The Journal of Rural and Agricultural Research Vol. 13 No. 2, 94-97(2013)
Received January 2013; Acceptance Septmber 2013

Response of FYM, N, P and K levels on growth and flowering of gladiolus (G*ladiolus gradiflorus)* cv white prosperity

B.R. GAJBHIYE, R.A. VETAL, A.N. PURI AND P.B. ADSUL
Department of Soil Science and Agricultural Chemistry, College of Agriculture, Latur (M.K.V., Parbhani) – 413512. Email: bhagyabr123@yahoo.co.in

Abstract

*A pot culture experiment was carried out to study response of Farm Yard Manure (FYM), nitrogen, phosphorus and potassium levels on growth and flowering of gladiolus (*Gladiolus grandiflorus) cv. *white prosperity during* Kharif *2010-11. The experiment was laid out in factorial randomized block design with three replications consisting three manure levels i.e. 0,12.5,25 g FYM pot^{1} and four fertilizer levels i.e. 0,20:10:10, 40:20:20, 60:30:30 g NPK pot^{1}. Minimum number of days required for sprouting of corm, opening of first spike and floret with application of less or no FYM. Application of 25 g FYM pot^{-1} significantly improved all growth characters, flower quality and production of gladiolus followed by the application of 12.5g FYM pot^{1}. Among NPK levels, the application of less or no NPK required minimum number of days for sprouting of corm, opening of first spike and floret. The application of 60:30:30g NPK pot-a significantly improved all growth characters of gladiolus which was followed by the application of 40:20:20 g NPK pot^{1}. The flower quality and production was highest with treatment 40:20:20 g NPK pot ^{1} and at par with 60:30:30 g NPK pot^{1}.*

Key words: Farm Yard Manure, nitrogen, phosphorus, potassium, flower quality, gladiolus

Introduction

The word gladiolus is derived from the Latin word "Gladius" meaning sword. It is also named as "Sword Lily" or "Corn Flag". Corn flag is another name in Europe because *Gladiolus illyricus* is found as wild weed in corn field. The term gladiolus was coined by Pliny and Elder (A.D. 23-79) to describe the shape of the leaves, which resemble that of sword. Flower have for long been important in India for three main considerations namely aesthetic, economic and social. Gladiolus (*Gladiolus grandiflorus)* is said to be the "Queen of bulbous plant" because the gladiolus is top in the list of its beauty, glamour, keeping quality, long range of colour like white, crimson, pink, orange, salmon, red, purple cream and rose etc. shades and shapes. Application of nitrogen fertilizer substantially augmented plant growth, number of leaves, spike length and number of florets per spike. Beyond the limit or higher rate of nitrogen delayed the time of flowering and increased the spike length, weight and size of corms. The higher rate of phosphorus and potassium tended to improve the flower quality.

Materials and Methods

The pot culture experiment was conducted in kharif 2010-11, for which 36 earthen pots of 25 kg capacity were selected. Healthy corms of gladiolus (4.5-5.0 cm in diameter) were selected for planting in each pot. Corms were treated with Bavistin @ 0.1%. For pot filling, sand, FYM and soil were used in equal proportion and well mixed 25 kg soil filled in each pot. The corms were planted per pot at a depth of 5 cm. The terminal buds were kept upwards. In order to find out the time required for sprouting the emerging corms were counted daily up to 12 days from planting. It was recorded at 15 days interval, starting from 15, 30 and 45 days after planting of crop. The plant height was measured by meter scale from base to the tip of last opened floret. Total number of leaves of observational plants was counted and the average per plant was worked out. This observation was recorded form 15 days after planting and up to 60 days of plant growth. Days required for emergence of first spike was recorded by counting date from planting day of corms to the appearance of first spike on the plant. Days required for opening of first floret was recorded by counting date from the junction of the second pair of leaf to the tip of the last opened floret of spike by meter scale. Number of floret per spike was measured by counting total number of floret per spike after opening of floret. The yield of spkes per plant was recorded as production of flower.

Results and Discussion

Number of days required for sprouting

The result (Table 1) indicated that the various manure and fertilizer levels were not significantly

Present address : Marathwada Krishi Vidyapeeth, Parbhani, College of Agriculture, Latur.
E-mail: bhagyabr123@yahoo.co.in

Table 1: Number of days required for sprouting of corns, opening of corns, opening of first spike and opening of first floret of gladiolus as influenced by different levels of FYM and NPK

