Research Paper | *The Asian Journal of Horticulture,* (June, 2010) Vol. 5 No. 1 : 123-126

Influence of chemical fertilizers on growth, quality, corm and cormel production of gladiolus(*Gladiolus grandiflorus*L.) cv. SANCERREE under South Gujarat conditions

N.M. PATEL, J.R.DESAI, S.N. SARAVAIYA, N.B. PATEL, KA. PATEL AND R.B. PATEL

Accepted : *April, 2010*

See end of the article for authors' affiliations

Correspondence to :

N.M. PATEL
ASPEE College of Horticulture and Forestry, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA

ABSTRACT

Field experiment was conducted to study the Influence of chemical fertilizers on growth, quality, corm and cormel production of gladiolus (*Gladiolus grandiflorus* L.) cv. "SANCERREE" at Floriculture Research Scheme, Regional Horticultural Research Station, Navsari Agricultural University, Navsari during *Rabi* season of 2002. The experiment was laid out in Factorial Randomized Block Design with three replications, which included twelve treatment combinations consisting of three levels of nitrogen *i.e.* 200, 250 and 300 kg/ha, two levels of phosphorus *i.e.* 150 and 200 kg/ha and two levels of potash *i.e.* 150 and 200 kg/ha. The gladiolus fertilized with 250 kg N/ha significantly improved the plant height, length of longest leaf, leaf area, fresh and dry weight of leaf, number of florets/spike, spike length, flower diameter, corm diameter, number of corms and cormels per plant. The maximum production of corms (5134.427 kg/ha) and cormels (2933.957 kg/ha) were also recorded under treatment N_2. Among the different levels of phosphorus, treatment receiving 200 kg P_2O_5/ha found superior for almost all the growth parameters, quality characters and yield components except number of leaves per plant, length of longest leaf and number of days required for spike emergence. The results revealed that all the growth parameters, quality characters and yield parameters were remained unaffected due to different dose of potassium.

Key words : Gladiolus, Inorganic fertilizers, Growth, Quality and yield attributes

The gladiolus (*Gladiolus grandiflorus L.)* belongs to family Iridaceae. Gladiolus flowers are mostly used as cut flowers, loose flowers and making bouquet and garlands. It has wide range of attractive colours like white, salmon yellow, red, pink, violet, greenish and smoky. Among the different management practices in flower crops, nutrient management plays an important role for good growth and flower production. It has been observed that N, P, K and Fe nutrients are limiting factors in successful growing of gladiolus. Thus, the response of gladiolus to the applied nutrients is quite encouraging in terms of flower production. Considering this, the present investigation was taken up to find out all the optimum dose of N, P and K for maximum production of flowers, corms and cormels in gladiolus under south Gujarat conditions.

MATERIALS AND METHODS

A field experiment was conducted at Floriculture Research Scheme, Regional Horticultural Research Station, Navsari Agricultural University, Navsari during *Rabi* season of 2002. The experiment was laid out in Factorial Randomized Block Design with three replications, which included twelve treatment combinations consisting of three levels of nitrogen *i.e.* 200, 250 and 300 kg/ha, two levels of phosphorus *i.e.* 150 and 200 kg/ha and two levels of potash *i.e.* 150 and 200 kg/ha. Full dose of phosphorus (in the form of single super phosphate) as well as potash (in the form of muriate of potash) and half quantity of nitrogen (in the form urea) was applied as basal. The remaining quantity of nitrogen was applied after one month.

RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Effect of nitrogen :

On growth attributes :

The medium level of nitrogen N_2 (250 kg/ha) recorded significantly maximum plant height (113.6 cm). Similarly highest leaf area (110.36 cm^2), as well as maximum length of leaf (73.4 cm), fresh weight of leaf (5.332g) and dry weight of leaf (1.497g) were also recorded maximum with the application of nitrogen at 250 kg/ha (Table 1). These increases might be due to better availability of nitrogen nutrient leading to the quick and better vegetative growth of gladiolus plant. As the

Table 1 : Influence of different levels of nitrogen, phosphorus and potassium on growth of gladiolus (*Gladiolus grandiflorus* L.) cv. SANCERREE

Treatments (kg ha^{-1})	Plant height with spike (cm)	Length of longest leaf (cm)	Leaf area (cm^2)	Fresh wt. of leaf (g)	Dry wt. of leaf (g)
Nitrogen (N)					
N_1 - 200	92.5	64.4	91.55	4.344	1.223
N_2 - 250	113.6	73.4	110.36	5.332	1.497
N_3 - 300	112.2	73.3	110.14	5.266	1.488
S. E. ±	3.23	2.54	3.53	0.152	0.042
C.D. (P=0.05)	9.49	7.46	10.36	0.446	0.122
Phosphorus (P)					
P_1 – 150	101.2	70.2	99.19	4.749	1.338
P_2 - 200	111.0	70. 4	108.83	5.211	1.467
S. E. ±	2.64	2.08	2.88	0.124	0.034
C.D. (P=0.05)	7.75	NS	8.46	0.364	0.099
Potassium (K)					
K_1 - 150	106.5	70.3	103.83	4.999	1.407
K_2 - 200	105.7	70.4	104.19	4.962	1.397
S. E. ±	2.64	2.08	2.88	0.124	0.034
C.D. (P=0.05)	NS	NS	NS	NS	NS
C.V.%	10.56	12.53	11.77	10.57	10.29
Significant interaction	N x P	NS	N x P	N x P	N x P

