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Response of micronutrients on plant growth and sucker production of various genotypes of gerbera (*Gerbera Jamesonii* L.) under naturally ventilated polyhose

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Abstract
Among the cut flowers, Gerbera is the one of the important cut flower in the international flower market. An experiment entitled **"Response of micronutrients on plant growth and sucker production of various genotypes of Gerbera *(Gerbera jamesonii* L.*)* under naturally ventilated polhouse"** was conducted at Floriculture research field, Department of Horticulture, Allahabad. During the year 2014-2015, the experiment was laid out in a two factors Randomized Block Design having 15 treatments with three replications. The 15 treatments comprised of five various genotypes of Gerbera including three levels of three micronutrients combination (Fe+Zn+Mn). The result revealed that Venizia was found to be best among five varieties, it shows better performance in terms of plant growth and sucker production i.e. maximum plant height (28.14 cm), plant spread (52.38 cm) and number of Suckers (6.64). Daphane cultivar shows maximum number of leaves (32.82). Among micronutrients combination, 0.2% of Fe+Zn+Mn shows superior over all other interacting combination in relation to plant growth and sucker production and also cost benefit ratio was registered in Venizia (1:2.31).

Keywords: Micronutrients, Fe, Zn, Mn, Plant growth and Gerbera

Introduction
Earth is bowl to a large number of plants that are grown ornamentally throughout the world. Human ingenuity created diversity of gardens offers a plant mix predominantly ornamentals. Flowers are heart, soul and ornamentation of nature. Flowers have been used in our country for many centuries (Rig-Veda, 3000-2000 B.C. and Ramayana, 1200-1000 B.C.) but commercial cultivation of flowers and development of floriculture as an industry is of recent origin (Singh, 2000). Gerbera is a cut flower crop with increasing commercial significance, is an excellent herbaceous perennial cut flower, having good demand in the both domestic and international markets (Kumar and Yadav, 2005). Gerbera is gaining lot of importance in recent days. The improvement of gerbera depends on the selection of stable genotypes for different agro climatic conditions (Aswathi, 2005). However, performance of each gerbera varieties varies with the region, season and growing conditions (Horn *et al.*, 1974; Biradar and Khan, 1996). Micronutrients are essentially as important as macronutrients to have better growth and yield of plants. In the past, there was no need of micronutrients because these trace elements were naturally supplied by soil. But due to intensive cultivation, increase in salinity and soil pH in most of soils, these nutrients are present but are not available to plants (Ahmad *et.al,* 2010). Micronutrients have a great bearing in influencing the yield attributes and flower production (Maharana and Pradhan, 1977; Khader *et al.*, 1985). Zende (1996) has been reported the role of micronutrients in various metabolic processes and the enzymes involved in these processes.

Materials and Methods
The present experiment was conducted at floriculture section, Department of Horticulture, SHIATS, Allahabad, during 2014-2015, in a two factors randomized block design replicated with three times, the experimental site is situated at a latitude of 20^0 and 15^0 North and longitude of 60^0 3` East and at an altitude of 98 meters above mean sea level (MSL). Minimum temperature ranged from 4^0 -5^0 C (during Oct - Feb) and maximum temperature ranged from 45^0 -48^0 C (during March - June). Five genotypes with uniform sized tissue cultured plants were planted during August 2014, maintaining a spacing of 30 cm either side. The combination of micronutrients solutions were prepared as per the requirement i.e. 0, 0.2 and 0.4 percent sprayed to each genotypes and replication at 15 days intervals. Five plants were selected for recording observations. The recommended package of practices was

followed for raising the successful crop. Data on plant growth yield and sucker production characters were recorded five months after transplanting when the plants were fully grown. V-Varieties (V_1 -Venizia, V_2 -Shania, V_3 –Kento, V_4 –Daphne and V_5 -P. intezz). M-Micronutrients combination (Iron+Zinc+Manganese) i.e. M_0- control, M_1-0.2% and M_3-0.4%.

Results and Discussion

The mean performances of the varieties of plant height have been presented in table No.1 all varieties were showing significant differences for plant height. The maximum plant height founded in Venizia (28.14 cm) followed by P, intezz and Kento was 27.33 cm and 24.17 cm respectively and minimum plant height obtained in Daphane (24.09 cm, V_4).The response of micronutrients combination shows that also significantly results .there was founded the maximum plant height 26.19 cm with M_1 (0.2% (Fe+Zn+Mn)) followed by 25.65 cm M_2 and the minimum plant height was measured 24.85 cm with M_0 (control). The interaction between variety and micronutrients combination was founded non-significant plant height. Similar result was notice by Balakrishnan (2005) in Marigold, Jauhari *et al.* (2005) and Rao (2005) in Gladiolus.

