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# Efficacy of Foliar Application of Micro Nutrients on Growth and Flowering of *Gerbera jamesonii* L.

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**Abstract** The study showed the significant effect of foliar application of micronutrients on all the parameters. The height of plants in $T_2$ increases by 5ml/1000ml solution. The application of micronutrients solution increases the number of branches per plant in $T_3$ (6.69) by 5ml/l 000ml solution of water as compare to control followed by $T_2$ (7.77), $T_1$ (6.21), and $T_0$ (4.87) respectively. Foliar fertilization improves the growth and development by providing essential nutrients. The $T_2$ (35.87 cm) showed the maximum length of branches per plant. Therefore plants that received no fertilization of micro nutrients, show less length of branches per plant. Data regarding number of leaves per plant depicted significant results for treatments. These results have similarity to results of number of branches per plant indicated that plant which fertilized with essential micro nutrients that represent more number of leaves per plant as compared to other treatments levels. Application of micro nutrients solution increases the number of leaves per plant in $T_2$ (8.10). A significant superiority of $T_2$ treatment over $T_1$ was observed. Emergence days was shorter for plants fertilized with $T_3$ of micro nutrients solution compared to those received no fertilization but was longer compared to plants receiving other fertilization treatments. Fertilization had greater effect on the flower emergence as compared to control. Therefore we can conclude that plant which received fertilization of micro nutrients solution show significant results as compared to those which received no fertilization.

**Keywords** Foliar Application, Micronutrients, *Gerbera Jamesonii*, Growth

## 1. Introduction

This Gerbera (*gerbera jamesonii*) belongs to family, Asteraceae and has 40 species scattered from Africa to Madagascar into tropical Asia and South America. Gerbera is popular plant for the backyard and their daisy-like bloom make ongoing cut flora [1].

Floriculture has been identified as a potential business due to divergence of farmers towards high value floral crops and utilization of flowers in social and industrial level in Pakistan. Commercial floriculture has emerged inside the country. The floriculture crops grown in Pakistan as cut flowers are roses, gladiolus, tuberoses, iris, narcissus, lilies, freesia, status and gerbera. Production of cut flowers in Pakistan is estimated at about 10-12 thousand tons per annum and floriculture is fast emerging as a profitable venture for small farmers [2].

Many investigations studied the consequence of spraying macro and micronutrients on development, yield and fruit excellence [3].Zinc and molybdenum increasing levels resulted in increasing plant height, number of fruits, fruit diameter and fruit yield. However, rising levels resulted increasing in development and height and fruit yield [4]. According to Stout[5] plants are considered as biological machines, their bodies are constructed from macro-elements, their working parts consist of proteins and enzymes revolving about N atoms and the 'micronutrient' provide the special lubricants required for a variety of energy transfer mechanisms within the plants. Foliar feeding that is functional to plant leaves and leaves are green factories where multipart chemical process of photosynthesis produces the compounds that required for plant growth.

Foliar feeding of nutrients has become an established procedure to increase yield and improve the quality of crop products [6].This procedure improves nutrient utilization and lower environmental pollution through reducing the amount of fertilizers added to soil. Foliar feeding of nutrients may actually promote root absorption of the same nutrient or other nutrients through improving root growth and increasing nutrients uptake [7].

Foliar application of nutrients is in advance more significance in fertilization of various field and floricultural crops, in many countries. The advantages of foliar fertilizers were more noticeable under growing conditions restricting

the incorporation of nutrients from the soil, as reported by [8].Foliar fertilization method may also be a good substitute to the predictable soil application to avoid the loss of fertilizers by leaching and thereby minimizing the ground water pollution [9]. Zinc plays an important role in the production of biomass [10]. It may be required for chlorophyll production, pollen function, fertilization [11]. It was also reported by many researchers that zinc had a significant effect on corm and cormel production in Gladiolus [12].

