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Effect of NPK on plant growth, flower quality and yield of gerbera (*Gerbera jamesonii*)

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Abstract: Twelve treatments were used in the trial *viz;* T_1 (Control); T_2 (5:7.5:10); T_3 (10:10:12.5); T_4 (15:12.5:15); T_5 (10:15:10); T_6 (20:20:15); T_7 (15:20:20); T_8 (17.5:15:17.5); T_9 (20:17.5:20); T_{10} (10:20:30); T_{11} (25:20:20) and T_{12} (30:20:20) NPK g/m^2. The experiment was laid out in Randomized Block Design (RBD) with three replications. Maximum treatments had a significant effect on various parameters over the control treatment. The maximum plant height (40.4 cm), number of leaves per plant (17.1), plant spread (58.8 cm), number of suckers per plant (6.3), number of flowers per plant (10.2), number of flowers per plot (204.5), days to first flower bud emergence (57.6 days), flower diameter (11.9 cm), stalk length (71.7 cm), longevity of flower in the plants (23.5 days) were produced by the plants treated with 20:20:15 NPK g/m^2. Thus, the treatment comprised of 20:20:15 NPK g/m^2 could be useful for harnessing good vegetative as well as reproductive characters of gerbera cv. Lanceolot.

Key words: Gerbera, NPK, Growth, Flower and yield

Introduction

Gerbera (*Gerbera jamesonii*) belongs to family Asteraceae that scattered from Africa to Madagascar into tropical Asia and South America (Tjia and Joiner, 1984). Gerbera is popular plant for the backyard and their daisy-like bloom make ongoing cut flora. The leaves are elongated, slim and covered with hair (pubescent) underneath, up to 10 inch broad (Tjia *et al.,* 2008). The midpoints (eye) of the flowers are very attractive and colour ranges from green, brown, black to dark red. The major nutrients (NPK) are reported to enhance the vegetative growth and assist the plant during the blooming period to mobilize the process of flower opening. Nitrogen, phosphorus and potassium have a significant effect on spike production and floret quality (Singh *et al*., 2004). Flowering can be increased with increased levels of NPK application (Anamika and Lavania, 1990). Numerous studies (Golcz *et al.,* 2006; Dzida and Jarosz, 2006; Biesiada and Kuœ, 2010) have shown that nitrogen fertilization results in a significant increase in quantity and quality of herbal plant yields. For successful cultivation of gerbera crop well-drained, porous, rich, light, neutral to slightly acidic soil about 30 cm depth is most suitable. The salinity level should not exceed 2 dS/m. The pH should be maintained 5.5 to 7.0 for absorption of the nutrients in a better form. Economic production of gerbera depends upon factors like soil organic status, irrigation water quality, plant density, plant protection measures, *etc.* But, nutritional requirement plays a vital role in successful crop production of gerbera and nutrient level such as nitrogen, phosphorus, and potash is much important, which allured our attention for taking up this study.

Materials and Method

A field experiment was carried out on experimental field of Department of Horticulture, Sam Higginbottom Institute of Agricultural, Technology and Sciences, Allahabad during of 2012-2013. The experiment was laid out in a Randomized Block Design with twelve treatments and three replications. The transplanting was done on 11 October, 2012 at a spacing of 30×30 cm. Urea, Single Super Phosphate (SSP) and Muriate of Potash (MoP) were used as source of nitrogen, phosphorus and potassium respectively. The application of nitrogen, phosphorus and potash were applied in two times. The first application was done along with 50 t/ha FYM before planting and next 45 days after planting. The observations were recorded on 9 characters *viz.,* Plant height (cm), plant spread (cm), number of leaves, number of suckers per plant, flower yield, days to first flower bud emergence, flower diameter (cm), stalk length (cm), longevity of flower in the plant (days). Data on different growth and yield parameters from all plants of each plot were recorded and analyzed statistically by using STPR computer package program. Analysis of variance was performed separately for each treatment Panse and Sukhatme, (1967).

