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Effect of potassium and zinc deficiencies on growth parameters of gerbera under polyhouse condition

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ABSTRACT : The results of the experiment revealed that K and Zn deficient treatments showed significantly inferior results in respect to growth parameters *viz.*, number of suckers per plant, number of leaves per plant, plant height and plant spread. The K and Zn deficient treatments showed significantly inferior results in respect to quality parameters *viz.*, height of flower stalk, flower diameter, green and dry weight of individual flower, vase life of flower, number of flower per plant and more number of days required for flower maturity over all nutrients application treatments. The significant reduction in yield of gerbera, green and dry matter production per plant, nutrient content and nutrient uptake observed due to the K and Zn deficient treatment. The K deficient treatments showed marginal necrosis of leaves and flowers became pale, which are the typical symptoms. The Zn deficient treatments showed formation of smaller sized thicker leaves which caused rosette formation and interveinal chlorosis of leaves with green spots at somewhere which are typical symptoms.

KEY WORDS : Potassium, Zinc, Deficiency, Growth, Gerbera, Polyhouse

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The role of potassium and zinc for the better growth of gerbera is well documented. The balanced nutrition and its concentration in shoots at the time of flowering in specific cultivars is an essential tool for obtaining the good quality flowers. Zinc is known to stimulate plant growth by the auxins. Among micro nutrients zinc deserves special attention. Recently zinc has gained key position in intensive cropping system with diminishing use of organic manures resulting in depletion of zinc from majority of agricultural productive areas of Maharashtra. In this view, the role of zinc in suckers production, leaf area assumes importance particularly in gerbera crop. Zinc is an important component of proteinases and peptidases enzyme system. Zinc plays important role in biosynthesis of chlorophyll and production of growth harmones (Hemantrajan and Garg, 1984). Scanty information on the optimum concentration of potassium and zinc in leaves and flowers of gerbera is a major constraint in yield and quality. Therefore, the present investigation was carried out to determine the effect of potassium and zinc deficiencies on growth, yield and nutrient concentration of gerbera.

RESEARCH METHODS

The present investigation was carried out under polyhouse condition at Hi-Tech Floriculture Vegetable Project, College of Agriculture, Pune-5 during November-2011 to December-2012. The cocopeat was used as growth media, had acidic in reaction (pH-5.8), EC (0.92 dS m^{-1}), organic carbon (48.76 %), total K (0.61 %) and

Zn (102 mg kg^{-1}). The experiment was laid out in Factorial Complete Randomized Design (FCRD), replicated thrice with five harvesting periods. The recommended dose of gerbera is 136-66-82 mg N, P_2O_5 and K_2O/plant/alternate day before flowering and 130-66-90 mg N, P_2O_5 and K_2O/plant/alternate day after flowering was applied. Flowering was not allowed upto 100 days. After 100 days of planting, five treatment combinations were normally applied with all nutrients, whereas other five treatment combinations applications of K was curtailed *i.e.* without K was applied and for another five treatment combinations application of Zn was curtailed.

The commercial grade water soluble inorganic fertilizer schedule was adopted. The polyhouse was naturally ventilated (GH-1) type and UV stabilized 200-micron thickness polythene film was used as cladding material. For maintaining temperature 50 per cent shade net was provide in the polyhouse. The misting system was provided for controlling the temperature and humidity. The harvested parts of plants were air dried and weighed and recorded as dry matter yield. Dried plants were grind and the powered samples were used for estimation of nutrient concentrations. The concentration was multiplied with dry matter yield to obtain nutrient uptake of different parts of the plants. The disbudding practice was followed for saving and diverting the food material to the beneficial parts of plants.

The representative samples were collected before and after flowering (100 DAP) with 10 days interval. The collected samples were dried in shade and then hot air oven at 65^0C for 24 hours and then grinded and used for analysis of nutrient concentrations. Potassium was estimated by flame photometer as per methods described by Jackson (1973) and zinc by Zososki and Burau (1997). Leaf chlorophyll was estimated by calorimetric method (Arnon, 1949).

RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Effect of K and Zn deficiency on morphological parameters of gerbera :

Number of suckers per plant :

The data pertaining to number of suckers per plant are presented in Table 1. The data clearly reveal that K (T_2) deficiency treatment caused significant reduction in number of suckers per plant as compared to all nutrient treatments (T_1). Though the number of suckers per plant significantly increased with DAP due to T_1, T_2 and T_3. The rate of increase was much more with T_1 as compared to T_2 and T_3 which signifies the role of K and Zn as an essential nutrient.

Application of all nutrients treatments was significantly superior over K deficiency treatment but it was at par with Zn deficiency treatment. The number of sucker at 150 DAP were significantly superior over others except at 140 DAP but interaction effects were non-significant.

Number of leaves per plant :

The data in respect of number of leaves per plant are presented in Table 2. The number of leaves produced per plant increased with increase in days from planting to 150 days due to all nutrients application. The gerbera plant produced significantly highest number of leaves (28.89) per plant due to application of all nutrients. In K and Zn deficiency treatments the rate of increase was less as compared with all nutrients application upto 120 DAP, which is further decreased with days.

Application of all nutrients treatment was significantly superior over K and Zn deficiency treatment. Number of leaves at 150 DAP were significantly superior over others except at 140 DAP and interactions were also significant.

Number of flowers per plant :

The data regarding number of flowers per plant are presented in Table 3. Among the different treatments, application of all nutrients produced significantly higher number of flowers (7.13) than application of K deficient treatments (5.73) and least with Zn deficiency treatments (4.99). In K and Zn deficiency treatments the rate of increase in number of flowers with days was less as compared with all nutrients application upto 140 DAP and then decrease.

The data clearly indicate that the K and Zn deficiency treatments caused significant reduction in number of flowers per plant as compared to application of all nutrients treatment. Similar trend was also observed in respect of number of leaves per plant.

Application of all nutrients treatment consistently and significantly produced increased number of flowers per plant with days. Specifically at 110 DAP two flowers per plant were observed, which were increased upto 11

flowers at 150 DAP. However, due to K and Zn deficiency treatments, through number of flowers initially increased upto 140 DAP, suddenly and significantly decreased at 150 DAP, indicating essentiality of K and Zn in the nutrition of gerbera to have optimum growth and flower production.

Plant height :

The data regarding plant height are presented in Table 4. Application of all nutrients reported significantly more height (50.1 cm) than other treatment. In K and Zn deficiency treatments, the rate of increase in plant height was less as compared with all nutrients application.

Application of all nutrients treatment was significantly superior over Zn and K deficiency treatments. Plant height at 150 DAP was significantly superior over others except at 140 DAP and interaction were also significant.

Table 1 : Number of suckers per plant

Treatments	110 DAP	120 DAP	130 DAP	140 DAP	150 DAP	Mean
T_1	4.00	4.50	5.00	5.50	5.80	4.96
T_2	3.00	4.00	4.33	5.00	5.10	4.29
T_3	4.00	4.33	4.70	5.33	5.40	4.75
Mean	3.67	4.28	4.68	5.28	5.43	
		Treatment		DAP	Intraction	
SE (±)		0.18		0.21	0.41	
C.D. (P=0.05)		0.52		0.59	NS	

NS=Non-significant

Table 2 : Number of leaves per plant

Treatments	110 DAP	120 DAP	130 DAP	140 DAP	150 DAP	Mean
T_1	25.00	26.70	28.70	30.33	33.70	28.89
T_2	24.00	24.30	24.00	23.67	23.00	23.79
T_3	24.33	25.33	24.60	24.33	23.33	24.39
Mean	24.44	25.44	25.77	26.11	26.68	
		Treatment		DAP	Intraction	
SE (±)		0.18		0.20	0.40	
C.D. (P=0.05)		0.51		0.57	1.14	

