

Original Research Article

“Effect of foliar application of micronutrients on growth, yield and flower quality of gerbera(*Gerbera jamesonii*) under naturally ventilated polyhouse conditions in Prayagraj ”

ABSTRACT

A field experiment was executed during November, 2022 to April, 2023 under polyhouse conditions in Research Field, Department of Horticulture, SHUATS, Prayagraj. The objective is to study the response of foliar application of micronutrients on growth, yield and flower quality of gerbera. The research consists of three levels of zinc, iron, magnesium(0.2, 0.4, 0.6 %). The experiment was laid out in Randomized Block Design with ten treatments and replicated thrice. The results indicated that the treatment T2-Zn@0.4% performed better in all parameters recorded viz., plant height (24.08 cm), plant spread (37.68 cm), days for first bud initiation (73 days), number of flowers per plant (10), flower diameter (9.67 cm) and vase life (9 days).

Keywords: Growth, Yield, Gerbera, Iron, Magnesium, Micronutrient, Zinc.

1.INTRODUCTION

Gerbera (*Gerbera jamesonii* Bolus) is an important commercial cut flower grown throughout the world in a wide range of climatic conditions. It belongs to the family Asteraceae. It is commonly known as Transvaal Daisy, Barberton Daisy or African Daisy and this flower is native to South African and Asiatic regions. The estimated area under flower cultivation in India is about 0.90 thousand ha with a production of 21.84 cut flowers in lakh number and 4.00 thousand metric tonnes as a loose flower (Ministry of agriculture, Govt. of India 2014-15).

The plant growth and development as well as flower quality significantly influenced by climatic factors as well as nutrient management. Due to imbalanced use of macro and micro nutrients, the plant growth, development and quality of flower are directly affected. Therefore, the balanced nutrient application is necessary for healthy plant growth and production of quality flower. Micronutrients play vital roles in the growth and development of plants, due to their stimulatory and catalytic effects on metabolic processes and ultimately on flower yield and quality (Khosa *et al.* 2011). These are essential for crop growth and development. Enrichment of crop with micronutrients, especially zinc, iron and magnesium may prove effective in regulating flowering in crops (Pratap *et al.* 2005) and aid in flower production.

Zinc is necessary for the synthesis of auxin IAA and for carbohydrate metabolism, protein synthesis. Iron is a key element in different oxidation-reduction reactions of respiration and photosynthesis and magnesium involves in chlorophyll synthesis, enzyme activation and protein synthesis. Micronutrients are to be necessarily taken up by the plants from soil or supplemented through foliar application for good growth and yield of crops. Foliar application of nutrients is gaining more importance in fertilization of various field and floricultural crops, in many countries. Foliar fertilization technique may also be a good alternative to the conventional soil application to avoid the loss of fertilizers by leaching. It is recommended by several investigators as an

alternative fertilization method to improve the growth and flowering of gerbera. . Keeping these facts in view, an attempt was made to evaluate the effect of foliar application of Zn, Fe and Mg on growth, flowering and yield of gerbera under protected condition.

2. MATERIALS AND METHODS

An experiment was carried out on “Effect of foliar application of micronutrients on growth, yield and flower quality of gerbera(*Gerbera jamesonii*) under naturally ventilated polyhouse conditions in Prayagraj” was carried out at Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, during 2022-2023.

2.1 Geographical location of the site

Geographically, Prayagraj is situated in the South-Eastern part of Uttar Pradesh. It lies between the parallels of 24° 77' and 25° 47' north latitudes and 81° 19' and 82° 21' east longitudes.

2.2 Experimental Details

The experiment was laid out in Randomized Block design with ten treatments and replicated thrice i.e., control (T0), ZnSO₄ @ 0.2% (T1), ZnSO₄ @ 0.4% (T2), ZnSO₄ @0.6% (T3), FeSO₄ @ 0.2% (T4), FeSO₄ @ 0.4% (T5), FeSO₄ @ 0.6% (T6), MgSO₄ @0.2% (T7), MgSO₄ @0.4% (T8) and MgSO₄ @0.9% (T9) were selected for this study. Healthy tissue cultured plants having 4-6 leaves were planted on flat beds. The planting material were procured from Sheel- Biotech, New-Delhi. They were planted at a spacing of 30 cm x 30 cm. As per treatments the micronutrients were sprayed after one month of planting and subsequently at one-month intervals up to 4 months. Four plants from each replication of a cultivar were used for recording observation. The recommended cultural practices were followed for raising the successful crop. Data on growth, flowering, yield and quality characters were recorded up to 4 months after one month of planting. The data recorded during the experiment were subjected to statistical analysis by using analysis of variance (ANOVA). The significant difference among the varieties were compared against the critical difference at 5% level of significance ($CD_{0.05}$).