Recently, foliar fertilizers are extensively used in vegetable, fruit crops and ornamental plants that contain various macro and micronutrients, which are necessary for the proper growth and yield. So, present study was planned to examine the appropriate doses of major macronutrients in foliar absorption and also to verify the effect of these elements along with the spray of micro power on plant efficiency (vegetative growth, plant height, flower size and yield) of gerbera (*gerbera jamesonii*).

## 2. Materials and Methods

The present experiment was carried out at Floriculture Research Area, Institute of Horticulture Sciences, University of Agriculture Faisalabad during the session of 2010-2012 to observe the effects of foliar application of micro nutrients on growth and flowering of *Gerbera Jamesonii* L. Newly transplanted plants at equal height were taken from nursery in 10 inches pots. The earthen pots were used. These pots were filled with standard growing media (silt + garden soil + leaf compost, 1: 1: 1) according to the layout of the experiment and transplanted next day in Floriculture Research Area, Institute of Horticulture Sciences. Three weeks after transplantation, the plants were sprayed with aqueous solution of micro nutrients with interval of 15 days. First spray was done after 30 days of transplanting. First irrigation was given just after transplanting while subsequent irrigation was applied when needed. Hoeing was done regularly to keep down the weeds and staking was done to support the plant and data was recorded as plant height (cm), number of branches per plant, length of branches per plant (cm), number of leaves, leaf area (cm), stalk length (cm), days to first flower emergence, flower diameter (cm) and flower quality. The experiment was conceded according to Randomized Completely Block Design (RCBD).

There were four treatments combinations comprising each three levels of urea (0, 1, 1.5 and 2.0%) and four levels of Zn (0, 0.5, 0.75 and 1%) were taken in the study. Four sprays were made on crop first after 15 days planting, second at 3-leaf stage third at 6-leaf stage and fourth after the harvesting of flower stalk to check the effect of nutrients on flower growth.

The earthen pots size of 4.5"x4.5"x4.75" were taken and filled with standard growing media (silt + garden soil + leaf compost, (1:1:1) and plant were transplanted in Floricultural Research Area, Institute of Horticultural Sciences. Four weeks after transplantation the plants were sprayed with aqueous solution of micro nutrients with interval of 15 days. First spray was done after 30 days of transplantation. First irrigation was given just after transplantation while the subsequent irrigations were applied when needed. Hoeing was done regularly to keep down the weeds and staking was done to support the plant. The micronutrients formulation was taken from Institute of Soil and Environmental Sciences, University of Agriculture Faisalabad. The micro power had following ingredients and their concentrations were taken in mg/100ml solution. The constant concentration (i.e. 5 ml/pot) was taken from this micro power solution. The data regarding all parameters was investigated statistically by performing analysis of variance techniques [13] and interpreted according to Duncan's Multiple Range (DMR) test at 5 probability level to compare the difference among treatment means.

## 3. Results

### 3.1. Plant Height (cm)

From 4000 ± 200 mg / 100 ml solution of micronutrients foliar spray plants used for $T_2$ (44.35 cm), maximum plant height. Minimum plant height resulted in $T_0$ (19.99 cm), and micronutrient solution was not applied. Micronutrient solution in a relatively high degree of control in $T_2$ plants 5ml/1000ml solutions, followed by $T_3$ (39.65 cm), $T_1$ (31.76 cm), $T_0$ (19.99 cm), respectively. As shown in Figure 4.2.1 in plant height graphics fluctuations. From this figure, it shows that all treatment levels were significantly different from each other. The results show that $T_2$ (4000 ± 200mg/100ml solution: 5ml/l000ml, solution) to the maximum height, foliar application of micronutrients. $T_3$ treatments (5000 ± 200mg/100ml: 5ml / 100 ml solution) got the second position (Figure 1).