Treatments	No. of days required for sproting of corn	No. of days required for opening of frist spike	No. of days required for opening of first floret
F.Y.M. Levels (M)			
M_0-0 gm FYM pot^{-1}	9.91	64.41	68.13
M_0-12.5 gm FYM pot^{-1}	9.75	65.83	70.91
M_0-25 gm FYM pot^{-1}	10.00	69.16	73.80
SEm$\pm$	0.41	1.28	1.08
CD at 5%	NS	3.65	3.08
N:P:K Levels (F)			
F_0-0 gm NPK pot^{-1}	9.77	63.20	67.90
F_1-20:10:10 gm NPK pot^{-1}	9.55	64.70	69.40
F_2-40:20:20 gm NPK pot^{-1}	9.88	68.30	71.90
F_3-60:30:30 gm NPK pot^{-1}	10.44	69.70	74.80
SEm$\pm$	0.47	1.48	1.25
CD at 5%	NS	4.21	3.56
Interaction (MxF)			
SEm$\pm$	0.83	2.56	2.17
CD at 5%	NS	NS	NS

influenced the number of days required for sprouting. However, the manure level M1(12.5g FYM pot^{-1}) recorded minimum (9.75 days) and level M2 (25g FYM pot^{-1}) required maximum days (10.00 days) for sprouting of corms than other treatments. Among the fertilizer levels, F1(20:10:10g NPK pot^{-1}) recorded minimum days (9.55 days) and maximum days (10.44 days) required in level F3 (60:30:30 g NPK pot^{-1}) for sprouting of corms over rest of the treatments. The interaction effect between the manure and fertilizer levels was not found significant.

It was evident from the result that sprouting of corms depends upon the stored food materials in the corm and not the external nutrition. The results are in conformity with the reports of Sharma et al. (2003). Similarly, this result is in a close agreement with the finding of Gupta et al. (2008) revealed that an early sprouting of corms (9.09 days) was observed with application of FYM @ 2.5 kg m^{-1}.

Plant height

The results regarding plant height recorded at 15,30,45 and 60th days after planting at different growth stages. The data (Table 2) revealed that maximum plant heights (21.01, 37.7, 42.7 and 51.0 cm) were observed with the level M2(25 g FYM pot^{-1}) at 15, 30,45 and 60th days after planting, respectively and at par with the level M1 (12.5g FYM pot^{-1}) of maure. Whereas, the minimum plant height was observed with M0 level (control). Among the fertilizer, level F3 (60:30:30g NPK pot^{-1}) recorded significantly higher plant height

Table 2: Plant height and No. of leaves per plant of gladiolus as influenced by different levels of FYM and NPK

Treatments	Plant height				No. of leaves per plant			
	15 DAS	30 DAS	45 DAS	60 DAS	15 DAS	30 DAS	45 DAS	60 DAS
F.Y.M. Levels (M)								
M_0-0 gm FYM pot^{-1}	15.63	33.42	38.42	45.42	0.83	2.00	5.83	5.92
M_0-12.5 gm FYM pot^{-1}	19.37	36.08	40.53	50.17	1.25	2.83	6.50	6.67
M_0-25 gm FYM pot^{-1}	21.02	37.67	42.67	51.00	1.42	2.92	6.75	6.92
SEm$\pm$	0.57	0.71	0.91	0.80	0.13	0.13	0.16	0.17
CD at 5%	1.62	2.03	2.58	2.27	0.36	0.38	0.45	0.48
N:P:K Levels (F)								
F_0-0 gm NPK pot^{-1}	14.10	31.44	35.00	44.33	0.78	1.89	5.22	5.44
F_1-20:10:10 gm NPK pot^{-1}	16.78	34.11	39.33	47.78	1.00	2.44	6.11	6.22
F_2-40:20:20 gm NPK pot^{-1}	21.06	37.78	43.26	50.89	1.33	2.78	6.89	7.00
F_3-60:30:30 gm NPK pot^{-1}	22.74	39.56	44.67	52.44	1.56	3.22	7.22	7.33
SEm$\pm$	0.66	0.82	1.05	0.92	0.15	0.15	0.18	0.19
CD at 5%	1.87	2.34	2.98	2.62	0.41	0.44	0.52	0.55
Interaction (MxF)								
SEm$\pm$	1.14	1.42	1.81	1.60	0.25	0.27	0.32	0.34
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS

(22.74, 39.6, 44.7 and 52.4 cm) of gladiolus at 15,30,45 and 60th days after planting, respectively which was superior over rest of the treatments, but statically at par with level F2 (40:20:20 g NPK pot^{-1}) of fertilizer. The plant height was recorded lower with F0 level (control). The interaction effect between the manure and fertilizer levels (MxF) on plant height was found non significant.

Nitrogen is widely known as the master nutrient in the growth and development of plant and it sis an important constituent of protoplasm. Many organic compounds contain nitrogen and sufficient nitrogen is required in each cell for the good growth and development. Similarly, Sehrawat et al. (2000) achieved increased plant height with application of nitrogen. On the other hand, Khan and Ahmad (2004) reported that the application of 10:10:5 g pot^{-1} NPK produced maximum plant height, but statically similar with 10:5:5 and g pot^{-1} NPK with produced tall plants, respectively. Sharma and Singh (2007) reported that the height of plant increased significantly with increase in levels of nitrogen, phosphorus and potassium over control.

