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## International Journal of Chemical Studies

# To study the effects of organic and inorganic fertilizers on vegetative and floral parameters of *Gladiolus* var. Nova Lux

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### Abstract

An experiment was conducted at Model Floriculture Centre, G.B.P.U.A.T. Pantnagar, during October 2015- 16, on *Gladiolus* (*Gladiolus grandiflorus* L.) var. Nuva Lux. Observations were recorded on various parameters of vegetative growth, flowering and yield attributes. The experiment was laid out in randomized block design with 9 treatments with 3 replications. The treatments comprised of FYM, vermicompost, neem cake and poultry manure with 75% RDF and along with the control. The maximum plant height (76.87 cm) was obtained in T2 (FYM +75%RDF) while the maximum number of leaves/plant (13) was exhibited by the treatment T5 (50%FYM+50% neem cake). The maximum number of corms/plant (1.9) was recorded in T8 (75% vermicompost + 25% poultry manure) while maximum weight of single corms (146 g) was found in T5 (50% FYM + 50% neem cake). The equal proportion of all organic manures in T9 recorded maximum number of cormels/plant.

**Keywords:** Organic manures, *Gladiolus*, corms

### Introduction

*Gladiolus* (*Gladiolus grandiflorus* L.) popularly known “Queen of bulbous flower” belongs to the family Iridaceae and believed to have its origination in South Africa and Asia Minor. Organic manures are the excellent and balanced source of nutrients and improve the quality of spikes, soil health and safe environment as well as increase nutrient uptake but release the nutrients slowly (Abusaleha and Shanmugavelu, 1988)<sup>[9]</sup>. Organic manure and bio-agents have great potential to boost the yield and can play an important role in enhancing flower and corm yield. The application of nutrients in small doses at a more frequent rate favors better growth and flower production rather than applying huge amount of doses at once.. Excessive use of inorganic fertilizers imposed disturbance in the ecosystem. Rathore *et al.* (2010)<sup>[6]</sup> reported that chemical fertilizers are mostly used in *Gladiolus* cultivation because of quick release of essential elements to the crop, which have some deleterious effect on flower quality besides adverse effect on soil health, water and environment. Therefore, organic farming is one of the possible solutions for this problem (Bhalla *et al.*, 2006)<sup>[8]</sup>. Application of farmyard manure was found to be beneficial for plant growth, flowering and corm yield parameters and considered best for growing a successful crop (Gupta *et al.*, 2008)<sup>[7]</sup>. Vermi-compost also acts as chelating agent besides being a rich source of micronutrients and regulate the availability of metabolic micronutrients like iron and zinc in the plants. It is cost-effective and is known to increase the plant growth and yield by providing nutrients in the most accessible forms.

### Material and Methods

The experiment was conducted in open field condition at Model Floriculture Centre, Pantnagar with *Gladiolus* variety Nova Lux. Planting was done in the month of October with uniform sized healthy corms which was pretreated with Bavistin (0.2%) for half an hour. The experiment was laid out in a randomized block design with nine treatments and three replications. The distance between row to row was 30 cm and plant to plant 20 cm. The different treatments that were used in the experiment are as follows: T<sub>1</sub> (Control) FYM=50 Ton/ha, RDF= N:P:K 400:100:100 Kg/ha FYM + RDF, Full FYM as basal + 50% Recommended Dose of Fertilizers applied at 3 leaf stage + 50% Recommended Dose of Fertilizers applied at 6 leaf stage, T<sub>2</sub> FYM + 75% RDF, FYM as Basal + 50% RDF apply at

