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Effect of integrated nutrient management on flowering, yield and vase life of African marigold (*Tagetes erecta* L.) cv. LOCAL under middle Gujarat Agro-climatic conditions

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ABSTRACT

The experiment was conducted at College Horticulture Nursery, Department of Horticulture, B.A. College of Agriculture, Anand Agricultural University, Anand during June, 2009 to November, 2009. The treatments comprised of three biofertilizers (*Azotobacter, Azospirillum* and PSB) three levels of vermicompost (2.0, 3.0 and 4.0 t ha^{-1}) and three levels of NPK (60, 70 and 80 % of RDF) including control (RDF). The experiment was laid out in a Randomized Block Design with ten treatments replicated thrice.The results revealed that application of 70% RDF + 3 t/ha vermicompost + *Azotobacter* + *Azospirillium* + PSB (T_7) produced significantly maximum flower diameter, number of pickings, average flower weight (g), number of flowers per plant, flower yield per plant (g) and per hectare (t) as compared to control, whereas the treatment of 60% RDF + 4 t/ha vermicompost + *Azotobacter* + *Azospirillium* + PSB (T_4) recorded early flower initiation and 50% flowering as compared to other treatments. Significantly the maximum shelf life and vase life of flower were registered with the same treatment (T_4) as compared to control.

Key words : African marigold, Biofertilizer, Inorganic fertilizer, Vermicompost, Vase life

INTRODUCTION

African marigold (*Tagetes erecta* L.) is one of the most important commercial flower crops grown all over the world and in India as well; accounting for more than half of Nation's loose flower production (Sreekanth *et al*.,2006). It occupies importance amongst gardeners and flower-dealers on account of its easy cultivation and wide adaptability to soil and climatic conditions. In landscape architecture, it is grown in flower beds, in borders and also even as potted plants.

The successful commercial cultivation of marigold depends on many factors amongst which nutrition plays an important role. No single source of nutrient is capable of supplying plant nutrients in adequate amount and in balance proportion. Thus, integrated nutrient management is a strategy for advocating judicious and efficient use of chemical fertilizers with matching addition of organic manures and biofertilizers. Such practices reduce the amount of inorganic fertilizers, control pollution in part at least caused due to use of high doses of fertilizers and protection of natural resources. Therefore, the present study has been made to find out the best integrated nutrient approach in African marigold cv. 'Local' under middle Gujarat Agro-climatic conditions.

MATERIALS AND METHODS

The present investigation was carried out at the Department of Horticulture, B.A. College of Agriculture, Anand Agricultural University, Anand during June, 2009 to November, 2009. The experiment was laid out in a Randomized Block Design with ten treatments and three replications. Treatments comprised of combinations of vermicompost, biofertilizers and inorganic fertilizers. The details of experimental treatments were: T_1: 200:100:100 kg NPK ha^{-1} +15 t/ha FYM (control) (RDF), T_2: 60% RDF + 4 t/ha vermicompost + *Azotobacter* + PSB, T_3: 60% RDF + 4 t/ha vermicompost + *Azospirillium* + PSB, T_4: 60% RDF + 4 t/ha vermicompost + *Azotobacter* + *Azospirillium* + PSB, T_5: 70% RDF + 3 t/ha vermicompost + *Azotobacter* + PSB, T_6: 70% RDF + 3 t/ha vermicompost + *Azospirillium* + PSB, T_7: 70% RDF + 3 t/ha vermicompost + *Azotobacter* + *Azospirillium* + PSB,T_8: 80% RDF + 2 t/ha vermicompost + *Azotobacter* + PSB, T_9: 80% RDF + 2 t/ha vermicompost + *Azospirillium* + PSB and T_{10}: 80% RDF + 2 t/ha vermicompost + *Azotobacter* + *Azospirillium* + PSB.

