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Effect of Integrated Nutrient Management (INM) on growth, flowering and yield in Gladiolus (*Gladiolus grandiflorus* L.*)* cv.White Prosperity

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Abstract

The present investigation entitled "Effect of Integrated Nutrient Management (INM) on growth, flowering and yield in Gladiolus (*Gladiolus grandiflorus* L.*)* cv.White Prosperity", was under taken at Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), during the year 2016-17. The experiment was laid out in randomized block design with 14 treatments replicated thrice. The treatments comprised of FYM, vermicompost, poultry manure and bio-fertilizer (Azotobacter & PSB) with 50% RDF and 75% RDF in different combinations including control (No fertilizers and manures) and 100% RDF. The results revealed that application of 75% RDF + FYM @ 2t/ha + Vermicompost @ 0.6 t/ha + Poultry manure @ 0.4 t/ha + Azotobacter @ 2.5 kg/ha + PSB @ 2.5 kg/ha (T_7) produced significantly minimum days to sprouting (10.53), maximum plant height (135.33 cm), number of leaves per plant (13.13), total fresh weight of plant (119.73 g). This treatment was also significantly noted duration of flowering (12.67 days), longevity of first floret (6.80 days), spike length (81.27 cm). However, the maximum spike yield per plant (2.53) and spike yield per plot (40.53), were shown maximum with this treatment.

Keywords: Gladiolus (*Gladiolus grandiflorus* L.*)*, White Prosperity, INM, RDF (Recommended dose of Fertilizers).

Introduction

Gladiolus is very popular bulbous flowering plant grown throughout the world. It is native to tropical and southern Africa and belongs to family Iridaceae. It is valued for its majestic spikes, beautiful colors, attractive shapes and excellent keeping quality or vase life. . It is one of the most important ornamentals for cut flower trade in India and abroad. It is also ideal for garden display, floral arrangements and for bouquet. The yield and quality of spikes can be improved by adopting integrated nutrient management practices which include the judicious and combined use of organic, inorganic and biofertilizers. In gladiolus too, *Azotobacter,* phosphorus solubilizing bacteria (PSB) are capable of mobilizing nutrient elements from non-usable form to usable form through biological processes (Bhalla *et al.*). Use of inorganic fertilizers under intensive agriculture has been associated with reduced crop yield, soil acidity and nutrient imbalance. Continuation uses of inorganic fertilizers in highly weathered soil create poor physical structure and nutrient retention characteristics hence adversely affect crop growth and yield. Therefore, the application of plant nutrients through organic sources like vermicompost, FYM, poultry manure and biofertilizers like Azotobacter and PSB remains the alternative choice of growers for maintaining its sustainable production. Plants require both organic manures and inorganic fertilizers in an adequate combination to produce better production.

Aim of the Study

The present experiment was conducted to study the effect of Integrated Nutrient Management (INM) on growth, flowering and yield in Gladiolus (*Gladiolus grandiflorus* L.*)* cv. White Prosperity

Materials and Methods

An investigation was carried out to find out the optimum dose of integrated nutrients in gladiolus. The experiment was conducted at Horticulture research farm, Department of Horticulture, SHUATS,

Allahabad during Rabi of 2016-17 employing randomized block design. There were 14 treatments involving Farm yard manure, Vermicompost, Poultry manure, Bio-fertilizer with 50% RDF, 75% RDF in combinations, 100% RDF and control (No fertilizers and manures). The plot size was 1.5 x 1.5 m and spacing was 30 x 30 cm. The land was brought to a fine tilth by thorough tillage. Irrigation channels and bunds were maintained properly. The corms of variety White prosperity were taken and cleaned by removing the dry scales present on them. These were dipped in carbendazim (0.3%) solution for 30 minutes. These corms were planted at a spacing of 30 cm x 30 cm in each row along the sides of ridges at a depth of 5-6 cm. Light irrigation was given immediately after planting. The organic manures were applied 10 days prior to planting, for proper decomposition, where as the bio-fertilizer like Azotobactor, PSB were applied at the time of planting. Full dose of phosphorus and potassium and half dose of nitrogen as per treatment were applied one week after planting. The remaining half dose of nitrogen was supplied in one split doses at 30 days after planting. Observations on growth characters i.e. days to first sprouting, plant height, number of leaves per plant, total fresh weight of whole plant and flowering parameters like number of days taken for basal floret to open, duration of flowering (days) longevity of first floret on spike (days), spike length (cm), number of florets per spike, floret diameter, floret length and spike yield per plant, spike yield per plot were recorded from time to time. The data on these parameters were subjected to statistical analysis to draw logical conclusions