3 leaf stage + 50% RDF applied at 6 leaf stage, T<sub>3</sub> 100% FYM, Full FYM as basal, T<sub>4</sub> 50% FYM + 50% Vermicompost, FYM as Basal, 50% Vermicompost applied in 2 splits i.e. at 3 leaf stage and 6 leaf stage, T<sub>5</sub> 50% FYM + 50% Neem Cake, FYM as Basal, Neem Cake applied in 2 splits i.e. at 3 leaf stage and 6 leaf stage, T<sub>6</sub> 75% FYM + 25% Poultry Manure, FYM as Basal, Poultry Manure applied in 2 splits i.e. at 3 leaf stage and 6 leaf stage, T<sub>7</sub> 50% Vermicompost + 50% Neem Cake Vermicompost and 50% Neem Cake as basal 25% Vermicompost and 25% Neem Cake at 3 leaf stage and 25% Vermicompost and 25% Neem Cake at 6 leaf stage, T<sub>8</sub> 75% Vermicompost + 25% Poultry Manure, Vermicompost as basal, 25% Vermicompost and 50% Poultry Manure at 3 leaf stage and 25% Vermicompost and 50% Poultry Manure at 6 leaf stage, T<sub>9</sub> 25% FYM + 25% Vermicompost + 25% Neem Cake + 25% Poultry Manure, Farmyard Manure and 50% Vermicompost as basal 25% Vermicompost apply at 3 leaf stage, 25% Vermicompost apply at 6 leaf stage, 50% Poultry Manure and 50% Neem Cake at 3 leaf stage and 50% Poultry Manure and 50% Neem Cake. Barring the treatments, the crop was maintained under uniform cultural practices/conditions.

## Result and discussion

### Effect of organic manure and inorganic fertilizer on vegetative characters of *Gladiolus*

Among the different treatments studied with respect to sprouting, the minimum days of sprouting was observed in T<sub>3</sub> (7.88 days, 100% FYM) followed by T<sub>4</sub> (8.00 days, 50% FYM + 50% Vermicompost) respectively. However, the maximum days to sprouting was recorded in T<sub>7</sub> (10.50 days, 50% Vermicompost + 50% Neem Cake). This might be because the application of organic manures might have enhanced soil texture by making soil loose which in turn might have avoided formation of soil crust and might have improved the water holding capacity which, in turn, enhanced early sprouting of corms. These findings are in conformity with Kumar *et al.* (2010)<sup>[5]</sup> in *Gladiolus* and Susheela *et al.* (2016) in tuberose. The maximum number of tillers (1.93) was obtained in T<sub>5</sub> (50% Farmyard Manure + 50% Neem Cake) which was at par with T<sub>6</sub> (75% Farmyard Manure + 25% Poultry Manure) but significantly higher than the rest of the treatments. The minimum number of tillers (1.47) was recorded in T<sub>1</sub> (Farmyard Manure + RDF). It is a due fact that nitrogen is used as a master nutrient in growth and development of plants. It is also an important constituent of protoplasm. Many organic manures contains as well as supplies sufficient amount of nitrogen required by the plants in each cell for their better growth and development. These findings are in conformity with Gupta *et al.* (2008)<sup>[7]</sup>. Similar results were also reported by Gajbhiye *et al.* (2013)<sup>[4]</sup>.

The effect of organic manures and inorganic fertilizers had significant influence on number of leaves per plant at 30 days. Among the different treatment, application of T<sub>3</sub> (100% farmyard manure) recorded the highest number of leaves (6.00) per plant followed by T<sub>5</sub> [50% farmyard manure + 50% Neem Cake, (5.83)], T<sub>4</sub> [50% Farmyard Manure + 50% Vermicompost, (5.75)] and minimum number of leaves (4.62) per plant was observed in T<sub>8</sub> (75% Vermicompost + 25% Poultry Manure). The data regarding effect of organic manures and inorganic fertilizers on number of leaves per plant at 60 days are presented in Table 1 and Table 2. The maximum number of leaves per plant (13.00) was exhibited in T<sub>5</sub> (50% Farmyard Manure + 50% Neem Cake) which was at par with T<sub>8</sub> [75% Vermicompost + 25% Poultry Manure,