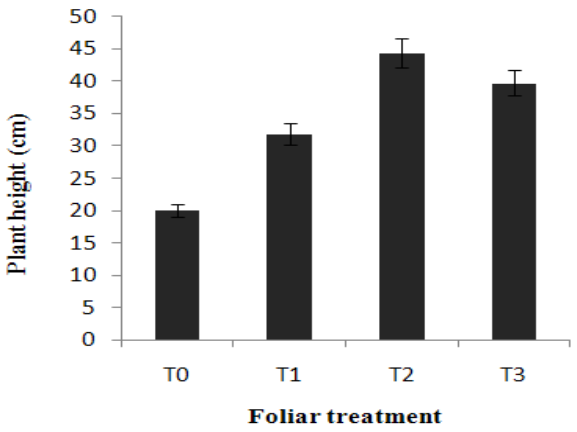


**Figure 1.** Effect of micronutrients on plant height

### 3.2. Number of Branches per Plant

Data on number of branches per plant showed highly

significant results for treatments. The minimum height of plant was resulted in $T_0$ where nofoliar spray of micro nutrients used. Therefore number of branches per plant is minimum in $T_0$.The application of micronutrients solution increases the number of branches per plant in $T_3$ (6.69) by 5ml/l 000ml solution of water as compare to control followed by $T_2$ (7.77), $T_1$ (6.21), and$T_0$ (4.87) respectively.

The treatment of $T_2$ and $T_1$ is a significant among each other with $T_0$ significantly with each other. Micronutrient levels increase, the number of branches per plant also increased (Figure 2).

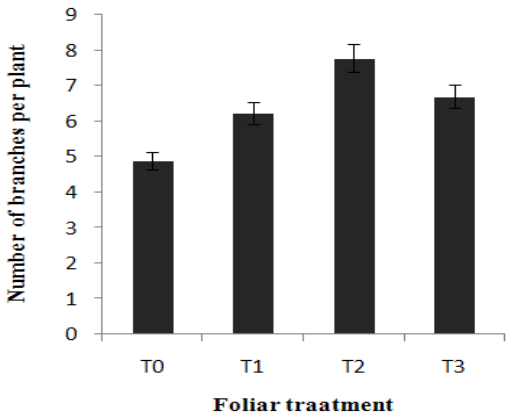


**Figure 2.** Effect of micronutrients on number of branches per plant

### 3.3. Number of Leaves per Plant

It was found that all the treatment levels are significantly different from each other. Data related to number of leaves per plant show significant results. The number of leaves per plant directly influenced the flower quality. As greater number of leaves, produces better quality flower. All this is due to foliar spray of micronutrients. Therefore $T_2$ treatment show greater number of leaves per plant and remaining treatments also give better results to foliar application of micronutrients spray (Figure 3).

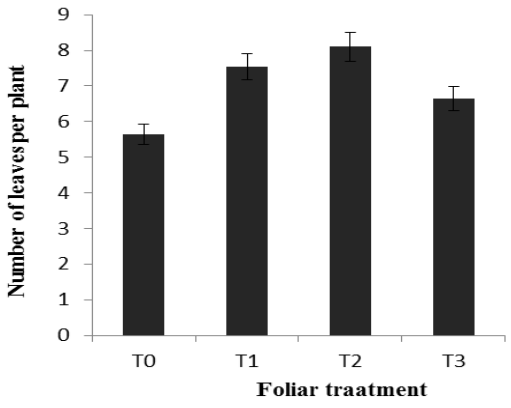


**Figure 3.** Effect of micronutrients on number of leaves per plant

### 3.4. Leaf Area ($cm^2$)

A significant relation among all the treatments of leaf area of gerbera plant was noticed by the spraying of micro nutrients solution. $T_2$ treatment, showed the maximum leaf area as compared to other treatments Therefore all treatments are significantly differed from each other. Leaf area represents the foliage of plants that give excellent results after foliar spraying of micro nutrients. The food prepares by leaves and maximum leaf area provides more food to body of the plant to keep it health (Figure 4).

