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Research Article

Effect of Nitrogen Levels with and without Magnesium on Growth, Yield and Quality of African Marigold (*Tagetes erecta* L.)

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ABSTRACT

A field experiment was conducted during rabi, 2019 to study the "Effect of nitrogen levels with and without magnesium on growth, yield and quality of African Marigold (Tagetes erecta L.)" was conducted during Rabi season of the year 2019-2020 on experimental farm of Department of Horticulture, AKS University, Satna (M.P.). The experiment was laid out in a randomized block design with three replicated 12 treatments viz., T_1: N @ 0kg + Mg @ 0kg, T_2: N @ 0kg + Mg @10 kg, T_3: N @ 0kg + Mg @20 kg, T_4: N @ 40kg + Mg @ 0kg, T_5: N @ 40kg + Mg @ 10 kg, T_6 N @ 40kg + Mg @ 20 kg, T_7: N @ 80kg + Mg @ 0kg, T_8: N @ 80kg + Mg @10 kg, T_9: N @ 80kg + Mg @ 20 kg, T_{10}: N @ 120kg + Mg @ 0kg, T_{11}: N @ 120kg + Mg @ 10 kg, T_{12}: N @ 120kg + Mg @ 20 kg. The results reveal that increase in nitrogen and magnesium level had significant response on vegetative growth yield and quality of African Marigold. The treatment T_{11} N @ 120kg + Mg @ 10 kg resulted in significantly higher growth parameters viz. plant height, number of leaves/plant, number of branches/plant, minimum days to first flowering, minimum days taken to 50% flowering, as well as yield parameters viz. flower size, number of flower/ plant, fresh flower weight, flower yield, biological yield, harvest index and economic yield of marigold (4.61 kg /plot).

Keywords: *African Marigold, Nitrogen, Magnesium, Quality.*

INTRODUCTION

African marigold (*Tagetes erecta* L.) is one of the traditional flower crops grown extensively in India. Marigold belongs to the genus *Tagetes*, family Asteraceae, chromosome number 2n=24 and is native to Mexico. It has gained popularity among the flower growers and gardeners on account of its easy cultivation, long flowering habit and wide adaptability (Subedi et al., 2020). In India marigold is one of the most commonly grown flowers and used extensively on religious and social functions in different forms.

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Because of their easy in cultivation, wide adaptability to varying soil and climatic conditions, long duration of flowering and attractively colored flowers of excellent keeping quality, the marigolds have become one of the most popular flowers in our country (Shyala et al., 2019). Flowers are sold in the market as loose or as garlands. Due to its variable height and colour marigold is especially use for decoration and included in landscape plants. Nitrogen (N) has the quickest most pronounced effect on the plant growth that ultimately leads to good yield. Nitrogen is the constituent of different amino acids, proteins and chlorophyll which is essential for good growth of plant Acharya and Dashora (2004). Nitrogen deficiency can be characterized by stunted growth flowering and fruiting are also reduced. Magnesium is an essential plant nutrient. It has a wide range of key roles in many plant functions. One of the magnesium's well-known roles is in the photosynthesis process, as it is a building block of the Chlorophyll, which makes leaves appear green (Narsude et al., 2010).