(12.83)] and T<sub>9</sub> [25% Farmyard Manure + 25% Vermicompost + 25% Neem Cake + 25% Poultry Manure, (12.08) but significantly higher than rest of the treatments and the minimum (10.02) was observed in T<sub>7</sub> (50% Vermicompost + 50% Neem Cake). Increase in vegetative growth might be possible due to better flow of various macro as well as micro nutrients along with plant growth substances into the plant system treated with a combination of vermi compost and poultry manure. Poultry manure contains uric acid with 60 per cent of nitrogen which changes rapidly to ammonical form and hence it is efficiently utilized by the plant for its better growth (Smith, 1950)<sup>[10]</sup>. The yield of crop is directly correlated with number of leaves because of its key role in photosynthetic activity. The significant number of leaves (13.00, 12.83 and 12.08) found in T<sub>5</sub> (50% Farmyard Manure + 50% Neem Cake), T<sub>8</sub> (75% Vermicompost + 25% Poultry Manure) and T<sub>9</sub> (25% Farmyard Manure + 25% Vermicompost + 25% Neem Cake + 25% Poultry Manure), respectively, were superior at 60 days. This might be due to the increased availability of nitrogen which happens to be an important constituent of protein thus, causing more growth (Atiyeh *et al.*, 2001). It is a due fact that nitrogen is used as a master nutrient in growth and development of plants. It is also an important constituent of protoplasm. The maximum plant height at 30 days (45.30 cm) was recorded in T<sub>9</sub> (25% FYM + 25% vermi-compost + 25% Neem cake + 25% poultry manure) and minimum (38.05 cm) in T<sub>8</sub> (75% vermi compost + 25% poultry manure) and at 60 day application of T<sub>2</sub> (FYM+ 75% RDF + 25% nitrogen from FYM) recorded the maximum plant height (76.76 cm) which was significantly higher than rest of the treatments, while it was minimum (58.85 cm) in T<sub>1</sub> control (FYM+ RDF). It is a due fact that nitrogen is used as a master nutrient in growth and development of plants. It is also an important constituent of protoplasm. Many organic manures contains as well as supplies sufficient amount of nitrogen required by the plants in each cell for their better growth and development. These findings were in conformity with Gupta *et al.* (2008)<sup>[7]</sup>. They investigated the effect of different levels of vermi compost, NPK and FYM on performance of *Gladiolus* (*Gladiolus grandiflorus* L.) cv. Happy End. They found that (FYM (2.5 kg/m<sup>2</sup>) showed significant effect on height of plant (49.49 cm), number of leaves (6.93) and number of tillers (1.16). Similar results were also reported by Gajbhiye *et al.* (2013)<sup>[4]</sup>. It is evident from data that treatment T<sub>1</sub> [FYM+ RDF (control)] lead to earliest spike emergence (73.32 days) followed by T<sub>4</sub> [50% FYM+ 50% Vermi compost (75.08)] which was statistically at par with other organic based treatments like T<sub>8</sub>, T<sub>9</sub> and T<sub>3</sub>. The treatment T<sub>7</sub> (50% Vermi compost + 50% Neem Cake) took maximum number of days (80.12) for spike emergence. These results are contrary to the earlier findings of Bohra and Kumar (2014) in chrysanthemum. They reported that vermi compost (300 g m<sup>2</sup>) combined with VAM (20 g / plant) exhibited minimum days to first bud initiation. Singh *et al.* (2014) also observed that early spike emergence (91.10 days) was found in 75% RDF, (NPK 225:150:150 kg/ha) + 2 tonnes of Vermi compost + PSB (2.5 kg/ha) + Azatobactor (2.5 kg/ha) treatment in *Gladiolus* (*Gladiolus grandiflorus* L.) cv. 'White Prosperity'. The significant result depicted above may be due to the balanced supply of nitrogen from poultry manure and organic sources which promote the translocation of phytohormones to the shoots resulting in early flower initiation (Marchner, 1983).