NS= Non significant

Table 2 : Influence of different levels of nitrogen, phosphorus and potassium on quality of gladiolus (*Gladiolus grandiflorus* L.) cv. SANCERREE

Treatments (kg ha^{-1})	Spike length (cm)	Number of florets per spike	Flower diameter (cm)
Nitrogen (N)			
N_1 200	66.50	11.40	10.80
N_2 250	81.60	14.10	13.30
N_3 300	80.50	13.90	13.10
S. E. ±	2.32	0.42	0.35
C.D. (P=0.05)	6.81	1.24	1.03
Phosphorus (P)			
P_1 150	72.70	12.40	11.80
P_2 200	79.70	13.80	13.00
S. E. ±	1.90	0.35	0.29
C.D. (P=0.05)	5.56	1.01	0.84
Potassium (K)			
K_1 150	76.50	13.10	12.50
K_2 200	75.90	13.20	12.40
S. E. ±	1.90	0.35	0.29
C.D. (P=0.05)	NS	NS	NS
C.V.%	10.56	11.18	9.79
Significant interaction	N x P	N x P	N x P

NS= Non significant

meristemic tissues have a very active protein metabolism, photosynthates transported to the site of growth are predominantly used in the synthesis of nucleic acid and protein, hence, during the vegetative phase nitrogen nutrition of the plant to a large extend to control the growth of the plant (Mongel and Kirby, 1982).

On quality attributes :

The data presented in Table 2 revealed that among all the doses N_2 (250 kg N/ha) resulted in the highest length of spike (81.6 cm), number of florets per spike (14.1) and diameter of floret (13.3 cm). This might be due to the improvement in growth characters that favorably modified the flower quality and consequently yield.

On corm and cormel production :

The application of nitrogen resulted in significant increase in corm and cormel production (Table 3) which were 5134.427 and 2933.957 kg/ha, respectively with N_2 (250 kg/ha) might be due to enhanced growth also resulted in more number of corms. Maximum size of corms and weight was produced by plants, which were fertilized with 250 kg N/ha. This treatment also significantly increased the cormel weight and number of cormels per plant. Nitrogen increased the total leaf area of plant resulting in

Table 3 : Influence of different levels of nitrogen, phosphorus and potassium on corms and cormels of gladiolus (*Gladiolus grandiflorus* L.) cv. SANCERREE

Treatments (kg ha^{-1})	Corms per plant	Yield of corms (kg ha^{-1})	Corm diameter (cm)	Cormels per plant	Yield of cormels (kg ha^{-1})
Nitrogen (N)					
N_1 200	1.9	4273.854	3.9	49.9	2442.201
N_2 250	2.2	5134.427	4.8	59.6	2933.957
N_3 300	2.2	4969.429	4.7	58.0	2839.673
S. E. ±	0.07	139.274	0.14	1.77	79.586
C.D. (P=0.05)	0.21	408.503	0.40	5.19	233.430
Phosphorus (P)					
P_1 150	2.0	4598.443	4.2	53.5	2627.679
P_2 200	2.3	4986.697	4.6	58.2	2849.541
S. E. ±	0.06	113.717	0.11	1.45	64.981
C.D. (P=0.05)	0.17	333.541	0.33	4.24	190.595
Potassium (K)					
K_1 150	2.1	4840.876	4.5	56.3	2766.213
K_2 200	2.1	4744.264	4.4	55.3	2711.007
S. E. ±	0.06	113.717	0.11	1.45	64.981
C.D. (P=0.05)	NS	NS	NS	NS	NS
C.V.%	11.66	10.07	10.60	10.99	10.07
Significant interaction	N x P	N x P	N x P	N x P	N x P

NS = Non significant

high dry matter production, which diverted towards the corm, had increased the weight and size of corm as well as yield of cormels.

Effect of phosphorus :

On growth attributes :

A perusal of data presented in Table 1 revealed that the higher dose of phosphorus @ 200 kg/ha gave significantly maximum plant height (111 cm), leaf area (108.83 cm^2), fresh weight of leaf (5.211 g) and dry weight of leaf (1.467 g). As phosphorus is the major constituent of chlorophyll and also involved in many physiological processes such as cell division, development of meristemic tissues, photosynthesis, metabolism of carbohydrates, fats and proteins which are all essential components of vegetative growth.

