Plant Archives Vol. 17 No. 1, 2017 pp. 312-314 *ISSN 0972-5210*

EFFECT OF MICRONUTRIENTS (Zn AND Fe) AS A FOLIAR SPRAY ON GROWTH AND FLOWER PRODUCTION OF MARIGOLD

M. J. Patokar, Neha Chopde and Ommala Kuchanwar

Horticulture Section, College of Agriculture, Amravati Road, Nagpur – 440 010 (Maharashtra), India.

Abstract

The investigation entitled "Effect of micronutrients (Zn and Fe) as a foliar spray on growth and flower production of marigold" was carried out to study the response of marigold 'F_1 Hybrid Yellow' to micro-nutrients *viz*., zinc and iron for higher production of better quality flowers during *rabi* season of the year 2015-16 at Horticulture Section, College of Agriculture, Nagpur with seven treatments in Randomized Block Design with three replications. The treatments comprised of different levels of zinc and iron (0% *i.e.* water spray, 0.25%, 0.5% and 0.75% each). The results revealed that, foliar application of 0.5% zinc recorded significantly maximum vegetative growth in respect of plant height, spread (E-W) of plant and spread (N-S) of plant, yield in respect of number of flowers plant^{-1} and flower yield ha^{-1}, quality in respect of flower diameter, weight of flower and longevity of intact flower and the earliest first flower bud initiation. However, 0.5% iron was the next best treatment in respect of growth, flowering, yield and quality parameters of marigold. The treatment differences in respect of stem diameter of marigold plant were found to be non-significant.

Key words : Marigold, micro-nutrients, growth, flowering, yield, quality.

Introduction

Flowers are important for their economic use as well as aesthetic value. Among the flowers grown by farmers, marigold (*Tagetes erecta* L.) has its own importance. It has gained popularity among flower growers because of its easy cultivation and wide adaptability. The growers are attracted towards marigold flower as it has a habit of free flowering, short duration to produce marketable flowers of attractive colours and good keeping quality. Marigold flower has more demand during festival period especially on Diwali and Dashehara. There is a constant demand for theses flowers throughout the year for various functions, festivals and floral decorations. Hence, the area under this crop in Vidarbha region of Maharashtra State is increasing day by day. For maximization of flower yield and quality of marigold an advanced technique like foliar application of micro-nutrients is required to be followed besides usual cultural and management practices.

In Vidarbha region, marigold is cultivated on a large scale but productivity is low and there is no proper recommendation based on latest technology to increase the yield potential. Low productivity and poor quality flowers of marigold is one of the major constraints to its cultivation.

Various research workers have reported that the application of micronutrients helps to increase the yield of good quality flowers of African marigold. The present investigation was therefore carried out to study the response of marigold 'F_1 Hybrid Yellow' to micro-nutrients *viz.*, zinc and iron for higher production of better quality flowers.

Materials and Methods

The present investigation was carried out at Horticulture Section, College of Agriculture, Nagpur during *rabi* season of the year 2015-16 to study the effect of foliar application of zinc and iron on growth, flowering, flower yield and quality of marigold 'F_1 Hybrid Yellow' and find out suitable concentration of both the nutrients for production of higher yield of better quality flowers of marigold with seven treatments in Randomized Block Design with three replications. The treatments comprised of different levels of zinc and iron (0% *i.e.* water spray, 0.25%, 0.5% and 0.75% each).

The experimental plot was brought to fine tilth by ploughing, clod crushing and harrowing. At the time of land preparation, well rotted FYM @ 15 t ha^{-1} was mixed uniformly in the soil before last harrowing. The field was

then laid out with flat beds of the dimension 1.8 m x 1.8 m. Uniform and healthy seedlings of marigold 'F_1 Hybrid Yellow' were transplanted in the prepared plots at the spacing of 30 × 30 cm.