Table 3 : Number of flowers per plant

Treatments	110 DAP	120 DAP	130 DAP	140 DAP	150 DAP	Mean
T_1	2.00	4.67	8.00	10.00	11.00	7.13
T_2	2.00	4.33	6.33	8.67	7.33	5.73
T_3	2.00	3.67	5.67	7.00	6.60	4.99
Mean	2.00	4.22	6.67	8.56	8.31	
		Treatment		DAP	Intraction	
SE (±)		0.17		0.19	0.38	
C.D. (P=0.05)		0.49		0.55	1.09	

Table 4 : Plant height (cm)

Treatments	110 DAP	120 DAP	130 DAP	140 DAP	150 DAP	Mean
T_1	45.00	50.00	51.00	52.00	52.50	50.10
T_2	43.50	44.60	45.17	45.60	45.76	44.93
T_3	44.00	44.50	44.80	45.00	45.20	44.70
Mean	44.17	46.37	46.99	47.53	47.82	
		Treatment		DAP	Intraction	
SE (±)		0.15		0.17	0.34	
C.D. (P=0.05)		0.44		0.49	0.98	

Root length :

The data regarding root length are presented in Table 5. Application of all nutrients reported significantly more root length (29.4 cm) than other treatments. In K and Zn deficiency treatment, the rate of increase in root length was less as compared with all nutrients application.

Application of all nutrients treatment was significantly superior over K and Zn deficiency treatments. Root length at 150 DAP was significantly superior over others and interactions were also significant. Similar results were reported by Das and Sen (1981).

Leaf area per plant :

The leaf area is presented in Table 6. Application of all nutrients reported significantly more leaf area (136.16 cm^2) than other treatments. In K and Zn deficiency treatments, the rate of increase was less as compared with all nutrients application upto 120 DAP, which was further decreased with days.

Application of all nutrients treatments was significantly superior over K and Zn deficiency treatments. The reduction in leaf area with days due to K and Zn deficiency proves the essentiality of these elements for normal growth of plants. Das and Sen (1981) also reported 40 per cent or more reduction in leaf area due to potassium deficiency.

Chlorophyll content of leaves (mg/g) :

The total chlorophyll content of leaves is presented in Table 7. Application of all nutrients treatment reported significantly more total chlorophyll content of leaves (1.31 mg/g fresh weight) over K and Zn deficiency treatments.

The reduction in total chlorophyll content in leaves due to K and Zn deficiency treatments reveal the role of K as well as Zn in chlorophyll production and further in photosynthesis activity. Terry and Ulrich (1973) recorded similar observation and reported that withholding K

Table 5 : Root length

Treatments	110 DAP	120 DAP	130 DAP	140 DAP	150 DAP	Mean
T_1	28.00	28.50	28.93	29.60	32.00	29.41
T_2	27.40	27.60	27.80	27.90	28.00	27.74
T_3	27.50	27.60	27.70	27.80	28.00	27.72
Mean	27.63	27.90	28.14	28.43	29.33	
	Treatment		DAP		Intraction	
SE (±)	0.18		0.20		0.40	
C.D. (P=0.05)	0.52		0.58		1.15	

Table 6 : Leaf area (cm^2) per plant

Treatments	110 DAP	120 DAP	130 DAP	140 DAP	150 DAP	Mean
T_1	135.20	135.51	136.10	136.33	137.67	136.16
T_2	133.07	133.90	130.67	128.50	123.67	129.96
T_3	134.50	134.67	131.00	129.67	125.07	130.98
Mean	134.26	134.69	132.59	131.50	128.80	
	Treatment		DAP		Intraction	
SE (±)	0.34		0.38		0.76	
C.D. (P=0.05)	0.97		1.08		2.17	

Table 7 : Chlorophyll content of leaves (mg/g)