MATERIALS AND METHODS

The experiment was laid out in Randomized Block Design comprising of 12 treatments each replicated three times. Treatments were randomly arranged in each replication, divided into twelve plots. A field experiment was conducted during *rabi*, 2019 to study the "Effect of nitrogen levels with and without magnesium on growth, yield and quality of African Marigold (*Tagetes erecta* L.)" Variety Pusa Narangi was conducted during Rabi season of the year 2019-2020 on Horticultural Research farm of Department of Horticulture, AKS University, Satna (M.P.). The experiment was laid out in a randomized block design with three replicated 12 treatments *viz*., T_1: N @ 0kg + Mg @ 0kg, T_2: N @ 0kg + Mg @10 kg, T_3: N @ 0kg + Mg @20 kg, T_4: N @ 40kg + Mg @ 0kg, T_5: N @ 40kg + Mg @ 10 kg, T_6 N @ 40kg + Mg @ 20 kg, T_7: N @ 80kg + Mg @ 0kg, T_8: N @ 80kg + Mg @10 kg, T_9: N @ 80kg + Mg @ 20 kg, T_{10}: N @ 120kg + Mg @ 0kg, T_{11}: N @ 120kg + Mg @ 10 kg, T_{12}: N @ 120kg + Mg @ 20 kg. The plot size was 1.5x1.2 and the spacing adopted was 40x30 cm between rows and plants. The fertilizers *viz*., urea for nitrogen, was weighed as per the calculated quantities according to each of the treatment combinations mentioned above. Half dose of nitrogen was applied basally to each specified plot. The remaining half dose was given at 30 days after transplanting. Growth parameters, viz. plant height, plant spread, number of leaves per plant, number of branches per plant were recorded at 20 days interval. A total four observations at 20, 40, 60, and 80 DAT were recorded during the experiment. The data were recorded on days required for Height of plant in (cm), No of leaves / plant, Number of branches, Days taken to 50% flowering, Days to first flowering, Flower size (cm), Number of flower/ plant, Fresh flower weight (g / flower), Flower yield (g /plant), Flower economic yield (t/ha), Harvest Index, Biological yield (kg/plot). The data recorded on each character were analysed by the ANOVA technique. The critical difference values were calculated at 5 per cent level of significance.

RESULTS AND DISCUSSION

Data on various growth and yield characters of Beetroot crop as influenced by the different levels of nitrogen and their combinations are presented in Tables 1. A field experiment was conducted at the Agriculture farm of AKS University, Satna, during rabi season 2019-2020, to study the Effect of nitrogen levels with and without magnesium on growth, yield and quality of African Marigold (*Tagetes erecta* L.). The maximum plant height at 20 40, 60 and 80 DAT stage was recorded due to N @ 120kg + Mg @ 10 kg (25.87, 37.83, 53.29 and 72.54 cm respectively) and minimum plant height was recorded from the Control (12.03, 20.31, 31.07 and 44.40cm, respectively) The highest number of leaves per plant at 20 40, 60 and 80 DAT was recorded from N @ 120kg + Mg @ 10 kg (41.80, 64.08, 115.76 and 209.22 respectively) and lowest number of leaves per plant was recorded in

case of Control (20.18, 42.07, 66.49 and 143.11 respectively). The highest number of branches per plant at 20 40, 60 and 80 DAT was recorded from N @ 120kg + Mg @ 10 kg (13.21, 17.70, 24.80 and 33.47 respectively) and lowest number of branches per plant was recorded in case of Control (6.64, 10.96, 15.37 and 22.30 respectively).

The findings of this investigation are in close conformity with those of Ahmad et al. (2011), Baboo and Singh (2003), Bhat and Shepherd (2006) and Jabbar et al. (2014).

The minimum days to first flowering was recorded from N @ 120kg + Mg @ 10 kg (50.07) and maximum days to first flowering was recorded in case of Control (54.60). The minimum (62.88) days taken to 50% flowering was recorded from N @ 120kg + Mg @ 10 kg and maximum (70.86) days taken to 50% flowering was recorded in case of Control (70.86). The maximum flower size was recorded from N @ 120kg + Mg @ 10 kg (6.96 cm) and minimum flower size was recorded in case of Control (4.78 cm). The maximum number of flower/ plant was recorded from N @ 120kg + Mg @ 10 kg (54.07) and minimum number of flower/ plant (46.20) was recorded in case of Control (46.20). The maximum fresh flower weight was recorded under N @ 120kg + Mg @ 10 kg (8.52 g/flower) and minimum fresh flower weight was recorded in case of Control (5.51 g/flower). Choudhary, et al. (2014), Ekwu and Mbah (2007) and Kishore et al. (2010) also obtained similar results.