Solutions of zinc and iron each of 0% (water spray), 0.25%, 0.5% and 0.75% were prepared by dissolving respective amount of zinc sulphate and ferrous sulphate, respectively in distilled water after calculation of total quantity required on the basis of their molecular weight. Then the prepared solution was sprayed at 10th day after transplanting of seedlings as per the treatment. The various observations on growth, flowering, yield and quality parameters of marigold were recorded at appropriate stages and data analysed statistically.

Results and Discussion

The data presented in tables 1 and 2 revealed that different levels of zinc and iron had significant effect on all growth, flowering, yield and quality parameters of marigold studied in this experiment except stem diameter of plant.

Growth

Significantly maximum plant height (33.52 cm), spread (E-W) of plant (21.33 cm) and spread (N-S) of plant (21.50 cm) in marigold were recorded with foliar application of 0.5% zinc and it was found to be at par with 0.5% iron (32.73 cm, 20.19 cm and 20.93 cm, respectively), 0.25% zinc (32.37 cm, 19.72 cm and 19.91 cm, respectively) and 0.25 % iron (31.40 cm, 19.29 cm and 19.42 cm, respectively). Whereas, the lowest plant height (28.80 cm), spread (E-W) of plant (16.79 cm) and spread (N-S) of plant (17.58 cm) were noticed with control i.e. water spray. Though the treatment differences were non-significant in respect of stem diameter of plant, maximum value was recorded with 0.5% zinc (1.06 cm).

An increased vegetative growth with foliar spray of 0.5% zinc might be due to the fact that, zinc applied at optimum concentration is closely involved in metabolism of RNA and ribosomal content in plant cell which leads to stimulation of carbohydrates, proteins and DNA formation. It also helps in synthesis of tryptophan which acts as a growth promoting substance. 0.5% iron was found to be the next best treatment in respect of growth of plant, which might have been due to the fact that, iron applied with proper concentration acts as an important catalyst in the enzymatic reaction of metabolism. This ultimately would have helped in larger biosynthesis of photoassymilates, thereby enhanced vegetative growth of plant. The results are in line with the findings of Karuppaiah (2014) and Saini *et al*. (2015) in chrysanthemum.

Flowering

The foliar treatment of 0.5% zinc took significantly minimum days for first flower bud initiation (15.00 days) which was found to be at par with 0.5% iron (16.00 days), 0.25% zinc (16.00 days) and 0.25% iron (16.33 days), whereas, the control treatment (water spray) recorded maximum days for first flower bud initiation (19.00 days).

An early flowering with 0.5% each of zinc and iron might be due to enhanced growth and development of plant. Zinc favours the storage of more carbohydrates through photosynthesis and iron involves in synthesis of plant hormones and also plays an important role in chlorophyll synthesis, photosynthesis and respiration. This may be the attributing factor for the positive effectiveness of optimum dose of zinc and iron on reducing juvenile phase of the plant. Similar results are also obtained by Gupta and Kumar (2015) in African marigold. They reported that, 0.4% zinc recorded an early flowering.

Flower yield and quality

In this experiment, total number of flowers plant^{-1}and flower yield ha^{-1} in marigold were noticed significantly maximum with the foliar treatment of 0.5% zinc (31.33 and 60.17 q, respectively) which were statistically at par with 0.5 % iron (30.07 and 54.99 q, respectively), whereas, the control treatment *i.e.* water spray counted significantly lowest number of flowers plant^{-1} (24.93) and recorded lowest flower yield ha^{-1} (38.20 q).

This might be due to the fact that, zinc activates several enzymes *viz*. catalyase, tryptophan synthate etc. and involves itself in chlorophyll synthesis and various physiological activities by which plant growth and development are encouraged, due to which the flower yield might have been increased.