Number of leaves per plant

The data (Table 2) revealed that the number of leaves per plant were significantly influenced by different manure and fertilizer levels at 15,30,45 and 60th days after planting. The application of 25 g FYM pot^{-1} (M^{2}) produced significantly higher number of leaves per plant (1.4, 2.9, 6.8 and 6.9) than other treatments at 15,30,45 and 6th days after planting, respectively. However, it was at par with the application of FYM 12.5 g pot^{-1} (M1). The less numbers of leaves were recorded with treatments M0 (control). Among NPK levels, application of 60:30:30g NPK pot^{-1} (F3) recorded significantly higher number of leaves per plant (1.6,3.2, 7.2, 7.3) at 15,30, 45 and 60th days after planting, respectively and at par with 40:20:20 g NPK pot^{-1} (F2) over rest of the treatments. Lower number of leaves per plant recorded with treatment F0 (control). The interaction effect between the manure and fertilizer levels (M xF) on number of leaves per plant was not significant.

Nitrogen is the most important constituent of chlorophyll and is a component of amino acids and enzymes, thus it might have increased the meristematic activities, cell division, cell number and cell enlargement of the plant. Similar, results are in conformity with the findings of Kumar and Misra, (2003). Gupta et al. (2008) reported that number of leaves per plant increased with the application of 2.5 kg FYM M^{-2}.

Flower production and quality of flowers

The data (Table 1) indicated that the level M2 (25g FYM pot^{-1}) required maximum number of days for opening of first spike (69.16 days) and florets (73.80 days), but in control the opening of first spike and florets were completed within 64.41 and 68.33 days, respectively and significant difference was recorded among all the treatments. Among the fertilizer levels, application of 60:30:30 g NPK pot^{-1} (F3) required maximum number of days (69.70 and 74.80 days) for opening of first spike and floret, but in control the opening of first spike and florets were completed within 63.2 and 67.9 days, respectively that the other treatments. The interaction effect between the manure and fertilizer levels (M x F) on number of days required for opening of first spike and floret was found non significant.

The delayed of flower emergence by higher nitrogen level might be due to prolonged vegetative growth. These results are in conformity with the results of Sharma and Singh, (2001). Similarly, higher levels of nitrogen and phosphorus are known to prolong vegetative growth by encouraging vigorous growth, more photosynthetic area for production and mobilization of photosynthetic resulting in delay of the reproductive phase which consequently delay the flowering (Kumar and Misra, 2003).

Length of Spike

The result (Table 3) revealed that the length of spike was significantly affected due to different manure and fertilizer levels. The application of 25 g FYM pot^{-1} (M2) recorded maximum length of spike (78.72 cm) which was significantly superior over control and at par with application of 12.5 g FYM pot-1 (M1). Among the fertilizer levels, the level F2 (40:20:20 g NPK pot^{-1}) produced maximum length of spike (80.44 cm) which was significantly superior over all the treatments and statistically at par with level F3 (60:30:30 g NPK pot^{-1}). The lower length of spike was recorded with level F0 (control). The interaction effect between the manure and fertilizer levels (M x F) on length of spike was not found significant.

The effect of added nutrients on the length of spike could be attributed to the better mobilization of applied nutrients during the advanced growth stage of plants. Pradhan et al. (2004) reported that the application of higher doses of N and K increased the length of spike due to the higher levels resulted in production of more number of leaves in plants which produced more photosynthesis and those higher levels photosynthates might have been utilized for production of longer spikes. Sharma and Singh (2007) revealed that the treatment N40P20K20 g M^{-2} showed the highest spike length followed by higher dose N50P25K25 g M^{-2} were found to have at par effect on the spike length than the rest of the treatments.

Number of florets per spike and production of spikes per plant

The data (Table 3) revealed that the level M2 (25 g FYM pot^{-1}) recorded highest number of florets per spike (12.00) and production of spikes per plant (2.50), which was significantly superior over control and par with level M1 (12.5 g NPK pot^{-1}) of manure. Among the fertilizer, the level F2 (40:20:20 g NPK pot^{-1}) produced maximum number of florets per spike and production of spikes per plant (12.78 and 2.67), respectively which was significantly superior to rest of the treatments, but statistically at par with level F3 (60:30:30 g NPK pot^{-1}) of fertilizer. Minimum number of florets per spike and production of spikes per plant were recorded with level F0 (control). The interaction effect between the manure and fertilizer levels (M x F) on number of florets per spike was not significant and production of spikes per plant was found significant. The data (Table 4) indicated that the interaction effect on production of spike per plant of gladiolus was highest due to level M2 (25 g NPK pot^{-1}) x level F3 (60:30:30 g NPK pot^{-1}), but it was at par with treatment M2 (25 g NPK pot^{-1}) x F2 (40:20:20 g NPK pot^{-1}), which was recorded significantly highest (2.67) production of spike per plant over rest of the treatment.

