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EFFECT OF FOLIAR APPLICATION OF ZINC AND IRON ON GROWTH, YIELD AND QUALITY OF GLADIOLUS

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Abstract

The investigation entitled "Effect of foliar application of zinc and iron on growth, yield and quality of gladiolus" was carried out during *rabi* season of the year 2013-14 at Horticulture Section, College of Agriculture, Nagpur with sixteen treatment combinations in Factorial Randomized Block Design. The treatments comprised of different levels of zinc (control *i.e.* water spray, 0.2%, 0.4% and 0.6%) and iron (control *i.e.* water spray, 0.2%, 0.4% and 0.6%). The results revealed that foliar application of 0.4% zinc and 0.4% iron recorded significantly maximum vegetative growth in respect of plant height and leaf area, yield in respect of spikes plant^{-1} and corms plant^{-1}, quality parameters *viz*. length of spike, length of rachis, florets spike^{-1}, diameter of spike and diameter of corm and the earliest 50 per cent flowering. However, interaction effect of zinc and iron on growth, flowering, yield and quality parameters of gladiolus was found to be non-significant.

Key words : Gladiolus, zinc, iron, spike, corm.

Introduction

Gladiolus (*Gladiolus grandiflorus* L.), belonging to family *Iridaceae*, is one of the most popular ornamental bulbous flower crops grown commercially for its bewitching flowers. It has second rank after tulip among the bulbous flowers in India and has occupied fourth position in international trade of cut flowers. Popularity of this crop as a cut flower is increasing day by day because of its keeping quality and in-exhaustive range of colors of the spikes. Various research workers have reported that, the proper concentration of micronutrients help to increase the yield of good quality spikes and corms in gladiolus. The micronutrients play crucial and vital role in gladiolus production as well as plant growth and development. Zinc and iron are the important micronutrients needed for better flower production. Information regarding requirement of iron and zinc with proper dose for gladiolus in Vidarbha region (M.S), India is lacking. Keeping this in view, the present study was undertaken to investigate the effect of foliar application of zinc and iron on growth, yield and quality of gladiolus.

Materials and Methods

The present investigation was carried out at Horticulture Section, College of Agriculture, Nagpur (Maharashtra), India; during *rabi* season of the year 2013-14 to study the effect of foliar application of zinc and iron on growth, yield and quality of gladiolus and find out suitable concentration of both the nutrients for production of higher yield of better quality spikes and corms of gladiolus with sixteen treatment combinations in Factorial Randomised Block Design with three replications. The treatments comprised of different levels of zinc and iron (0% *i.e.* water spray, 0.2%, 0.4% and 0.6% each).

After preparatory tillage operations, well-rotted FYM @ 20 t ha^{-1} was mixed uniformly in the soil before last harrowing. The field was laid out with the beds of 45 cm spaced ridges and furrows and the beds were prepared. The rested, cold stored, uniform and bigger sized gladiolus corms of the variety 'American Beauty' were treated with copper fungicide for 15 minutes before planting. The corms were planted 20 cm apart on ridges and furrows at 5 cm depth.

Solutions of zinc and iron each of 0 (water spray), 0.2, 0.4 and 0.6% were prepared on molecular weight basis by dissolving respective amount of zinc sulphate and ferrous sulphate, respectively in distilled water. Then the prepared solution was sprayed twice at 20th and 30th day after planting individually and in combination as per the treatment. The various observations on growth, flowering, yield and quality parameters of gladiolus spikes and corms were recorded and analysed statistically.

Table 1 : Effect of foliar application of zinc and iron on growth, flowering, yield and quality of gladiolus.