The maximum (460.67 g / plant) flower yield was recorded under N @ 120kg + Mg @ 10 kg and minimum (254.56 g / plant) flower yield was recorded in case of Control. The maximum (4.61 kg /plot) flower economic yield was recorded from N @ 120kg + Mg @ 10 kg and minimum (2.54 kg /plot) economic yield was recorded in case of Control. The maximum flower yield was recorded from N @ 120kg + Mg @ 10 kg (25.59 t/ha) and minimum flower yield was recorded in case of Control (14.14 t/ha). The maximum harvest index was recorded from N @ 120kg + Mg @ 10 kg (5.09) and minimum harvest index was recorded in case of Control (2.14). The maximum biological yield was recorded from N @ 120kg + Mg @ 10 kg (8.94 kg/plot) and minimum biological yield was recorded in case of Control (6.13 kg/plot). The maximum Benefit: Cost ratio was recorded from N @ 120kg + Mg @ 10 kg (0.79:1) and minimum Benefit: Cost ratio was recorded in case of Control (0.64:1).

Table 1: Effect of nitrogen levels with and without magnesium on African Marigold

Treatments	Plant height (cm) 80 DAT	No of leaves / plant 80 DAT	Number of branches / plant 80 DAT	Days to first flowering	Days taken to 50% flowering	Flower size (cm)	Number of flower/ plant	Fresh flower weight (g / flower)	Flower yield (g /plant)	Flower (economic) yield (kg /plot)	Flower yield (t/ha)	Harvest Index	Biological yield (kg/plot)
T_1	44.40	143.11	22.30	54.60	70.86	4.78	46.20	5.51	254.56	2.54	14.14	2.14	6.13
T_2	45.27	144.25	25.57	54.13	69.40	5.76	48.17	5.71	288.92	2.89	16.05	2.56	6.45
T_3	46.13	144.67	26.63	52.93	68.15	5.69	49.93	6.15	311.98	3.12	17.33	2.79	7.57
T_4	57.11	170.42	27.60	52.13	67.47	5.84	50.60	6.24	300.58	3.01	16.70	3.17	7.46
T_5	58.30	172.38	28.66	51.73	67.01	5.55	50.73	6.76	337.52	3.38	18.75	3.45	7.67
T_6	59.02	173.24	29.20	50.67	64.60	5.46	50.93	7.13	363.13	3.63	20.17	3.76	7.82
T_7	66.47	187.05	29.20	51.67	66.34	5.46	51.80	7.33	379.69	3.80	21.09	4.75	7.64
T_8	67.18	188.49	29.80	52.00	67.64	6.03	52.00	7.49	389.48	3.89	21.63	4.53	7.73
T_9	67.90	189.02	29.53	51.27	66.83	6.14	52.27	7.55	394.63	3.95	21.92	4.21	7.89
T_{10}	70.26	205.16	30.13	50.93	64.71	6.51	53.13	7.83	416.00	4.16	23.11	4.02	8.22
T_{11}	72.54	209.22	33.47	50.07	62.88	6.96	54.07	8.52	460.67	4.61	25.59	5.09	8.94
T_{12}	71.63	207.64	32.47	50.47	63.47	6.59	53.27	8.05	428.82	4.29	23.82	4.78	8.58
F-test	S	S	S	S	S	S	S	S	S	S	S	S	S
S.Ed(±)	1.01	1.06	0.64	1.15	1.10	0.13	1.13	0.16	1.03	0.08	0.44	0.09	0.17
CD at 5%	2.09	2.20	1.32	2.39	2.28	0.27	2.34	0.32	2.14	0.17	0.92	0.18	0.36

CONCLUSION

On the basis of the finding presented earlier and discussion in preceding pages, it may be concluded that the application of N @ 120kg + Mg @ 10 kg resulted in significantly higher growth parameters viz. Plant height, Number of leaves/plant, Number of branches/plant, Minimum days to first flowering, Minimum

days taken to 50% flowering, as well as yield parameters viz. Flower size, Number of flower/ plant, Fresh flower weight, Flower yield, Biological yield, Harvest index and Economic yield of marigold (4.61 kg /plot). The Benefit: Cost ratio of marigold flowers were significantly higher (0.79:1) in the treatment T_{11} (N @ 120kg + Mg @ 10 kg).

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