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EFFECT OF FOLIAR APPLICATION OF MICRONUTRIENTS ON VEGETATIVE GROWTH IN GLADIOLUS (*GLADIOLUS HYBRIDUS* HORT.) CV. WHITE PROSPERITY

Amit Kumar Singh¹, Rakesh Kumar Singh¹, Ajay Kumar Singh¹, Vaishali Gangwar², Gaurav Shukla³, Neetu⁴, Prasoon Kumar Rai^{5*}, Sachin Kumar Singh⁵, Shubham Yadav⁵, Dharmendar Kumar⁵ and Shivani Kumari⁶

¹Department of Floriculture and Landscape Architecture Banda, University of Agriculture & Technology, Banda-21001 Uttar Pradesh India

²Department of Crop Physiology, Banda University of Agriculture & Technology, Banda-21001 Uttar Pradesh (India)

³Department of Agricultural Statistics & Computer Science, Banda University of Agriculture & Technology, Banda-21001 Uttar Pradesh (India)

⁴Department of Vegetable Science, Banda University of Agriculture & Technology, Banda-21001 Uttar Pradesh (India)

⁵Department of Fruit Science College of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut 250110, Uttar Pradesh, India

⁶School of Agriculture Sciences, K.K. University, Bihar Sharif, Nalanda, Bihar, 803115

*Corresponding author E-mail: prasoonrai.111@gmail.com

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ABSTRACT

An investigation was carried to observe the effect of foliar application of micronutrients on vegetative growth in gladiolus (*Gladiolus hybridus* Hort.) cv. White Prosperity at Department of Floriculture and Landscape Architecture, College of Horticulture, Banda University of Agriculture & Technology, Banda during 2021-22. The experiment was laid out in Randomized Block Design (RBD) with three replications. All the growth parameters were periodically observed. Analysis of results revealed that the application of T₉ (Zn 0.4% + Cu 0.4%) improved economically important characteristics viz. plant height at 60 days after planting (DAP) and 75 days after planting (52.27 cm & 67.93 cm) respectively, width of longest leaf (4.36 cm), length of longest leaf (52.93 cm), leaf area (82.07 cm²), However, maximum number of leaves per plant (9.33) were noticed with the treatment T₈ (Zn 0.4% + Cu 0.2%). On the basis of research findings, it can be concluded that treatment T₉ (Zn 0.4% + Cu 0.4%) showed the best performance w.r.t. vegetative growth of gladiolus (*Gladiolus hybridus* Hort.) cv. White Prosperity.

Keywords : Zinc, Iron, Copper, micro nutrient, Gladiolus, White prosperity.

Introduction

In India, total area under flower crops is around 3.03 lakh ha with 29.10 lakh metric tonnes of production (Anonymous, 2018-19). Gladiolus (*Gladiolus hybridus* Hort.) is one of the most popular cut flowers. It is popularly known as Queen of bulbous flower because of its beautiful spikes having diverse range of colours and longer keeping quality. It is grown for use as cut flower, garden decoration purpose, pots, herbaceous borders and making high quality bouquets.

Gladiolus requires adequate amounts of chemical fertilizers in their balanced proportions for ensuring

maximum flower production. Being involved in the physiology of plants, micronutrients well contribute to the growth and yield of the plants. Micronutrients activate a variety of enzymes (catalase, peroxidase, alcohol dehydrogenase, carbonic dehydrogenase and tryptophan synthase etc.) and that also contribute to chlorophyll synthesis and a variety of physiological activities that promote growth and development in plants (Kumar and Arora, 2000). A micronutrient contributes significantly to plant growth, development and flower yield in part by stimulating and catalyzing metabolic processes (Lahijie, 2012) and by improving flower quality (Khosa *et al.*, 2011).

Among the various micronutrients, zinc and copper greatly influences growth and developmental activities in plant. Copper and Zinc are essential trace nutrients taking part in redox reactions, structural configuration of several enzymes and nucleic acid metabolism. Zinc is an essential micronutrient necessary for sugar pathway regulation and enzymatic activity associated with plant growth (Khosa *et al.*, 2011). Zinc plays an important role in protein and starch synthesis, and therefore, a low zinc concentration induces accumulation of amino acids and reducing sugars in plant tissue (Graham and McDonald, 2001). Copper has a very significant role in plant growth and development. Copper is involved in a number of physiological processes such as the photosynthetic and respiratory electron transport chains (Van Assche and Clijsters, 1990). Hence, in order to boost the yield potential of gladiolus, it is vital to incorporate micronutrients to improve its vegetative characteristics

Materials and Methods

Location - The present investigation was carried out at Instructional Farm, College of Horticulture, Banda University of Agriculture & Technology, Banda during the Rabi season of year 2021-22.