**Table 1:** Effect of organic manures and inorganic fertilizers on vegetative growth of *Gladiolus* var. Nova Lux

Sr. No.	Treatments	Number of tillers/plant	Sprouting (days)	No. of leaves at 30 days	Number of leaves at 60 days	Plant height at 60 days	Spike emergence (days)
T <sub>1</sub>	FYM + RDF (control)	1.47	10.00	5.42	10.25	58.85	73.32
T <sub>2</sub>	FYM + 75% RDF	1.70	9.00	5.68	11.58	76.87	76.83
T <sub>3</sub>	100% FYM	1.67	7.88	6.00	10.25	64.32	76.83
T <sub>4</sub>	50% FYM + 50% VC	1.65	8.00	5.75	10.67	71.25	75.08
T <sub>5</sub>	50% FYM + 50% NC	1.93	8.13	5.83	13.00	65.57	78.67
T <sub>6</sub>	75% FYM + 25% PM	1.92	8.02	4.85	10.17	71.83	80.12
T <sub>7</sub>	50% VC + 50% NC	1.49	10.50	4.77	10.02	59.35	80.90
T <sub>8</sub>	75% VC + 25% P M	1.62	8.33	4.62	12.83	72.33	75.67
T <sub>9</sub>	25% FYM + 25% VC + 25% NC + 25% P M	1.72	8.50	5.00	12.08	70.28	76.73
S.Em±		0.042	0.29	0.290	0.350	0.874	0.568
C.D. at 5%		0.125	0.86	0.869	1.049	2.621	1.701

**Table 2:** Effect of organic manures and inorganic fertilizers on corms and cormels yield of *Gladiolus* var. Nova Lux

Sr. No.	Treatments	Number of corms/plant	Weight of corms (g)	Weight of largest corm (g)	Diameter of largest corm (cm)	Number of cormels per plant	Weight of cormels per plant (g)
T <sub>1</sub>	FYM + RDF (control)	1.47	104.83	105.33	7.10	27.67	9.67
T <sub>2</sub>	FYM + 75% RDF	1.53	145.08	150.67	6.83	40.17	10.20
T <sub>3</sub>	100% FYM	1.67	133.00	133.00	7.50	53.40	10.67
T <sub>4</sub>	50% FYM + 50% VC	1.73	128.25	104.00	7.27	52.60	10.13
T <sub>5</sub>	50% FYM + 50% NC	1.76	146.08	82.33	7.17	55.16	10.38
T <sub>6</sub>	75% FYM + 25% PM	1.72	139.58	154.67	7.90	48.73	10.67
T <sub>7</sub>	50% VC + 50% NC	1.57	114.00	104.00	7.40	54.23	10.17
T <sub>8</sub>	75% VC + 25% P M	1.90	127.83	120.67	7.60	47.96	9.67
T <sub>9</sub>	25% FYM + 25% VC + 25% NC + 25% P M	1.73	137.25	131.67	7.73	62.10	11.33
S.Em±		0.024	5.914	3.768	0.251	4.291	1.925
C.D. at 5%		0.074	17.729	11.296	N/A	12.976	N/A

