, Amino acid and phenol. Similar kind of trends were noticed in papaya under South Gujarat condition[2]. Thus, the synchronized effect of all INM strategies enhance the flower yield[3,9] in garlic.

Economics

Among the different INM treatments studied in present investigation, resulted in T_{10} (FYM @ 5 t/ha + 100% RDF (150: 100: 100 NPK kg/ha) + *Azotobacter* + PSB + KMB + 1% foliar spray of *NAUROJI Novel* organic liquid fertilizer) gave highest benefit: cost ratio of (3.20) at Tansa condition. This can be attributed to the fact that biofertilizers not only help in improving the nutrient uptake in plants by release of growth hormones and antibiotics but also improves the quality produce[8].

Table 1: Effect of Integrated Nutrient Management on vegetative parameters in African Marigold

Treatments		Plant height (cm)	No. of Primary branches	No. of secondary branches
T_1	100% recommended dose of chemical fertilizer (RDF) @ 150:100:100 kg NPK per ha (without FYM)	67.90	10.90	18.40
T_2	FYM @ 5 t/ha + 100% RDF	76.62	14.70	23.10
T_3	FYM @ 5 t/ha + 75% RDF	68.99	11.73	19.17
T_4	FYM @ 10 t/ha + 50% RDF	61.77	7.60	14.70
T_5	T_1 + *Azotobacter* + PSB + KMB	64.69	8.93	16.07
T_6	T_2 + *Azotobacter* + PSB + KMB	79.97	15.20	24.27
T_7	T_3 + *Azotobacter* + PSB + KMB	70.17	13.67	21.50
T_8	T_4 + *Azotobacter* + PSB + KMB	66.94	9.97	17.10
T_9	T_1 + 1% foliar spray of *NAUROJI Novel* organic liquid fertilizer	69.97	12.43	20.23
T_{10}	T_6 + 1% foliar spray of *NAUROJI Novel* organic liquid fertilizer	80.16	16.25	25.50
S. Em.±		**3.33**	**0.58**	**1.04**
C.D. at 5%		**9.88**	**1.72**	**3.10**
C.V. %		**8.14**	**8.27**	**9.03**

Table 2: Effect of Integrated Nutrient Management on flowering parameter in African Marigold

Treatments		Total duration of flowering (days)	Flower diameter (cm)	No. of flowers per plant	Flower yield		Flower longevity (days)	B:C ratio
					g/ plant	t/ha		
T_1	100% recommended dose of chemical fertilizer (RDF) @ 150:100:100 kg NPK per ha (without FYM)	64.90	5.57	68.90	260.06	7.04	6.07	1.84
T_2	FYM @ 5 t/ha + 100% RDF	75.73	6.21	80.87	341.88	9.73	7.03	2.75
T_3	FYM @ 5 t/ha + 75% RDF	67.20	5.76	71.23	273.06	7.99	6.23	2.25
T_4	FYM @ 10 t/ha + 50% RDF	60.47	5.26	60.53	206.20	5.65	4.93	1.28
T_5	T_1 + *Azotobacter* + PSB + KMB	62.50	5.35	62.97	234.77	5.94	5.43	1.39
T_6	T_2 + *Azotobacter* + PSB + KMB	76.03	6.48	83.90	370.60	9.84	7.17	2.73
T_7	T_3 + *Azotobacter* + PSB + KMB	65.90	5.80	75.93	299.29	8.81	6.50	2.48
T_8	T_4 + *Azotobacter* + PSB + KMB	63.63	5.46	65.93	248.72	6.23	5.87	1.48
T_9	T_1 + 1% foliar spray of *NAUROJI Novel* organic liquid fertilizer	66.07	5.70	74.13	280.09	8.62	6.43	2.42
T_{10}	T_6 + 1% foliar spray of *NAUROJI Novel* organic liquid fertilizer	77.37	6.86	87.23	396.42	11.36	7.27	3.20
S. Em.±		**2.95**	**0.33**	**3.50**	**19.41**	**0.58**	**0.19**	
C.D. at 5%		**8.76**	**0.97**	**10.39**	**57.67**	**1.72**	**0.57**	
C.V. %		**7.51**	**9.72**	**8.28**	**11.55**	**12.33**	**5.32**	

CONCLUSION

In conclusion, the response of African marigold varies with application of FYM @ 5 t/ha + 100% RDF (150: 100: 100 NPK kg/ha) + *Azotobacter* + PSB + KMB + 1% foliar spray of *NAUROJI Novel* organic liquid fertilizer gave maximum growth and yield attributes of flowers with higher B:C ratio.

REFERANCES

1. Ahir, T. R., Patel, R. B., Chawala, S. L. and Rathod, D. M., Effect of integrated nutrient management in gladiolus (*Gladiolus grandiflorus L*.) cv. American Beauty., *J. Ornam. Hort.,* **13(4):** 283-286 (2010).
2. Anonymous, Evaluation of sources of organic in presence and absence of sap on yield of papaya under organic farming system., Final report (NAIP COMPONENT) at Navasri. pp 41-42 (2011).
3. Anonymous, Effect of castor cake and Banana Pseudostem sap on yield and quality of organically grown Garlic (*Allium sativum L*.) cv. GG-2., 10th meeting of Horticulture and Agro-Forestry at Navsari Agricultural University, Navsari. pp (NRM 1-10) (2015).
4. Gayithri, H. N., Jayaprasad, K. V. and Narayanaswamy, P., Response of bio-fertilizers and their combined application with different levels of inorganic fertilizers in statice (*Lumonium caspia*)., *J. Ornam. Hort*., **7(1):** 70-74 (2004).
5. Jadhav, P. B., Alka Singh., Mangave, B. D., Patil, N. B., Patel, D. J. and Dekhane, S. S., Effect of organic and inorganic fertilizers on growth and yield of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda., *Intl. J. of Tropical Agric.*, **32(3-4):** 547-551 (2014).
6. Kumar, S., Singh J. P., Braj, M. Nathiram. and Rajbeer., Influence of integrated nutrient management on growth, flowering and yield parameters of marigold (*Tagetes erecta* L.) cv. Pusa Basanti Gainda., *The Asian J. of Hort.,* **8(1):** 118-121 (2013).
7. Panse, V. G. and Sukhatme, P. V. "*Statistical Methods for Agricultural Workers"*, Indian Council of Agricultural Research, New Delhi, India, pp. 152-161 (1967).

8. Rao, K. D., Kameswari, Lalitha and Rani, T. B., Impact of integrated nutient management on growth, flowering, yield and economics of tuberose., *Agric. Sci. Digest.*, **35(1):** 66-69 (2015).
9. Singh, A., Singh, A. K. and Yadava, L. P., Integrated nutrient management induces flowering duration and flower quality of gladiolus., *Res. Environ. Life Sci.*, **7(1):** 49-52 (2014).
10. Syamal, M. M., Dixit, S. K. and Kumar, S., Effect of bio-fertilizers on growth and yield in marigold. *J. Ornam Hort.*, **9(4):** 304-305 (2006).
11. Yadav, P. K., Singh, A. S., Dhindwal, A. S. and Yadav, M. K., Effect of N and FYM application on floral characters and yield of African Marigold (*Tagetes erecta* L.). *Haryana J. of Hort.*, **29 (1 & 2):** 69-71 (2000).
12. Yathindra, H. A., Manohar, R. K., Rajesh, A. M. and Harshavardhan, M.., Effect of integrated nutrient management on growth parameters of Bird of paradise (*Strelitzia reginae* L.), *The international Quartery J. of Life Sci.*, **11(1):** 565-568 (2016).