Results and Discussion

Plant height: The plant height of gerbera was influenced by different application of the NPK at 30, 60, 90 and 120 days after planting. The statistically analysed data are presented in table 1. Significant variations in plant height was gained at 60, 90 and 120 days after planting but it was found non-significant at 30 days after planting which might be due to insufficient nutrient availability at earlier stage of plant growth.

Table-1: Vegetative parameter of gerbera as influenced by different doses of NPK

Varieties	Plant height (cm)				Number of leaves				Plant spread (cm)			
	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T_1	21.0	23.9	27.7	30.5	6.3	8.4	9.8	11.7	26.7	29.6	32.7	37.7
T_2	22.6	27.2	31.7	33.7	6.7	10.3	11.7	13.9	26.1	35.0	38.0	42.4
T_3	19.5	23.6	30.7	33.8	7.7	12.0	13.3	14.9	26.1	38.3	41.2	46.2
T_4	23.3	27.9	32.8	35.6	6.9	10.2	11.3	11.9	31.3	40.8	43.5	47.5
T_5	20.9	23.7	31.7	34.6	7.2	11.9	12.7	14.7	26.2	36.9	39.3	45.2
T_6	24.9	37.7	38.3	40.4	9.2	13.1	15.5	17.1	31.8	48.9	52.7	58.8
T_7	22.0	30.0	32.0	34.1	7.7	9.9	11.0	12.5	29.7	33.7	36.6	42.2
T_8	22.4	33.9	36.6	38.1	7.1	9.7	11.9	14.1	31.2	46.4	49.7	53.5
T_9	23.1	33.4	36.2	38.7	7.3	10.8	13.5	14.7	28.6	45.9	48.8	53.3
T_{10}	23.1	26.7	37.7	40.4	5.9	9.8	12.8	14.6	29.4	44.9	48.6	52.7
T_{11}	20.9	33.8	35.9	37.9	7.7	10.0	10.9	13.0	28.4	44.6	48.2	52.2
T_{12}	21.2	35.3	37.9	39.6	8.5	11.5	12.8	14.6	27.2	44.8	48.9	52.9
Mean	22.0	29.5	33.9	36.4	7.4	10.7	17.9	21.1	28.4	38.5	41.7	43.7
F- test	**NS**	**S**	**S**	**S**	**NS**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
S. Ed. (±)	-	0.81	0.90	0.87	-	0.55	0.77	0.78	0.89	1.94	1.71	1.73
C.D. at 5%	-	1.69	1.86	1.79	-	1.14	1.60	1.62	1.86	4.02	3.62	3.65

Table-2: Floral quality and yield of gerbera as influenced by different doses of NPK

Varieties	Days to first flower bud emergence	Flower diameter (cm)	Stalk length (cm)	Longevity of flower (days)	No. of sucker /plant	Flower yield (lakh/ha)
T_1	52.5	8.6	43.3	16.4	4.6	4.7
T_2	54.3	9.4	54.7	19.3	4.9	5.5
T_3	54.7	9.0	54.0	20.1	5.1	6.5
T_4	55.7	8.9	57.8	19.3	5.1	5.8
T_5	53.5	10.1	68.5	22.7	5.8	6.2
T_6	57.6	11.9	71.7	23.5	6.3	6.8
T_7	54.4	9.8	62.8	17.0	5.5	6.0
T_8	56.6	10.3	67.7	17.1	5.5	5.8
T_9	51.4	8.8	61.0	20.8	6.0	5.8
T_{10}	53.0	10.2	55..5	19.0	5.3	6.0
T_{11}	56.3	10.4	64.0	20.7	5.1	5.4
T_{12}	54.8	10.2	55.3	21.4	6.1	5.7
Mean	55.1	9.9	58.8	19.8	5.4	5.9
F-test	S	S	S	S	S	S
S. Ed. (±)	0.41	0.12	0.84	0.25	0.20	2.84
C.D. at 5%	0.85	0.25	1.75	0.52	0.41	5.89

The maximum plant height (24.9, 37.7, 38.3 and 40.4 cm) was found at 30, 60, 90 and 120 days after planting, respectively, in treatment (T_6) with NPK 20:20:15 g/m^2 and in case of the minimum plant height were observed all the control treatment (T_1). Instead of T_6 the treatment comprised of NPK 20:20:15 g/m^2, (T_{10}) with NPK 10:20:30 g/m^2 was given better performance over the rest of treatments. The experiment also revealed that plant height of gerbera was increased when the doses of NPK increased in soil. The result of nutritional application is in close agreement with the findings of Digendra *et al.* (2014) in tuberose.