### Effect of organic manure and inorganic fertilizer on floral attributes of *Gladiolus*

The maximum number of corms/plant (1.90) was obtained in T<sub>8</sub> (75% Vermicompost + 25% Poultry Manure) and the minimum value (1.47) was recorded in T<sub>1</sub> [FYM+ RDF (control)] which was statistically higher than rest of the treatments. Similar results were also reported by Kumari *et al.* (2014) [2]. The maximum weight (154.67g) of largest corm was recorded in T<sub>6</sub> (75% FYM+ 25% Poultry Manure) which was statistically at par with T<sub>2</sub> [FYM+ 75% RDF (150.67g)]. The minimum weight (82.33g) of corm was observed in T<sub>5</sub> (50% FYM+ 50% Neem Cake). These findings are in confirmation with the findings of Sisodia *et al.* (2015) [1]. The highest weight of corm (146.08 g) was obtained from the treatment T<sub>5</sub> (50% FYM + 50% neem cake) which was statistically at par with T<sub>2</sub> (FYM+ 75% RDF) (145.08 g) and T<sub>6</sub> [75% FYM+ 25% Poultry Manure (139.58 g)] but significantly higher than rest of the treatment. The minimum weight (104.83 g) of corms was found in T<sub>1</sub> [FYM+ RDF (Control)]. The maximum diameter of largest corm (7.90 cm) was obtained in T<sub>6</sub> (75% FYM+ 25% Poultry Manure) followed T<sub>9</sub> [25% FYM+ 25% Vermicompost + 25% Neem Cake + 25% Poultry Manure (7.73 cm)] and T<sub>3</sub> (100% FYM (7.50 cm)]. The minimum diameter of largest corm (6.83 cm) was registered in T<sub>2</sub> (FYM+ 75% Recommended Dose of Fertilizers). The maximum value for number of cormels/plant (62.10) was obtained in T<sub>9</sub> (25% FYM+ 25% Vermicompost + 25% Neem Cake + 25% Poultry Manure) which was at par with T<sub>5</sub> (50% FYM+ 50% Neem Cake), T<sub>7</sub> (50% Vermicompost + 50% Neem Cake), T<sub>3</sub> (100% Farmyard Manure) and T<sub>4</sub> (50% FYM+ 50% Vermicompost). The minimum data (27.67) was recorded in T<sub>1</sub> [FYM+ RDF (control)]. The results were similar to the work of Kumari *et al.* (2014) [2]. The highest weight of cormels per plant (11.33

g) was obtained from T<sub>9</sub> (25% FYM+ 25% Vermicompost + 25% Neem Cake + 25% Poultry Manure) followed T<sub>3</sub> [100% FYM (10.67 g)]. The minimum weight of cormels per plant (9.67 cm) was registered in T<sub>1</sub> [FYM+ RDF (control)]. These results are in corroboration with the findings of Rathore *et al.*, (2010) [6]. Application of organic manures influenced various corm parameters. This pronounced effect can be duly attributed to the improvement in soil texture by loosening the soil which might have avoided the formation of soil crust and increase water holding capacity which, in turn, encouraged enhancement in weight of corms, number of corms, diameter of corms as well as weight and number of cormels. Sishodia *et al.* (2015) reported similar results wherein, maximum weight of corms/plant (32.34 g) and diameter of corm (4.03cm) were recorded with FYM 2.5 kg/m<sup>2</sup> + *Trichoderma* vermi compost 2.5 kg/m<sup>2</sup> and (FYM) 5.0 kg/m<sup>2</sup> + 5.0 kg/m<sup>2</sup> vermi compost. Kumari *et al.* (2014) [2] reported that the number of corms/plant, weight of corms, number of cormels and cormels weight were found to be highest with the combined application of VAM + *Azospirillum*+ *Trichoderma* with 75% RDF and vermi compost. Different bio fertilizers, i.e. VAM, vermi compost and vermi wash used in combination happens to enhance the number of corms/m<sup>2</sup> (28.66), weight of corms (50.68 g) and number of cormels/plant (56.66) as it is reported by Kumar *et al.* (2013). The maximum corm weight 40.32 g, corm diameter 5.59 cm, number of cormels per plant 22.23 and cormels weight 3.55 g was observed in 50 kg N from urea + 50 kg N from poultry manure (Rathore *et al.*, 2010) [6]. Gupta *et al.* (2008) [7] observed that the performance of *Gladiolus* to varying treatments of F<sub>1</sub> [Vermi compost (125 gm/m<sup>2</sup>)], F<sub>2</sub> [NPK (75 gm/m<sup>2</sup>)] and F<sub>3</sub> [FYM (2.5 kg/m<sup>2</sup>)]. However, F<sub>3</sub> treatment was recorded with best results for corm yield.

## Conclusion

Based on the findings of present investigation it may be concluded that the application of 75% of FYM +25% poultry manure is beneficial for commercial traits of *Gladiolus* cv. Nova Lux.

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