Treatment	Plant height (cm)	Leaf area (cm^2)	Days for 50% flowering (days)	Spikes $plant^{-1}$	Corms $plant^{-1}$	Length of spike (cm)	Length of rachis (cm)	Florets $spike^{-1}$	Diameter of spike (cm)	Diameter of corm (cm)
Factor A- Zinc										
Z_1- Control (Water spray)	49.50	109.69	86.83	2.83	2.78	74.68	30.07	7.80	0.52	3.98
Z_2- Zinc 0.2%	50.49	113.69	84.33	2.94	2.95	76.15	30.98	8.31	0.56	4.16
Z_3- Zinc 0.4%	52.82	117.72	78.33	3.17	3.55	82.05	34.11	9.18	0.63	4.56
Z_4- Zinc 0.6%	50.67	114.10	80.52	3.07	3.08	77.77	31.77	8.63	0.57	4.35
SE (m) ±	0.79	1.64	1.48	0.08	0.14	0.63	0.64	0.13	0.016	0.02
CD at 5%	2.30	4.75	4.28	0.23	0.41	1.82	1.86	0.40	0.04	0.36
Factor B- Iron										
F_1- Control (Water spray)	49.66	106.82	89.16	2.75	2.70	74.33	29.31	7.57	0.53	3.90
F_2- Iron 0.2%	50.35	113.74	84.68	2.98	2.94	76.07	30.31	8.57	0.55	4.10
F_3- Iron 0.4%	53.08	119.63	75.58	3.31	3.52	82.20	34.69	9.37	0.59	4.62
F_4- Iron 0.6%	50.36	114.91	81.08	3.06	3.20	78.02	32.84	8.78	0.58	4.44
SE (m) ±	0.79	1.69	1.48	0.08	0.14	0.63	0.64	0.13	0.016	0.12
CD at 5%	2.30	4.75	4.28	0.23	0.41	1.82	1.86	0.40	0.04	0.36
Interaction effect										
SE (m) ±	1.59	3.29	2.97	0.16	0.28	1.26	1.29	0.27	0.03	0.25
CD at 5%	-	-	-	-	-	-	-		-	

Results and Discussion

The data presented in table 1 revealed that different levels of zinc and iron had significant effect on all growth, flowering, yield and quality parameters of gladiolus studied in this experiment.

Growth

Significantly maximum plant height and leaf area in gladiolus were recorded with the application of 0.4% zinc (52.82 cm and 117.72 cm^2, respectively), which was found to be at par with 0.6% zinc. Similarly, 0.4% iron exhibited significantly the highest plant height and leaf area (53.08 cm and 119.63 cm^2, respectively) as compared to other treatments. Whereas, 0% each of zinc and iron *i.e.* water spray (control treatment) noted minimum vegetative growth in terms of plant height and leaf area. An increased vegetative growth with foliar spray of 0.4% zinc and 0.4% iron 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. Similarly, iron applied with proper concentration acts as a 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 could paint in the same direction of Jat *et al*. (2007) in marigold and Lahije (2012) in gladiolus.

Flowering

The treatment of 0.4% zinc and 0.4% iron took significantly minimum days for 50 per cent flowering (78.33 and 75.58 days, respectively), whereas, 0% zinc and iron *i.e.* water spray recorded maximum days for 50 per cent flowering in gladiolus (86.63 and 89.16 days, respectively). An early flowering with 0.4% 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 harmones 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 Balkrishnan *et al*. (2007) in African marigold. They reported that 0.5% zinc sulphate and 0.5% ferrous sulphate recorded an early flowering.

Yield

The yield parameters *viz*. spikes $plant^{-1}$ and corms $plant^{-1}$ were recorded significantly maximum with the application of 0.4% zinc (3.17 and 3.55, respectively)

and 0.4% iron (3.31 and 3.52, respectively), however, the treatment of 0% zinc and iron *i.e.* water spray had produced minimum yield of spikes (2.83 and 2.75, respectively) and corms (2.78 and 2.70, respectively) plant^{-1}. 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 and corm yield might have been increased. The findings are in agreement with the results obtained by Jat *et al.* (2007) in African marigold and Sharma *et al.* (2013) in gladiolus. Similarly, iron applied at 0.4% concentration enhanced the flowering parameters, relived the plant from chlorosis and produced healthy green leaves which resulted in higher assimilate synthesis and partitioning of flower growth which may in turn have increased the flower and corm production and ultimately yield. Similar results were also reported by Balkrishnan *et al.* (2007) in marigold and Ganga *et al.* (2008) in chrysanthemum.

Quality

Significantly maximum length of spike (82.05 and 82.20 cm), diameter of spike (0.63 and 0.59 cm), length of rachis (34.11 and 34.69 cm), florets spike^{-1} (9.18 and 9.37) and diameter of corm (4.56 and 4.62 cm) were recorded under the treatment of 0.4% zinc and 0.4% iron, respectively. Better quality spikes and corms of gladiolus were produced due to application of 0.4% zinc and 0.4% iron 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 as well as corms of gladiolus. The results are in close conformity with the findings of Lahije (2012) in gladiolus.

The interaction effect of zinc and iron in respect of all growth, flowering, yield and quality parameters of gladiolus was found to be non-significant.

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