Experimental Design - The experiment was laid out in Randomized Block Design (RBD)

Treatment:

T ₁	Control
T ₂	Zn 0.2%
T ₃	Zn 0.4%
T ₄	Cu 0.2%
T ₅	Cu 0.4%
T ₆	Zn 0.2% + Cu 0.2%
T ₇	Zn 0.2% + Cu 0.4%
T ₈	Zn 0.4% + Cu 0.2%
T ₉	Zn 0.4% + Cu 0.4%

Observation recorded

Plant height at 60 days after planting (cm)

The height of the plant was measured in cm from ground level to the tip of the plant at 60 DAP with the help of meter scale and the average was calculated.

Plant height at 75 days after planting (cm)

The height of the plant was measured in cm from ground level to the tip of the plant at 75 DAP with the help of meter scale and the average was calculated.

Number of leaves per plant

The number of leaves per plant was counted at 60 DAP in five randomly selected plants in each treatment and average was computed.

Width of longest leaf (cm)

Width of the longest leaf was measured in five randomly selected plants at the three position of the leaf blade (top, middle and lower portion) after planting at 60 days and the average was calculated.

Length of longest leaf (cm)

Length of the longest leaf was measured in five randomly selected plants 60 DAP from the attachment point to tip of the leaf and the average was calculated.

Leaf Area (cm²)

Leaf area (LA) per leaf was determined from the samples by graph paper immediately after removal of leaves from plants to avoid rolling and shrinkage. Leaf area was recorded before initiation of rachis in the plants and expressed in centimeter square.

Result and Discussion

Plant height (cm)

The perusal of data appended in Table 1 and Fig. 1 showed significant variation among various treatments for plant height. At 60 days after planting (DAP), plant height ranged from 42.80 cm to 52.27 cm. The tallest plants were measured (52.27 cm) in T₉ (Zn 0.4 per cent + Cu 0.4 per cent), which was followed by T₈ (45.57 cm) and T₆ in height (44.29 cm). Control had the smallest plant height (42.80 cm), followed by T₂ (43.10 cm) and T₄ (43.13 cm).

At 75 days after planting (DAP), same trend was recorded and maximum height (67.93 cm) was reported in T₉ (Zn 0.4% + Cu 0.4%), which was followed by T₈ (60.07 cm) and T₆ (59.40 cm), whereas control exhibited minimum plant height (54.07 cm).

Table 1 : Effect of foliar application of micronutrients on plant height (cm) in gladiolus cv. White Prosperity

S.N.	Treatments	Plant height at 60 DAP (cm)	Plant height at 75 DAP (cm)
1	Control	42.80	54.07
2	Zn 0.2%	43.10	54.80
3	Zn 0.4%	43.73	56.80
4	Cu 0.2%	43.13	56.27
5	Cu 0.4%	43.63	57.40
6	Zn 0.2% + Cu 0.2%	44.29	59.40
7	Zn 0.2% + Cu 0.4%	43.97	58.40
8	Zn 0.4% + Cu 0.2%	45.57	60.07
9	Zn 0.4% + Cu 0.4%	52.27	67.93
	C.D.	2.79	6.29
	SE(m)	0.92	2.08
	SE(d)	1.30	2.94
	C.V.	3.57	6.17

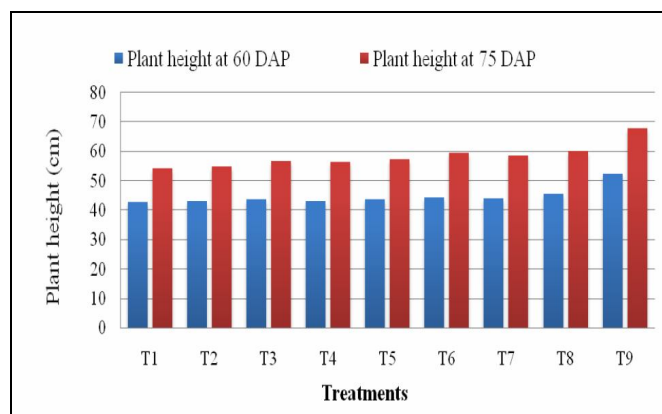


Fig. 1 : Effect of foliar application of micronutrients on plant height (cm) in gladiolus cv. White Prosperity

The increased plant height might be attributed to the role of micronutrients particularly zinc in the formation of tryptophan, a precursor to indole acetic acid (IAA) and RNAase (Rashid, 2005). Tryptophan acts as growth promoting substance. It is also involved in manufacture of photo-assimilates and increased level of plant metabolites which are responsible for faster cell division and elongation, ultimately resulting in increased plant growth (Sarwar *et al.*, 2012 and Singh *et al.*, 2015a). Copper is an important component of proteins found in the enzymes that regulate the rate

of many biochemical reactions in plants (Devi *et al.*, 2017). The results obtained are in line with the observations recorded by Saeed *et al.* (2013); and Sharma *et al.* (2013) in gladiolus.