Number of leaves per plant: Different doses of NPK significantly influenced the number of leaves per plant at 60, 90 and 120 days after planting (table 1). However, there was no-significant variations in number of leaves per plant were observed with different doses of NPK at 30 days after planting which might be due to insufficient nutrient availability at earlier stage of plant growth. The treatment NPK 20:20:15 g/m^2 (T_6) produced maximum numbers of leaves (13.1, 15.5 and 17.1) at 60, 90 and 120 days to planting, respectively. Followed by NPK 10:10:12.5 g/m^2 (T_3) and in case of minimum numbers of leaves were observed in control treatment (T-$_1$). Similar results have been repeated in gerbera cv. Sunway (Gaurav *et al.,* 2004).

Plant spread: The plant spread influenced by different doses of NPK which were given to the crop at 30, 60, 90 and 120 days after spraying (Table 1). The plant spread (31.8, 48.9, 52.7 and 58.8 cm) significantly affected at 30, 60, 90 and 120 days after planting, respectively, in treatment (T_6) with NPK 20:20:15 g/m^2 followed by (T_8) with NPK 17.5:15:17.5 g/m^2 showed good recitation over the other treatments. Spreading of vegetation of the crop in case of the gerbera might be due to the habit of the plant somewhat and availability of nutrient may be considerable. These results are in agreement with the findings of Singh *et al.* (2014).

Numbers of Suckers: The number of suckers was affected significantly by the different doses of NPK (Table 2). The maximum numbers of suckers (6.3) were recorded in T_6 (20:20:15 g/m^2) followed by T_{12} (6.1) and T_9 (6.0) with 30:20:20 NPK g/m^2 and 20:17.5:20 NPK g/m^2. It might be due to the sufficient availability of the nutrients to the plant at the right stages of growth. The minimum number of suckers were recorded in (4.6) in T_1 control. The nutritional effect of NPK on numbers of sucker's formation in gerbera (Singh *et al.,* 2014).

Flower yield (lakh/ ha): Flower yield influenced by different doses of NPK during the period of experiment (Table 2). The maximum flower yield was found in the treatment of T_6 (20:20:15 N.P.K. g/m^2) followed by T_5 (10:15:10 N.P.K. g/m^2) and T_7 (15:20:20 N.P.K. g/m^2) with the yield 6.8, 6.2 and 6.0 lakh/ha, respectively. It may be due to the sufficient availability of the proper nutrients to the crop at the growth stage. The plants raised in control plot had resulted minimum flower yield. This result was in agreement with Tjia and Joiner (1984) in gerbera.

Days taken to first flower bud emergence: Days taken to flower bud emergence with the application of different levels of N.P.K. in gerbera has been presented in Table 2. The earliest flower bud emergence (51.4 days) was recorded with the application of 20:17.5:20 N.P.K. g/m^2 (T_9) followed by control (T_1) and 10:20:30 N.P.K. g/m^2 (T_{10}). It might be due to the availability of nutrients to plant that forced towards the growth of vegetative parts then it took time to bloom as compared to control treatment. The maximum days (57.6 days) were taken by the treatment of (T_6) 20:20:15 N.P.K. g/m^2. Similar type of finding was also reported in tuberose (Digendra *et al.,* 2014).

Flower diameter (cm): Flower diameter also influenced by the availability of the nutrients to the gerbera plant basically NPK. The maximum flower diameter was recorded in 20:20:15 N.P.K. g/m^2 (T_6) followed by 25:20:20 N.P.K. g/m^2 (T_{11}) and 10:20:30 N.P.K. g/m^2 (T_{10}) with in scale 11.9, 10.4 and 10.2 cm, respectively. Whereas, the minimum flower diameter (8.6 cm) was found in control (T_1) which might be due to the lack of nutrients. Gaurav *et al.* (2004) reported that different nutritional levels significantly influenced the yield and quality of gerbera cv. Sunway. The overall assessment suggested that the application of 20:20:15 g N, P and K per m^2 per month was found to be effective in producing good quality and higher number of flowers in gerbera.

