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Research Article

Effect of Nutrients on Growth, Flowering and Yield of African Marigold (*Tagetes erecta* L.) cv. Pusa Basanthi at Hadauti Region

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ABSTRACT

In Randomized Block Design, the experiment was conducted with 10 treatments consisting of 3 levels each of T_1-Control, T_2-1% urea spraying, T_3-2% urea spraying, T_4-3% urea spraying, T_5-0.2% MgSO4, T_6 -0.4% MgSO4, T_7- 0.6 % $MgSO_4$, T_8- 0.2% Boron spraying, T_9- 0.4% Boron spraying, T_{10}- 0.6% Boron spraying. replicated three times to evaluate the effect of nutrients on African marigold growth, flowering attribute and yield characters. Among all the treatments, urea (0.2%) resulted in maximum plant height (55.56), plant spread (40.30), number of branches (25.53), initiation of early flower buds (57.16), first flower opening (93.74), minimum flowering time(36.90), number of flowers per plant(53.63), length of flower stalk (7.60), flower weight (12.74), flower weight per plant (53.63), and flower yield (348.64) per hectare was identified in this experiment , in order to increase soil fertility and crop production in sustainable agriculture.

Keywords: *Nutrient, Marigold, Growth and Yield.*

INTRODUCTION

Marigold (*Tagetes erecta* Linn.) is India's largest commercial herb, belonging to the Asteraceaee tribe (Compositeae). The common name "marigold," originating from "Mary's Gold," is synonymous with the Christian legends of the Virgin Mary. It originated in Mexico, especially in Central and South America. The marigold is one of the most widely cultivated flowers in India. Because of their ease of cultivation, wide adaptability to changing soil and climatic conditions, long flowering time and attractive flower colours of outstanding quality. Marigold can be cultivated in all seasons, i.e. seasonal, winter and summer, the major crops of which are rainy and winter season crops in eastern U.P. In the months of July-August and September-October, respectively, seedlings are transplanted, while summer season crops are transplanted between February and March. Marigold is primarily cultivated in India, Tropical Africa, Sri Lanka and Madagascar. In the world, India occupies 15 percent of the conventional flower field (Jawahar, 2004).

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Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, West Bengal, Orissa, Delhi, U.P and Uttarakhand are big producing marigold states. The marigold is one of the most popular flowers in our country and is widely used in various forms for religious and social functions. Flowers are sold on the market as loose flowers or as garlands. For plant growth and production, nitrogen is an essential metabolic factor. It is essentially considered to be a metabolic activity, an energy transfer that is necessary for protein metabolism and other biochemical products such as nucleic acid, chlorophyll and protoplasm. Magnesium sulphate foliar application is a means of improving the nutritional status of crops under conditions of deficiency. In order to increase the chlorophyll concentration and vegetative yield of plants, foliar application of Mg has been shown to be a constituent of chlorophyll, polyribosome chromosomes and a carrier of P in plants, especially in concentrations with high oil content seed formation; promotes oil and fat formation, starch translocation, catalytic action. Boron's function is the preservation of the integrity of the cell wall by binding to pectic polysaccharides.

Boron is involved in plant processes such as sugar translocation and permeability of the membrane, leaf photosynthesis, leaf expansion and differentiation, biosynthesis of the cell wall, fixation of nitrogen, protein, amino acids, and metabolism of nitrate. It also has a strong effect on flower development, pollen germination, fertilisation, seed growth, and fruit abscission. Boron is an essential element found in the meristematic regions of plant such as root tips, emerging leaves and buds. Keeping in view the role of these nutrients, present investigation was conducted to assess the effect urea, magnesium sulphate and boron spraying on marigold.

MATERIALS AND METHODS

At the School of Agriculture Sciences, Career Point University, Kota, Rajasthan, India, the experiment was carried out. In Randomized Block Design, the experiment was conducted with 10 treatments consisting of 3 levels each of T_1-Control, T_2-1% urea spraying, T_3-2% urea spraying, T_4-3% urea spraying, T_5- 0.2% MgSO4, T_6 -0.4% MgSO4, T_7- 0.6 % $MgSO_4$, T_8- 0.2% Boron spraying, T_9- 0.4% Boron spraying, T_{10}- 0.6% Boron spraying. A 30-day-old African marigold seedling (*Tagetes erecta* L.) cv. At a distance of 40 x 40 cm, Pusa Basanthi Gainda was planted. As plant height, plant spread, number of branches and flowering characters viz., the significant vegetative growth. Days taken for the initiation of the first flower bud, days taken for the opening of the first flower, flowering period, flower stalk length (cm), flower diameter (cm), number of flower characters per plant and yield characters such as flower weight (g), flower yield per plant (g) and flower yield per hectare (q) were registered for each reproduction in five randomly selected plants. The knowledge was evaluated by the approach proposed by Fisher and Yates (1949).

RESULTS AND DISCUSSION

The results presented in Table 1 show that the variation in plant height was significantly influenced by the foliar application of nutrients. The result shows that plant height at 75 DAT was significantly maximum (55.56 cm) with T_3 urea applications at 2 percent spray and found at boron (0.4 percent) and boron (0.4 percent) par (0.6 percent).

In plant processes such as sugar translocation and membrane permeability, leaf photosynthesis, cell elongation and division, cell wall biosynthesis and nitrate, the effect of urea on the growth of plants that are considered to be metabolic activities, energy transformation, essential for the metabolism of protein and other biochemical products such as nucleic acid, chlorophyll and protoplasm and boron, Similar findings were also reported in China aster and Gladiolus by Dashora et al. (2004) and Jat and Gupta (2007) in African marigold, Kakade et al. (2009) and Reddy and Chaturvedi (2009).