Table 3: Length of spike, No. of floret/spike, No. spike/ plant of gladiolus as influenced by different levels ofFYM and NPK

Treatments spike	Length of spike	No. of floret spike^{-1}	No. of plant^{-1}
F.Y.M. Levels (M)			
M_0-0 gm FYM pot^{-1}	70.00	9.83	1.33
M_0-12.5 gm FYM pot^{-1}	75.20	11.50	2.08
M_0-25 gm FYM pot^{-1}	78.72	12.00	2.50
SEm±	1.67	0.20	0.14
CD at 5%	4.91	0.58	0.48
N:P:K Levels (F)			
F_0-0 gm NPK pot^{-1}	66.74	9.11	1.11
F_1-20:10:10 gm NPK pot^{-1}	73.22	10.28	1.55
F_2-40:20:20 gm NPK pot^{-1}	80.44	12.78	2.67
F_3-60:30:30 gm NPK pot^{-1}	78.16	12.28	2.56
SEm±	1.93	0.24	0.16
CD at 5%	5.67	0.67	0.46
Interaction (MxF)			
SEm±	3.35	0.41	0.28
CD at 5%	NS	NS	0.80

Table 4: Production of spike/plant of gladiolus as influenced by interaction effect between FYM and NPK levels

FYM levels	NPK levels F_0	F_1	F_2	F_3	Mean
F.Y.M. Levels (M)					
M_0	3	4	5	4	1.33
M_0	3	5	9	8	2.08
M_0	4	5	10	11	2.50
SEm±	0.28				
CD at 5%	0.80				
Mean	1.11	1.56	2.67	2.56	1.97

The lowest production of spike per plant was recorded with treatment combination M0 x F0 (control).

The increasing growth and flowering due to nitrogen level is attributed to its effect on vegetative characters as nitrogen is a main constituent of chlorophyll and is involved in major physiological processes like photosynthesis. Similar, result was reported by Sharma et al. (2003). Similarly, Dalvi et al. (2008) observed that the higher nitrogen level, more vegetative growth and more accumulation of food reserves which are diverted for flower bud differentiation and resulted in more number of florets per spike. On the other hand, Sharma and Singh (2007) revealed that the treatment N40P25K25 g m^{-2} showed the maximum number of florets per spikes followed by higher dose of N50P25K25 g m^{-2} was found to have at par effect on the number of florets per spike than rest of the treatments. This might be due to higher protein synthesis and thus improved the vegetative growth, dry matter accumulation and partitioning of nutrients towards the developing spikes.

References

Dalvi, N.V., Rangwala, A.D. and Joshi, G.D. (2008). Effect of spacing and graded levels of fertilizers on yield attributes of gladiolus. J. Maharashtra Agric. Univ., 33 (2): 167-170.

Gupta, P., Rajwal, N., Dhaka, V.K. and Rajwal, D. (2008). Effect of different levels of vermicompost, NPK and FYM on performance of gladiolus (*Gladiolus grandiflorus* L.) cv. Happy end. Asian J. Hort.,3 (1) : 142-143.

Khan, M.A. and Ahmad, I. (2004). Growth and flowering of (*Gladiolus hortulanus* L.) cv. Wind song as influenced by various levels of NPK. Internationl J. Agric. And Biology. 1037-1039.

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

Pradhan, A., Das, J.N., Mishra, H.N. and Lenka, P.C. (2004). Effect of N and K on growth yield of gladiolus. Orissa J. Hort., 32(2): 74-77.

Sehrawat, A., Ahlawat, V.P. and Gupta, A.K. (2000). Influence of nitrogen, phosphorus and potassium application on growth, flowering and corm production in gladiolus. Haryana J. Hort. Sci., 29 (1-2) : 71-72.

Sharma, G. and Singh, P. (2007). Response of N,P and K on vegetative growth, flowering and corm production in gladiolus under mango orchard. J. Ornamental Hort., 10 (1) : 52-54.

Sharma, J.R., Gupta, R.B. and Kaushik, R.A. (2003). Growth and flowering of gladiolus as affected by N and P levels. J. Ornamental Hort., 6 (1) : 76-77.

Sharma, S. and Singh, D.B. (2001), Response of the nitrogen fertilization on gladiolus. J. Ornamental Hort. New series, 4 (2) : 128.