Stalk length (cm): The stalk length of gerbera effected significantly by different doses of NPK (Table 2). The maximum stalk length exhibited by the plants applied with 20:20:15 NPK g/m^2 (T_6) followed by 10:15:10 NPK g/m^2 (T_5) and 17.5:15:17.5 NPK g/m^2 (T_8) with the length 71.7, 68.5 and 67.7 cm, respectively. It may be due to the favourable nutrients availability to the crop for stalk formation. The minimum stalk length (43.3 cm) was recorded in the treatment of control (T_1). This result was in agreement with Gaurav *et al.* (2004) in gerbera.

Longevity of flower (days): The longevity of flower influenced by the dose of NPK in gerbera has been presented in Table 2. The application of 20:20:15 NPK g/m^2 (T_6) had resulted maximum flower longevity (23.5 days). It might be due to the availability of nutrients to plant that forced towards the growth of vegetative parts then it takes time to complete wilting as compared to control treatment. The minimum days (16.4 days) were taken by the treatment of (T_1) control. These results are in agreement with the findings of Singh *et al.* (2014). Based on the field experiment it could advised that the application of NPK @ 20:20:15 NPK g/m^2 may resulted better quality growth, flowering and yield of the gerbera under shade net condition.

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References

Anamika and Lavania, M.L.: Effect of nitrogen, phosphorus and potassium on growth, yield and quality of rose. *Haryana J. Hort. Sci*., **19**: 291-298 (1990).

Biesiada, A. and Kucœ, A.: The effect of nitrogen fertilization and irrigation on yielding and nutritional status of sweet basil (*Ocimum basilicum* L.). *Acta Sci. Pol*., Hortorum Cultus, **9**: 3-12 (2010).

Singh, D., Singh, V.K. Kumari, S., Pandey, S.K. and Singh, D.: Response of different levels of NPK on growth, flowering and yield of tuberose (*Polianthes tuberosa* L.) cv. Shringar. *New Agriculturist,* **25**: 1-5 (2014).

Dzida, K. and Jarosz, Z.: Yielding and chemical composition of *Origanum majorana* L. depending on different nitrogen-potassium fertilization. *Acta Agroph*., **7**: 561-566 (2006).

Gaurav, S.B., Katwate, Sabale, R.N., Kakade, D.S. and Dhane, A.V.: Effect of nutritional levels on yield and quality of gerbera. *J. Ornam. Horti*., **7**: 226-229 (2004).

Golcz, B., Politycka, K. and Seidler: The effect of nitrogen fertilization and stage of plant development on the mass and quality of sweet basil leaves (*Ocimum basilicum* L.). *Herba Pol*., **52**: 22-30 (2006).

Tjia, B. and Joiner, J.N.: Growing gerberas. *Greenhouse Manager*, **3**: 67, 70, 73-75 (1984).

Tjia, B., Black, R.J. and Park-Brown, S.: Gerberas for Florida. CIR527. Gainesville: University of Florida Institute of Food and Agricultural Sciences (2008).

Singh, V.K., singh, D., Kumari, S., Ali, J. and Prasad, V.M.: Evaluation of gerbera (*Gerbera jamesonii*) cultivars under shade net house condition. *New Agriculturist*, **25**: 105-109 (2014).

Singh, S.R.P.; Singh, D.K. and V.K.: Effect of NPK combinations on growth and flowering of tuberose (*Polianthes tuberose* L.) cv. Double. *Plant Archives,* **4**: 515-517 (2004).

Panse, V.G. and Sukhatme, P.V.: Statistical methods for agricultural workers. *Ind. Coun. Agric. Res*., New Delhi, p. 155 (1967).

Kumar V., Pandey S.K., Singh V.K., Verty P. and Samoon S.A.: Response of nitrogen and phosphorus levels on calendula (Calendula officinalis L.) *Res. Environ. Life Sci*., **8**: 557-560 (2015).