The foliar application of urea (2 percent), which was found at par with urea (1 percent), $MgSO_4$ (0.4 percent), $MgSO_4$ (0.6 percent), boron (0.4 percent) and boron (0.4 percent), plant spread (40.30cm) was recorded to a significant maximum (0.6 percent). While in control, the lowest plant spread was recorded. Urea culminated in hyper elongation of the internodal length causing plant height extension thus increasing the total number of latent buds from where primary branches

originated, resulting in optimal plant distribution. These findings are in close accordance with the results in China aster of Nagaich et al. (2003) in marigold and Kakade et al. (2009). Maximum branch numbers were registered for urea (2%), which was found to be equivalent to urea (1%), urea (3%), MgSO4 (0.2%) and MgSO4 (0.4 percent). Khan (2000) reported controlling the maximum number of branches per dahlia plant with Zn @ 4 percent, boron @ 0.2 percent and Mn @ 0.2 percent care, and Mathew et al. (2004) and Kumar et al. (2010) reported an increased number of major branches in marigold.

With the application of urea 2 percent, followed by boron 0.6 percent, the earliest bud initiation and flowering was observed and decreases Juvenile times while maximum days taken to bud initiation with the application of MgSO4 0.4 percent was noted. The nitrogen function is to trigger the meristematic activity of plants. The division of cells and the enlargement of cells are both accelerated by sufficient nitrogen supply. In Tagetes erecta, Singh et al. (2004) in Gladiolous and Muthumanickam et al. (1999) in Gerbera, early flowering and maximum flower diameter with nitrogen application were recorded by Acharya et al. (2004).

Nitrogen was found most effective in extending the flowering period particularly with urea 2 percent followed by urea 3 percent and urea 1 percent and it may be due to advanced stage of flowering in marigold. The results are similar to those of Muktanjali et al. (2004) in gladiolus marigold Jauhari et al. (2005). The maximum length of flower stalk was dramatically recorded with 2 percent foliar urea spray. In African marigold, Yadav et al. (2000) also observed increased pedicel length in marigold with nitrogen. Data provided in Table 1 clearly showed that the maximum numbers of flower per plant were registered with foliar application of urea 2 percent followed by MgSO4 0.4 percent. The increase in the number of flowers per plant may be attributable to the development at the early stage of growth of a large number of laterals that had ample time to accumulate carbohydrates for proper separation of flower buds due to improved reproductive ability and reduced plant form photosynthesis. The result was in near conformity with the chrysanthemum of Barman et al. (1993) and Kumar et al. (2009). The maximum flower diameter was substantially found with urea 2 percent, followed by 0.4 percent with $MgSO_4$, while the minimum flower diameter was reported under regulation.

It is obvious from the data provided in Table 1 that with foliar application of urea 2 percent, the weight of flower and flower yield per ha were recorded substantially maximum. The rise in flower weight with growing amounts of nitrogen was observed by Yadav et al. (2000) and maximum weight was obtained with the application of 180 ppm nitrogen in marigold. The results are consistent with the results in rose, Kumar et al. (2010) in marigold of Bhattacharjee et al. (1992).

Table1. Effect of nutrients on growth, flowering and yield of African marigold (*Tagetes erecta* L)

Treatment	Plant Height (cm)	Plant spread (cm)	Number of branches / plant	Days taken to first flower bud initiation	Days taken to Opening of first flower	Duration of flowering (days)	Length of flower stalk (cm)	Diameter of Flower (cm)	Weight of Flower (g)	Number of flower / plant	Flower yield (q/ha)
T1-Control	43.44	37.29	24.23	54.61	92.63	36.90	7.25	6.56	9.07	47.58	220.36
T2-1% urea spraying	50.69	38.41	25.04	53.56	92.44	38.54	7.44	6.96	10.29	50.51	265.58
T3-2% urea spraying	55.56	40.30	25.53	57.16	91.33	40.47	7.60	8.57	12.74	53.63	348.64
T4-3% urea spraying	50.37	37.56	24.75	54.22	92.63	39.00	7.54	7.39	10.79	50.06	275.89
T5- 0.2% MgSO4	53.04	36.38	24.82	54.6	92.90	36.90	7.31	7.261	10.31	44.74	235.69
T6 -0.4% MgSO4	47.68	38.73	25.08	50.62	93.03	38.02	7.44	7.80	10.80	52.55	289.94
T7- 0.6 % MgSO4	44.74	38.80	24.62	54.02	93.74	37.56	7.44	7.40	10.36	48.96	258.99
T8- 0.2% Boron spraying	53.17	34.94	24.16	54.15	93.29	37.10	7.46	7.56	10.88	45.09	250.61
T9- 0.4% Boron spraying	54.12	38.47	24.23	54.48	92.31	37.29	7.44	7.33	10.42	48.44	257.71
T10- 0.6% Boron spraying	54.64	38.15	24.30	52.45	93.29	37.43	7.369	7.25	10.29	48.21	253.45
Sem	**1.31**	**0.97**	**0.63**	**1.38**	**2.37**	**0.98**	**0.19**	**0.19**	**0.27**	**1.26**	**6.97**
CD at 5%	**3.93**	**2.91**	**1.89**	**4.14**	**7.11**	**2.94**	**0.57**	**0.57**	**0.81**	**3.78**	**20.91**

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