3. RESULTS AND DISCUSSION

3.1 Vegetative Parameters

The results of study revealed that application of different levels of Zn, Fe and Mg had produced a significant effect on growth parameters, viz. plant height, plant spread, number of leaves. Significantly taller plants (24.08cm) were observed with treatment T2(Zn@0.4%) followed by T5(Fe@0.4%, 22.63cm) whereas, significantly shorter plants were reported in T0(Control, 17.69cm). The increased in plant height with application of micronutrients might due to its role in synthesis of tryptophan which is a precursor of auxin (IAA) . Similarly iron acts as an important catalyst in enzymatic reactions of metabolism and would have helped in larger biosynthesis of photo assimilates thereby enhancing the growth of plants. Similar results observed in Balakrishnan (2005) in marigold, Pal. *et al.*, (2016) in gerbera .Significantly wider plant spread (m^2) (37.68cm) was observed with treatment T2(Zn@0.4%) followed by T5(Fe@0.4% , 35.80cm) whereas, significantly lesser plant spread (m^2) was reported in T0(Control, 23.62cm). The plant spread significantly influenced with application of micronutrient ferrous sulphate is an essential an essential components of several dehydrogenase, proteinase, peptidase and promotes growth hormones and closely associated with plant growth , all these factors contribute to cell multiplication, cell division and cell differentiation resulting in increased photosynthesis and translocation of food material which enhanced the plant spread and zinc sulphate could be attributed to improved root system of plants resulting in absorption of water and nutrients and its utilization. Similar results were also obtained by Kakade *et al.*, (2009) in China aster, Balakrishnan (2007) in marigold. Significantly more leaves (15.08) were recorded in treatment (Zn@0.4%) followed by

T5(Fe@0.4%, 11.17) and significantly a smaller number of leaves in T0(Control, 7.00). Zinc (Zn) and iron (Fe) are essential micronutrients for plant growth and development including photosynthesis, enzyme activation, and hormone synthesis. Adequate levels of these micronutrients helps in promoting leaf growth and increasing leaf number. Similar results were observed in Khan (2000) . The statistically analysed data was presented in Table 1.

Table 1. Effect of different level of micronutrients on vegetative parameters of Gerbera

Treatment Symbol	Treatment Combination	Plant height(cm)	Plant spread (cm)	Number of leaves per plant
T ₀	Control	17.69	23.62	7.00
T ₁	Zn@0.2%	21.43	33.61	8.67
T ₂	Zn@0.4%	24.08	37.68	15.08
T ₃	Zn@0.6%	22.55	35.38	9.67
T ₄	Fe@0.2%	22.37	32.43	7.17
T ₅	Fe@0.4%	22.63	35.80	9.58
T ₆	Fe@0.6%	21.80	35.70	11.17
T ₇	Mg@0.2%	20.39	34.86	7.83
T ₈	Mg@0.4%	18.86	34.50	7.67
T ₉	Mg@0.6%	18.50	26.99	7.25
F-Test		S	S	S
S.Ed(±)		0.43	0.85	0.55
C.V.		2.52	3.15	7.47
CD 0.05		0.90	1.79	1.16

3.2 Floral parameters

The data from investigation revealed that application of different levels of Zn, Fe and Mg exerted a significant influence on flowering and yield parameters, viz. days for first bud initiation, number of flowers/plant, stalk length and vase life .The review of data presented in Table 2 indicated that significantly lesser days (73.25) were taken for first bud initiation in treatment (Zn@0.4%) followed by T5(Fe@0.4%, 85.58) while significantly more number of days taken to first bud initiation T0-Control (106.67). Micronutrients like zinc and iron aids to storage of more carbohydrates through photosynthesis, which may be enhanced to earlier flower bud initiation . Similar results were reported by Jadhav *et al.*, (2005). Significantly more flowers per plant (10) was found with plants treated with treatment (Zn@0.4%) followed by T5(Fe@0.4%, (9), whereas significantly lowest was recorded in T0-Control (6). Application of iron and zinc relieved the plants from chlorosis and produced healthy green leaves which resulted in higher assimilate synthesis which may increase the flower

production and ultimately flower yield. Similar results were obtained by Pal *et al.*, (2016). The highest stalk length (56.50 cm) was observed with treatment (Zn@0.4%) followed by T5(Fe@0.4%, 54.17 cm) while lowest was reported in T7(Mg@0.2%, 47.67 cm). The increment in the stalk length might be due to enhanced cell division and cell enlargement. Similar results were found in Khan (2000). More vase life (8.75) was observed with treatment (Zn@0.4%) followed by T5(Fe@0.4%, 7.68) whereas less vase life was reported in T0(Control, 5.67). The positive impact of micronutrients like zinc, iron and magnesium might be due to the ability of these nutrients in activating several enzymes and its involvement in chlorophyll synthesis and various physiological activities ultimately enhance the vase life. Similar results were found in Jadhav *et al.*, (2005) and Pal *et al.*, (2016). The statistically analysed data was presented in Table 2.

Table 2. Effect of different level of micronutrients on floral parameters of Gerbera

Treatment Symbol	Treatment Combination	Days to first bud emergence (Earliness)	Number of Flower/Plant	Stalk length(cm)	Vase life
T ₀	Control	106.67	8	47.67	5.67
T ₁	Zn@0.2%	95.17	9	49.25	6.86
T ₂	Zn@0.4%	73.25	10	56.50	6.33
T ₃	Zn@0.6%	89.08	8	49.08	8.75
T ₄	Fe@0.2%	87.00	9	49.17	7.22
T ₅	Fe@0.4%	85.33	9	54.17	7.68
T ₆	Fe@0.6%	85.58	8	50.50	6.89
T ₇	Mg@0.2%	93.00	6	48.42	6.44
T ₈	Mg@0.4%	100.42	6	48.58	6.69
T ₉	Mg@0.6%	98.42	6	49.67	6.00
F-Test		S	S	S	S
S.Ed(±)		3.71	0.43	0.93	0.49
C.V.		4.97	6.74	2.26	8.76
CD 0.05		7.80	0.90	1.95	1.03

4. CONCLUSION

It is concluded from the present investigation of 10 treatments under study showed significant variation in all the parameters observed. The treatment T2-Zn@0.4% reported significantly better performance in parameters like plant height, plant spread, earliness for first bud initiation, number of flowers per plant, stalk length, vase life.

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UNDER PEER REVIEW