On quality attributes :

The data revealed that (Table 2) maximum spike length (79.70 cm), highest number of florets per spike (13.80) and size of floret (13.00 cm) were recorded under higher dose of phosphorus P_2 (200 kg/ha). The

Table 4 : Interaction effect between different levels of nitrogen and phosphorus on growth, quality, corms and cormels production of gladiolus (*Gladiolus grandiflorus* L.) cv. SANCERREE

Observations	N_1P_1	N_1P_2	N_2P_1	N_2P_2	N_3P_1	N_3P_2	S.E. ±	C.D. (P=0.05)
Plant height with spike (cm)	97.9	87.2	100.5	126.7	105.2	119.1	4.57	13.42
Leaf area (cm^2)	95.94	87.15	96.52	124.19	105.12	115.16	5.00	14.65
Fresh wt. of leaf (g)	4.593	4.095	4.717	5.947	4.938	5.593	0.215	0.630
Dry wt. of leaf (g)	1.293	1.153	1.320	1.673	1.400	1.575	0.059	0.173
Spike length (cm)	70.3	62.6	72.2	91.0	75.5	85.5	3.28	9.63
Number of florets per spike	12.2	10.7	12.2	16.0	13.0	14.7	0.60	1.76
Flower diameter (cm)	11.5	10.2	11.7	14.9	12.3	14.0	0.50	1.46
Corms per plant	1.7	2.3	2.2	2.3	2.3	2.1	0.10	0.30
Yield of corms (kg ha^{-1})	3725.41	4822.29	4866.17	5402.68	5203.74	4735.11	196.96	577.71
Corm diameter (cm)	4.1	3.6	4.2	5.3	4.4	5.0	0.19	0.56
Cormels per plant	43.4	56.2	56.2	63.0	60.7	55.2	2.50	7.34
Yield of cormels (kg ha^{-1})	2128.80	2755.59	2780.66	3087.24	2973.56	2705.78	112.55	330.12

constitutional role of phosphorus in plant metabolism has already been discussed earlier that phosphorus helps in better vegetative growth and development in terms of better quality flowers and higher yield. Delay in emergence of spike due to increased vegetative growth with application of phosphorus, which is antagonistic to the reproductive phase. These findings are in accordance with the findings of Mukherjee *et al*. (1994), Singh *et al*. (1996), Kumar and Chattopadhyay (2001) and Kumar *et al*. (2003).

On corm and cormel production :

The higher level of phosphorus P_2 (200 kg/ha) recorded significantly higher number of corms and cormels (2.3 and 58.20, respectively), size of corm (4.60 cm), production of corm (4986.697 kg/ha) and cormel (2849.514 kg/ha) (Table 3). This might be due to higher dry matter accumulation in the plant and its greater mobilization in corms and cormels resulting in their better yield.

Effect of potassium :

The results revealed that all the growth parameters, flowering characters and yield parameters were remained unaffected due to different dose of potassium. This might be probably due to higher status of potassium content in the soil. These findings are in accordance with Singh and Gupta (1995) and Kumar and Misra (2003).

Interaction effect :

Among different interaction *viz*., NP, NK, PK and NPK only N x P interaction was found positive which significantly influenced plant height, leaf area, fresh and dry weight of leaf, spike length, number of florets per spike, size of floret, number of corms and cormels per plant, corm diameter, production of corm and cormel (Table 4). The combined application of nitrogen (250 kg/ha) and phosphors (200 kg/ha) fertilizers found very effective in all the phases of gladiolus.

Authors' affiliations:
J.R. DESAI, S.N. SARAVAIYA AND R.B. PATEL, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA
N.B. PATEL, AICRP (Tuber Crops), ASPEE College of Horticulture and Forestry, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA
K.A. PATEL, Krishi Vigyan Kendra, Waghai, DANGS (GUJARAT) INDIA

REFERENCES

Kumar, M. and Chattopadhyay, T.K. (2001). Effect of NPK on the yield and quality of gladiolus cv. "TROPICA SEA". *Environ. & Ecol.*, **19** (4) : 868-871.

Kumar, R. and Misra, R.L. (2003). Response of gladiolus to nitrogen, phosphorus and potassium fertilization. *J. Orna.. Hort*., **6** (2) : 95-99.

Kumar, R., Chaturvedi, O.P. and Misra, R.L. (2003). Effect of N and P on growth and flowering of gladiolus. *J. Orna. Hort*., **6** (2) : 100-103.

Mongel, K. and Kirby, E.A. (1982). "*Principle of plant nutrition*" 3rd International Potash Institute, Berne.

Mukherjee, S., Jana, S.C. and Chatterjee, T.K. (1994). Effect of nitrogen and phosphorus doses on production of flowers and corms of gladiolus (*Gladiolus grandiflorus* L.). *Indian agric.*, **38** (3) : 211-213.

Singh, A., Godara, N.R. and Kumar, A. (1996). Effect of NPK on flowering and flower quality of tuberose (*Polianthes tuberosa* L.) cv. "SINGLE". *Haryana Agril.Uni. J. Res*., **26** (1) : 43-49.

Singh, Z. and Gupta, A.K. (1995). Effect of nitrogen, phosphorus and potassium on tuber production in *Dahlia variabilis* wild cv. "POWDER PUFF". *Crop Res*., **10** (2): 174-178.

****