Treatments	110 DAP	120 DAP	130 DAP	140 DAP	150 DAP	Mean
T_1	1.25	1.27	1.30	1.35	1.40	1.31
T_2	1.24	1.21	1.19	1.14	1.07	1.17
T_3	1.24	1.22	1.16	1.11	1.04	1.15
Mean	1.24	1.23	1.22	1.20	1.17	
	Treatment		DAP		Intraction	
SE (±)	0.01		0.01		0.02	
C.D. (P=0.05)	0.03		0.03		0.06	

nutrition diminishes rapidly the K concentration of the leaf blade tissues and the rate of photosynthesis in sugar beet. Similar work related to the present investigation was also done by Kumari *et al.* (2010); Magar *et al.* (2010); Tamgadge *et al*. (2010); Chobe *et al*. (2010); Bhosale *et al*. (2012); Kumar (2013) and chauhan *et al.* (2014).

Conclusion :

Application of K and Zn deficiency treatments recorded significantly reduced results of number of suckers, number of leaves per plants, number of flowers per plant, plant height, root length, leaf area per plant, chlorophyll content of leaves. However, application of all nutrients treatments recorded highest growth observatios.

REFERENCES

Arnon, D.I. (1949). Copper enzymes in isolated chloroplast poly phenol oxidase in *Beta velgaris. J. Pl. Physiol.*, **24** : 1-25.

Bhosale, A.B., Deshmukh, M.R. and Takte, R.L. (2012). Effect of different planting densities on performance of gerbera under polyhouse conditions. *Asian J. Hort.*, **7**(2) : 449-453.

Chauhan, R.V., Varu, D.K., Kava, K.P. and Savaliya, V.M. (2014). Effect of different media on growth, flowering and cut flower yield of gerbera under protected condition. *Asian J. Hort.*, **9**(1) : 228-231.

Chobe, R.R., Pachankar, P.B. and Warade, S.D. (2010). Performance of different cultivars of gerbera under polyhouse condition. *Asian J. Hort.*, **5** (2) : 333-335.

Das, B.K. and Sen, S.P. (1981). Effect of N, P, K deficiency on the uptake and mobilization of ions in Bengal gram. *J. Biosci.*, **3** : 249-258.

Hemantrajan, A. and Garg, O.K. (1984). Effect of zinc fertilization on senescence of wheat varieties. *Indian J. Pl. Physiol.*, **27**(3): 239-246.

Jackson, M.L. (1973). *Soil chemical analysis.* Prentice Hall, India Pvt. Ltd. New Delhi. : 498 pp.

Kumar, Rajiv (2013). Evaluation of gerbera (*Gerbera jamesonii* Bolus ex. Hooker F.) genotypes for flower quality traits under naturally ventilated polyhouse. *Asian J. Hort.*, **8**(2) : 680-682.

Kumari, Anop, Patel, K.S. and Nayee, D.D. (2010). Comparative performance of gerbera cultivars (*Gerbera jamisonii Bolus ex hooker* F.) under protected environment conditions. *Asian Sci.*, **5** (1) : 32- 33.

Magar, S.D., Warade, S.D., Nalge, N.A. and Nimbalkar, C.A. (2010). Performance of Gerbera (*Gerbera jamesonii*) under naturally ventilated polyhouse condition. *Internat.J.Plant Sci.*, **5** (2) : 609-612

Tamgadge, Soniya, Jadhao, Anuradha, Deshmukh, Anita, Telgote, Nayana and Bodakhe, Vijay (2010). Effect of nitrogen levels and gibberellic acid on quality and vase life of gerbera under polyhouse condition, *Internat. J. Proc. & Post Harvest Technol.*, **1** (2) : 62-64.

Terry and Ulrich (1973). Effect of K deficiency on photosynthesis and respiration of leaves of sugar beet. *J. Plant Physiol.*, **51**: 783-786.

Zososki, R.J. and Burau, R.G. (1997). A rapid nitric perchloric acid digestion method for multi element tissue analysis. *Comm. Soil Sci. & Pl. Anal.*, **8**(5): 425-436.