The soil was sandy loam in texture, locally known as *'Goradu'*. It responds well to irrigation and manuring and suitable for marigold cultivation. Twenty days old seedlings were transplanted at 60 x 45 cm spacing in the month of July, 2009. Inorganic fertilizers were applied in the form of urea, single superphosphate and murate of potash. The half dose of N and full dose of P and K were incorporated in the field as per treatments before planting. The remaining dose of N was top-dressed after one month of planting. Vermicompost was weighed as per treatment and applied in respective plots as a basal dose, two days prior to transplanting. Liquid biofertilizers *i.e. Azotobacter, Azospirillum* and PSB were applied by seedlings dipping

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Table 1: Effect of integrated nutrient management on flowering, yield and vase life of African marigold cv. LOCAL

Treatments	Days to first flower initiation	Days required for 50% flowering	Flower diameter (cm)	Average flower weight (g)	No. of pickings	Number of flowers per plant	Flower yield		Shelf life (days)	Vase life (days)
							g / plant	t / hectare		
T_1	61.33	70.67	5.79	5.80	7.67	46.03	270.54	10.02	3.33	6.33
T_2	60.33	69.67	5.23	5.54	7.33	42.67	237.23	8.78	4.33	8.00
T_3	57.33	66.67	5.47	6.18	7.67	40.27	248.35	9.22	4.67	8.00
T_4	53.67	63.00	6.80	7.23	8.67	44.07	323.96	11.99	4.67	8.33
T_5	59.00	71.00	5.78	6.53	8.00	43.17	282.78	10.47	3.67	7.33
T_6	59.67	72.00	6.03	6.63	8.33	45.60	302.25	11.19	3.33	7.00
T_7	55.67	69.33	7.39	7.43	9.00	52.37	388.33	14.38	3.67	6.67
T_8	62.00	75.33	6.12	6.67	8.00	48.73	323.84	12.00	4.00	6.33
T_9	56.33	69.33	6.07	6.70	8.33	45.60	303.84	11.25	3.67	7.00
T_{10}	56.33	71.00	6.86	7.33	9.00	49.10	355.48	13.16	3.33	6.67
S.E. $\pm$	1.70	2.04	0.31	0.23	0.29	2.13	18.03	0.67	0.33	0.42
C.D. (P=0.05)	5.04	6.06	0.91	0.69	0.87	6.33	53.58	1.99	0.98	1.26
C.V. %	5.05	5.07	8.62	6.12	6.16	8.05	10.29	10.30	14.85	10.26

method (5 ml/lit water each). Recommended package of practices were followed for the entire crop season. The observations on flowering and flower yield were recorded and subjected to statistically analysis.

Five fully opened fresh flowers were randomly selected from each net plot separately and kept for shelf life (without pedicel in paper dishes) and vase life (with pedicel in 250 ml volumetric flasks containing distilled water) at normal room temperature. The days were calculated from the date of putting the flowers in the flask/ paper dishes to the day when the flowers totally withered.

RESULTS AND DISCUSSION

The experimental results revealed that the flowering, yield and vase life were significantly influenced due to combined application of biofertilizers and different levels of inorganic fertilizers and vermicompost.

Significantly, maximum flower diameter (7.39 cm), number of pickings (9.00), higher average flower weight (7.43 g), number of flowers per plant (52.37) and flower yield per plant (388.33 g) as well as per hectare (14.38 t) were recorded with the application of 70% RDF + 3 t/ha vermicompost + *Azotobacter* + *Azospirillium*+ PSB (T_7) followed by treatment T_{10} as compared to control *i.e.* RDF (Table 1). This increase was attributed to the constant and optimal supply of nutrients influenced better growth which in general has significant positive correlation with flowering and yield parameters. These findings corroborate the results obtained by Nethra *et al*. (1999) and Kumar *et al*. (2003) in China aster. The treatment of 60% RDF + 4 t/ha vermicompost + *Azotobacter* + *Azospirillium* + PSB (T_4) recorded significantly early flower initiation (53.67 days) and 50% flowering (63.00 days).This might be due to the altered C: N ratio which helped in balanced management of vegetative as well as reproductive phases and promote early flowering. Similar findings have been reported by Naik *et al.* (2008) and Rathi *et al.* (2005) in marigold.

Significantly increase in shelf life (4.67 days) and vase life of flowers (8.33 days) were noted under the treatment T_4 (60% RDF + 4 t/ha vermicompost + *Azotobacter* + *Azospirillium* + PSB) as compared to control. This might be due to the reason that higher dose of nitrogen keeps the flower soft and succulent in texture and this type of flower texture resulted in higher and faster respiration and dehydration. These findings corroborate the results obtained by Parmar (2007) in China aster, Patel *et al*. (2008) in marigold and Panchal (2009) in chrysanthemum.

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