Results and Discussion

The data revealed that different nutrient management practices affected various vegetative parameters of gladiolus sown in Table 1. Significant difference in all the growth parameters was recorded due to application of different combinations of nutrients. The treatment T_7 recorded the maximum plant height (135.53 cm), followed by T_{13} (133.53 cm) which differed significantly from each other as well from other treatments. The increase in plant height in the treatments T_7 and T_{13} might be due to the beneficial effect of vermicompost and poultry manure in combination with 75% RDF with inorganic fertilizers while the increase in the plant height might be due to unavailability of sufficient nutrient at critical stages of plant for its luxuriant growth. The treatment T_7 showed minimum days to sprouting (10.53 days) and Total fresh weight (119.73 g) as well as number of leaves (13.13) per plant as compared to other treatments. This significant improvement with application of vermicompost along with 75% RDF might have attributed to the translocation of nutrients from soil and enhanced supply of macro and micronutrients during entire growing season and microbial decomposition. There it might have favoured for stimulation and production of auxiliary buds resulting in formation of more number of branches. Similar findings were reported by Chaudhari *et al.* (2013), Kumar (2014) and Narendra et al. (2013) in gladiolus.

Table 1. Effect of Integrated Nutrient Management on Vegetative Growth Parameters of Gladiolus

Treatments		Minimum days to sprouting	Plant height (cm)	No. of leaves per plant	Total fresh weight of plant
T_0	No fertilizers and manure	13.27	103.87	9.67	93.50
T_1	100% RDF @ NPK 120:80:80 kg/ha	11.20	125.50	11.47	114.40
T_2	75% RDF + FYM @ 6 t/ha	11.07	129.93	12.07	115.43
T_3	75% RDF + Vermicompost @ 2 t/ha	11.00	127.13	11.80	112.87
T_4	75% RDF + Poultry manure @ 1 t/ha	11.33	124.80	11.47	110.93
T_5	75% RDF + Azotobacter @ 2.5 kg/ha	12.27	115.27	10.67	104.13
T_6	75% RDF + PSB @ 2.5 kg/ha	12.33	112.60	10.47	101.73
T_7	75% RDF + FYM @ 2t/ha + VC @ 0.6 t/ha + PM @ 0.4 t/ha+Azotobacter @ 2.5 kg/ha + PSB @ 2.5 kg/ha	10.53	135.53	13.13	119.73
T_8	50% RDF + FYM @ 12 t/ha	11.67	122.07	11.27	109.13
T_9	50% RDF + Vermicompost @ 4 t/ha	11.47	119.40	11.00	108.23
T_{10}	50% RDF + Poultry manure @ 2 t/ha	11.87	117.60	10.93	105.97
T_{11}	50% RDF + Azotobacter @ 5 kg/ha	12.60	109.73	10.07	98.07
T_{12}	50% RDF + PSB @ 5 kg/ha	12.67	107.60	9.87	96.43
T_{13}	50% RDF + FYM @ 4 t/ha +Vermicompost @1.2 t/ha + Poultry manure @ 0.8 t/ha + Azotobacter @ 5 kg/ha + PSB @ 5 kg/ha	10.60	133.53	12.53	118.50
S. Ed. (±)		0.09	0.35	0.12	0.57
C. D. at 5 %		0.20	0.72	0.24	1.18