In respect of the flower quality parameters in marigold, the foliar treatment of 0.5% zinc exhibited significantly maximum longevity of intact flower (31.00 days), flower diameter (8.50 cm) and weight of flower(25.22 g) which were found statistically at par with 0.5% iron (30.00 days, 8.30 cm and 24.03 g, respectively) and 0.25% zinc in respect of longevity of flower (29.33 days) and weight of flower (23.36 g), however, the control treatment *i.e*. water spray recorded minimum values (24.67 days, 7.19 cm and 20.27 g, respectively). Better quality flowers of marigold were produced due to application of 0.5% zinc which might be due to enhanced vegetative growth resulted into production of more food material which in turn might have been utilized for better development of flowers. The results are in close

Table 1 : Effect of foliar application of zinc and iron on growth and flowering of marigold (F_1 Hybrid Yellow).

Treatments	Plant height (cm)	Spread of plant (E-W) at flower bud initiation (cm)	Spread of plant (N-S) at flower bud initiation (cm)	Stem diameter (cm)	Days for first flower bud initiation
T_1- Control (water spray)	28.80	16.79	17.58	0.89	19.00
T_2- 0.25% Zinc	32.37	19.72	19.91	0.98	16.00
T_3- 0.50% Zinc	33.52	21.33	21.50	1.06	15.00
T_4- 0.75% Zinc	30.90	18.82	18.35	0.94	18.00
T_5- 0.25% Iron	31.40	19.29	19.42	0.97	16.33
T_6- 0.50% Iron	32.73	20.19	20.93	1.03	16.00
T_7- 0.75% Iron	30.73	18.73	18.45	0.96	17.33
SE (m) ±	0.81	0.76	0.60	0.05	0.71
CD (p=0.05)	2.35	2.23	1.78	-	2.10

Table 2 : Effect of foliar application of zinc and iron on flower yield and quality of marigold (F_1 hybrid Yellow).

Treatments	Flowers plant^{-1}	Flowers yield ha^{-1} (q)	Longevity of flower (days)	Flower diameter (cm)	Weight of flower (g)
T_1- Control (water spray)	24.93	38.20	24.67	7.19	20.27
T_2- 0.25 % Zinc	28.87	51.07	29.33	8.13	23.36
T_3- 0.50 % Zinc	31.33	60.17	31.00	8.50	25.22
T_4- 0.75 % Zinc	25.93	44.43	28.00	7.96	22.58
T_5- 0.25 % Iron	27.68	48.66	28.00	8.12	23.07
T_6- 0.50 % Iron	30.07	54.99	30.00	8.30	24.03
T_7- 0.75 % Iron	26.00	43.63	27.33	7.93	22.03
SE (m) ±	1.10	2.26	0.85	0.11	0.77
CD (p=0.05)	3.25	6.67	2.50	0.33	2.26

conformity with the findings of Shah *et al*. (2016) in marigold. They concluded that, 0.5% of zinc should be sprayed for higher yield of good quality flower production of marigold under Peshawar (Pakistan) conditions.

Thus, it can be inferred from the present investigation that, foliar application of 0.5% zinc increased vegetative growth and flower yield, enhanced flowering and improved flower quality in marigold 'F_1 Hybrid Yellow' and foliar application of 0.5% iron was the next best treatment.

References

Gupta, Aashish Kumar and Ashok Kumar (2015). Effect of micro-nutrients on flowering and yield attributes of African marigold. *Res. Environ. Life Sci*., **8(2)** : 289-290.

Karuppaiah, P. (2014). Effect of zinc and iron on growth, yield and quality of chrysanthemum. *The Asian J. Hort*., **9(1)** : 232-236.

Saini, Tara Chand, N. D. Polara and A. A. Bajad (2015). Effect of micro-nutrients (Fe and Zn) on growth of chrysanthemum. *The Asian J. Hort*., **10(2)** : 216-221.

Shah, S. T., S. Ullah, N. Khan, M. Sajid, A. Rab, N. V. Amin, A. Iqbal and S. Rawan (2016). Effect of zinc as a foliar spray on growth and flower production of marigold. *Academia J. Agril. Res*., **4(3)** : 140-144.