Number of leaves per plant

Number of leaves per plant also exhibited significant differences among the treatments. The treatment T₈ (Zn 0.4% + Cu 0.2%) showed maximum number of leaves followed by the T₉ (Cu 0.4% + Cu 0.4%). However, Control (T₁) exhibited minimum number of leaves per plant. This might be due to reason that zinc is known to play a significant role in plant growth and in carbohydrates metabolism, auxins and ribosome functions. Copper played an important role in activation of enzymes involved in the synthesis of IAA (Salisbury and Rose, 1992), regulating protein synthesis and hormonal signaling. Similar results were also obtained by Prabhat and Arora (2000) in gladiolus cv. White Prosperity.

Width of longest leaf (cm)

The perusal of data appended in Table 2 revealed that maximum width of longest leaf (4.36 cm) was seen in T₉ (Zn 0.4% + Cu 0.4%). However, minimum leaf width (2.80 cm) was noticed in T₁ (Control).

Table 2: Effect of foliar application of micronutrients on vegetative parameters in gladiolus cv. White Prosperity

S.N.	Treatments	Number of leaves per plant	Width of longest leaf (cm)	Length of longest leaf (cm)	Leaf area (cm ²)
1	Control	5.73	2.80	44.53	67.07
2	Zn 0.2%	6.93	2.95	45.20	69.13
3	Zn 0.4%	7.47	3.01	45.60	69.52
4	Cu 0.2%	6.87	3.04	44.60	70.79
5	Cu 0.4%	7.07	3.05	45.73	73.34
6	Zn 0.2% + Cu 0.2%	7.20	3.17	46.80	74.64
7	Zn 0.2% + Cu 0.4%	7.07	3.03	46.40	76.12
8	Zn 0.4% + Cu 0.2%	9.33	3.27	45.27	80.63
9	Zn 0.4% + Cu 0.4%	7.60	4.36	52.93	82.07
	C.D.	2.79	1.61	0.42	7.97
	SE(m)	0.92	0.53	0.14	2.64
	SE(d)	1.30	0.75	0.19	3.73
	C.V.	3.57	12.69	7.47	6.20

Length of longest leaf (cm)

Significant variation was noticed for length of longest leaf among different micronutrient concentration and combinations. Leaf length values ranged from 44.53 cm to 52.93 cm. The treatment T₉ (Zn 0.4 per cent + Cu 0.4 per cent) had the longest leaves, measuring a total of 52.93 cm, followed by T₆ (46.80 cm) and T₇ (46.40 cm), respectively. The control had the shortest leaves, measuring 44.53 cm.

The increase in length and width of leaves might be due to zinc which is responsible for increased intensity of auxin (IAA) which in turn promotes cell division and cell elongation (Reddy and Rao, 2012) as well as photosynthetic and metabolic activities, resulting in more number of cells and increase in the cell length and width, which ultimately resulted in more length and width of leaves. These findings are in line with the results obtained by Katiyar *et al.* (2012) and Singh *et al.* (2015b) in gladiolus.

Leaf area (cm²)

The interpretation of data presented in Table 2 showed that there is significant variation among the treatments for leaf area. Treatment T₉ (Zn 0.4%+Cu 0.4%) exhibited maximum leaf area (82.07 cm²) followed by T₈ (80.63 cm²), T₇ (76.12 cm²) and T₆ (74.64 cm²). The control exhibited the lowest leaf area (67.07 cm²).

Munikrishnappa *et al.* (2002) and Yadav *et al.* (2003) in tuberose also reported better leaf area with zinc spray.

Conclusion

The application of T₉ (Zn 0.4% + Cu 0.4%) improved vegetative characteristics viz. plant height at 60 days after planting (DAP) & 75 days after planting (DAP), width of longest leaf, length of longest leaf, leaf area. On the basis of above findings, it can be concluded that among all the treatment used in study under Bundelkhand region in Uttar Pradesh, T₉ (Zn 0.4% + Cu 0.4%) showed the best performance w.r.t. vegetative growth of gladiolus (*Gladiolus hybridus* Hort.) cv. White Prosperity.

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