Floral characters

The commencement of flowering was delayed with application of organic fertilizers and control in comparison with inorganic fertilizers revealed that duration of flowering, longevity of first floret were maximum in T_7 followed by T_{13} (Table 2). It could be related to the presence of higher amount of nitrogen which might have helped in prolonging the vegetative phase of the plants under these treatments. Significantly spike length (81.27 cm) was recorded under treatment T_7 followed by T_{13} (80.47 cm). The increased number of flowers with the application vermicompost along with 75% recommended dose of fertilizers could be attributed to more number branches per plant and also availability of ample of nutrients due to application of higher level

of fertilizer that might have resulted in production of maximum spike length. Similar findings were reported by Narendra *et al.* (2013) Pansuriya, and Chauhan, (2015) and Kumar *et al.* (2014) in gladiolus.

Yield characters

In the present study, among the various treatment combinations tried, the plots applied with vermicompost + 75% RDF (T_7) recorded maximum spike yield per plant (2.53) and per plot (40.53), followed by T_{13} (2.34) and per plot (37.33) respectively, was significantly superior to all other treatments. The positive effect of these treatments on flower yield might be due to combined application of inorganic and organic sources of NPK in experimental field and balanced nutrition of crop with good photosynthesis. Similar findings are reported by Radhika *et al.* (2010) Kumari *et. al* (2014) Sathyanarayana *et. at (2018),* and Singh *et. al* 2014 in gladiolus.

The higher spike yield is a manifestation of other yield contributing characters viz. number of spikes per plant, flowering duration, flower diameter and fresh weight of individual flower. The treatment T_7 recorded maximum individual fresh weight (119.73 g) followed by T_{13} (118.50 g).

Besides, this treatment also exhibited similar trend with respect to number of flowers per plant, flowering duration as well as diameter of flowers. The increase in floret diameter, weight, number and duration in those treatments might be due to the effect of balanced nutrition supplied through the combined application of vermicompost with 75% RDF. This might have resulted in higher yield as observed in the present study. Similar findings were reported by Chaudhari *et al.* (2014), Kumar (2014), Pansuriya, and Chauhan, (2015) Mamta Bohra and B.P. Nautiyal (2019) and Narendra et al. (2013) in gladiolus.

It could be concluded from the present investigation that for higher quantity and quality production of gladiolus flowers, application of 25% organic + 75% inorganic was most effective. Hence to maximize production of quality flowers in gladiolus application of vermicompost 25 % along with 75% recommended dose of fertilizers is more suitable.

Table 2. Effect of Integrated Nutrient Management on Flower Parameters and Yield Attributes in Gladiolus

Treatments	Longetivity of first floret	Duration of flowering	Spike length (cm)	Rachis length (cm)	Spike yield per plant	Spike yield per plot	Vase life of spikes (days)
T_0	4.47	6.00	65.87	52.10	1.00	16.00	6.27
T_1	6.40	11.33	78.60	67.80	1.80	29.87	8.80
T_2	6.27	11.00	78.13	67.80	1.80	29.87	8.67
T_3	6.40	11.67	79.33	68.10	1.94	30.93	9.13
T_4	6.07	10.33	77.07	65.80	1.53	24.53	8.40
T_5	5.07	7.00	72.67	58.60	1.20	19.20	7.40
T_6	5.20	7.67	71.40	56.80	1.20	19.20	6.93
T_7	6.80	12.67	81.27	72.60	2.53	40.53	10.53
T_8	5.67	9.00	75.07	60.80	1.33	21.33	7.80
T_9	5.80	9.67	76.20	63.80	1.46	23.47	8.07
T_{10}	5.47	8.00	74.13	59.90	1.27	20.27	7.00
T_{11}	4.80	6.67	69.47	55.20	1.14	18.13	6.67
T_{12}	4.67	6.33	68.13	53.60	1.13	18.13	6.40
T_{13}	6.67	12.00	80.47	69.90	2.34	37.33	10.20
S. Ed. (±)	0.12	0.57	0.08	0.38	0.08	1.22	0.46
C.D.at 5%	0.26	1.18	0.17	0.78	0.16	2.52	0.95

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