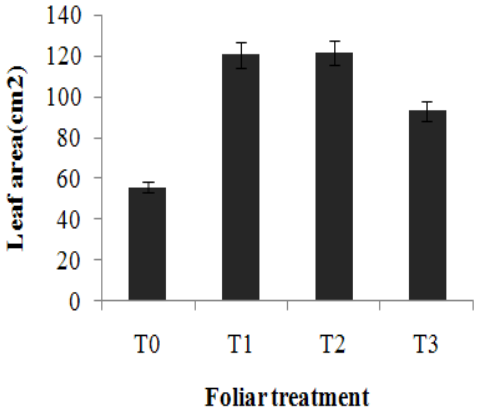


**Figure 4.** Effect of micronutrients on leaf area

### 3.5. Stalk Length (cm)

The result indicated that4000±200mg/100ml solution of micro nutrients is superior over the treatments. Maximums talk length was obtained from the plants where 4000±200mg/100ml solution of micronutrients was used as foliar spray. The minimum stalk length obtained in $T_0$ (17.44 cm) whereon micro nutrients solution was applied. It was clearly visualized that all treatment level are significantly differed from each other and their mean followed a sequence of $T_2$, $T_3$, $T_1$ and $T_0$ giving values 47.77 cm, 39.98 cm, 32.17 cm and 17.44 cm respectively. The result indicated that $T_2$ plants get maximum stalk length i.e. 47.77 cm that get highest position. Treatment $T_3$ obtains 39.98 cm length and occupies medium position and $T_1$ has 32.17 cm length as shown in table 4.2.6 due to foliar spray of micro nutrients (Figure 5).

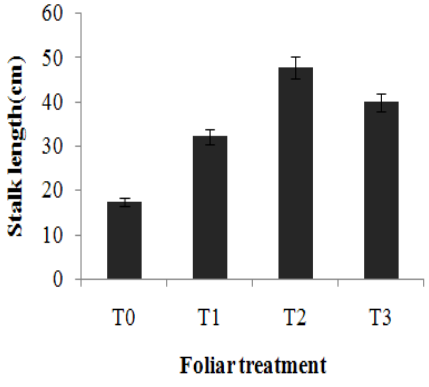


**Figure 5.** Effect of micronutrients on

### 3.6. Days to first Flower Emergence

It is evident from the results those days for flower emergence was shortened with increased fertilization of micro nutrients. The emergence days were shortest for plants fertilized with $T_2$of the treatment level and longest for the plants which received no fertilization i.e. $T_0$.Emergence days was shorter for plants fertilized with $T_3$ of micro nutrients solution compared to those received no fertilization but was longer compared to plants receiving other fertilization treatments. The fertilization levels of micro nutrients shortened or lengthened the days to first flower emergence from 107.77 to 83.29 when fertilization level increased from 0 to5000±200mg/100 ml solution i.e. 5ml/1000ml solution(Figure 6). The fertilization level of micronutrients improves the growth and productivity of plants.

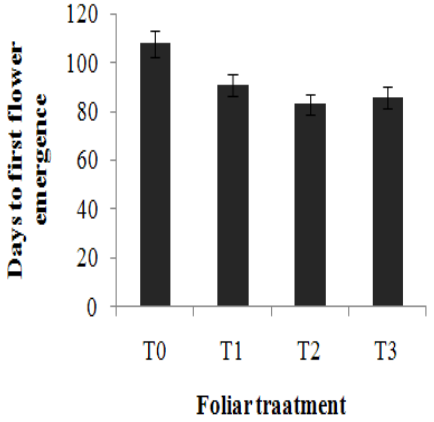


**Figure 6.** Effect of micronutrients on days first flower emergence

### 3.7. Flower Diameter (cm)

The result demonstrated that 4000±200mg/100ml solution (i.e. 5ml/1000ml solution of water) is dominant over other treatments. The maximum flowers diameter were obtained from the plants where 4000±200mg/100ml solution (i.e. 5ml/1000ml solution of water) of micro nutrients was used as foliar spray in $T_2$.The minimum flowers diameter obtained in $T_0$where no micro nutrients solution was applied as foliar spray, only simple tap water was used (Figure 7).