On the perusal data have been presented in table No.2 revealed that the Venizia variety shows the significant result in case of plant spread. The maximum plant spread founded in Venizia (52.38cm) followed by Daphane and P, intezz was 51.43 cm and 50.76 cm respectively and minimum plant spread obtained in Kento (49.43 cm). The response of micronutrients combination shows that also significantly results, there was founded the maximum plant spread 51.46 cm with M_1 [0.2% (Fe+Zn+Mn)] followed by 50.80 cm M_2 [0.4% (Fe+Zn+Mn)] and the minimum plant spread was measured 50.11 cm with M_0 (control). The interaction between variety and micronutrients combination was founded non-significant on plant spread. These results are conformity with findings of Balakrishnan (2005) in Marigold and Ahmad *et al.* (2010) in Rose.

The mean performances of the varieties of leaves have been presented in table No.3 all varieties were showing significant differences for number of leaves. The maximum number of leaves founded in Daphane (32.82) followed by Venizia and P, intezz was 32.47 and 31.78 respectively and minimum number of leaves obtained in Kento (30.64, V_3). The response of micronutrients combination also shows significant results and founded the maximum number of leaves 32.13 with M_1 [0.2% (Fe+Zn+Mn)] followed by 31.88 M_2 and the minimum number of leaves was measured 31.24 with M_0 (control). The interaction between variety and micronutrients combination was founded non-significant number of leaves. The results are conformity with findings of Khan (2000) in Dahlia cv. Swami Lokeshwaranad and Ahmad *et al.* (2010) in Rose.

The data pertaining to the number of suckers was recorded under five cultivars of Gerbera and three micronutrients combination presented in table No.4. The variety Venizia shows the significant result in case of number of suckers. The maximum number of suckers was founded in Venizia (6.64) followed by P, intezz and Daphanewas 5.71 and 5.51 respectively and minimum number of suckers obtained in Shania (4.42). The response of micronutrients combination shows that also significantly results .there was founded the maximum number of suckers 5.60 with M_1 [0.2% (Fe+Zn+Mn)] followed by 5.47 M_2 [0.4% (Fe+Zn+Mn)] and minimum number of suckers was measured 5.00 with M_0 (control). The interaction between variety and micronutrients combination was founded non-significant on number of suckers. Similar result was notice by Jauhari *et al.* (2005), Pratap *et al.* (2005*)* and Rao (2005) in Gladiolus.

Conclusion

On the basis of above, it may be concluded that the cultivar Venizia was shown good response in terms of plant height, plant spread and sucker production among all varieties. Among micronutrients combination, 0.2% of Fe+Zn+Mn shows superior over all other interacting combination in relation to plant growth and sucker production and also cost benefit ratio was registered in Venizia (1:2.31).

Table 1: Micronutrients combination influences on different varieties of Gerbera on Plant height (cm).

Factor B / Factor A	Control	M_1	M_2	Mean
V_1	27.48	28.97	27.96	28.14
V_2	23.45	24.43	24.42	24.10
V_3	23.47	24.73	24.31	24.17
V_4	23.54	24.64	24.09	24.09
V_5	26.32	28.19	27.48	27.33
Mean	24.85	26.19	25.65	25.57
	F-test	S.Ed (+-)	C.D at 5%	
Factor A	S	0.14	0.28	
Factor B	S	0.11	0.22	
A x B	NS	0.24	0.49	

Table 2: Micronutrients combination influences on different varieties of Gerbera on Plant spread (cm).

Factor B / Factor A	Control	M_1	M_2	Mean
V_1	51.18	53.59	52.38	52.38
V_2	49.61	50.38	49.85	49.95
V_3	48.59	50.00	49.70	49.43
V_4	50.98	51.92	51.38	51.43
V_5	50.18	51.42	50.69	50.76
Mean	50.11	51.46	50.80	50.79
	F-test	S.Ed (+-)	C.D at 5%	
Factor A	S	0.21	0.43	
Factor B	S	0.16	0.33	
A x B	NS	0.36	0.74	

Table 3: Micronutrients combination influences on different varieties of Gerbera on Number of leaves per plant.

Factor B / Factor A	Control	M_1	M_2	Mean
V_1	31.60	33.27	32.53	32.47
V_2	31.00	31.20	30.93	31.04
V_3	30.60	30.60	30.73	30.64
V_4	31.67	33.47	33.33	32.82
V_5	31.33	32.13	31.87	31.78
Mean	31.24	32.13	31.88	31.75
	F-test	S.Ed (+-)	C.D at 5%	
Factor A	S	0.12	0.24	
Factor B	S	0.09	0.19	
A x B	S	0.21	0.42	

Table 4: Micronutrients combination influences on different varieties of Gerbera on Number of suckers per plant.

Factor B / Factor A	Control	M_1	M_2	Mean
V_1	6.27	7.00	6.67	6.64
V_2	4.20	4.67	4.40	4.42
V_3	3.87	4.60	5.00	4.49
V_4	5.13	5.60	5.80	5.51
V_5	5.53	6.13	5.47	5.71
Mean	5.00	5.60	5.47	5.36
	F-test	S.Ed (+-)	C.D at 5%	
Factor A	S	0.15	0.31	
Factor B	S	0.12	0.24	
A x B	NS	0.27	0.54	

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