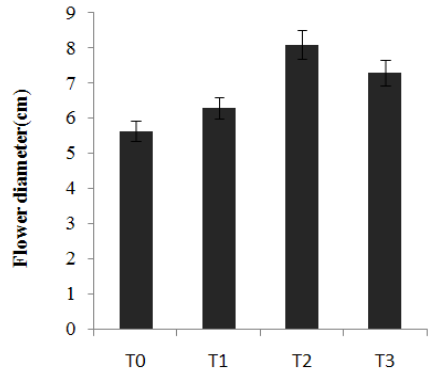


**Figure 7.** Effect of micronutrients on flower diameter

## 4. Discussion

Results showed that Micronutrient used as foliar application significantly influence the plant height (Figure 1). Micronutrients application on *Sangral carnation* plant has a great influence vegetative growth, micronutrient is essential for plant growth, because they enhance the availability macronutrients and also activate the plant defense mechanism result in of increase in plant vegetative growth [14]. Prabhat [15] studied the role of micronutrients, in order to improve production in gladiolus and 16 did experiments to determine the effect of zinc spray to increase the number of monoclonal branches. Micronutrients in sweet orange increased the concentration in leaves so that to produce healthy leaves which results in production of good quality fruit, [17]. Balanced fertilization with micro nutrients in plant nutrition that is important for the production of highly quality products. The results of this study are in agreement with El-Fouly [18] who noticed that leaf area of sunflower plants were increased by the addition of micro nutrients spray of Fe, Mn and Zn, Usha [16]done experiment on gladiolus to observed greater leaf area as compared to control treatment by the spray of micro nutrients i.e., Zn. Figure 5 showed that application of micronutrients increased the stalk length. These results are in agreement with Nahed[19] who conduct experiment on blue sage to enhance the length of peduncle and length of main inflorescence by the spray of zinc and tyrosine. The fertilization levels of micro nutrients shortened or lengthened the days to first flower emergence from 107.77 to 83.29 when fertilization level increased from 0 to5000±200mg/100 ml solution i.e. 5ml/1000ml solution(Figure 6). These results are in line with Sharaf[20] who stated that carnation has greater response to foliar application of boron with phosphorus combination and alone with different level of boron and give best results to flowering characteristics mean enhanced flowering time (vase life), reduced emergence days of flowering at 200mg/L of phosphorus and 50mg/L of boron. The figure 7 shows that follower diameter increase with the increase in micronutrients up to a certain limit but Micronutrient levels rise beyond the limits plant growth decreased. Foliar application of kinetin to Mattiola plants significantly promoted growth of plant. Plants are sprayed with tryptophan as precursor of auxin is synthesize with the help of zinc and causes stem elongation result in better growth and flowering diameter, [21] studies the response of schefflera plant to foliar fertilizer spray increased all growth parameters significantly specially flower diameter, Mostafa[22] studies the effect of B, Mn and Mg on the growth of carnation as result flower diameter increased.

## 5. Conclusion

Any Analysis of variance for plant height revealed highly significant results for all treatments by foliar spray of micro

nutrients. Application of micro nutrients solution increases the height of plants in $T_2$ by 5ml/1000ml solution as compare to control followed by $T_3$ (39.65 cm), $T_1$ (31.76 cm), $T_0$ (19.99 cm) respectively. It is indicated that all treatments levels were significantly different from each other. The data on number of branches per plant had reflected significant results for the treatments in case of micro nutrients spray. The application of micronutrients solution increases the number of branches per plant as compare to control. Statistical analysis for length of branches per plant has reflected highly significant results. Foliar fertilization improves the growth and development by providing essential nutrients. Therefore plants that received no fertilization of micro nutrients, show less length of branches per plant. The plant which fertilized with essential micro nutrients that represent more number of leaves per plant as compared to other treatments levels. Observation regarding leaf area showed significant results in case of foliar spray of micro nutrients as compared to control. The application of micro nutrients solution increases the stalk length in $T_2$ by (47.77 cm) as compared to control. Therefore foliar fertilization of essential nutrients has great effect on flower diameter. Therefore we can conclude that plant which received fertilization of micro nutrients solution show significant results as compared to those which received no fertilization.

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