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Effect of Organic Manure and Inorganic Fertilizer on Plant Growth and Flower Yield of Asiatic Lily *(Lilium longiflorum)* Sp. Zephyranthes

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Abstract *Lilium longiflorum* is a monocotyledon belonging to liliaceae, it grow well demands in tropical region. An experiment was laid out to find out suitable organic manure and inorganic fertilizer dose for batter growth and development of Zephyranthus was under taken during 2014-2015. The experiment was layout in randomized block design (RBD) with thirteen treatments and each treatment replicated thrice. The treatments consist of different combinations of 75%, 50% and 25% RDF (150 : 100: 80 kg NPK ha^{-1}) and organic manures, FYM, vermicompost and poultry manure (15.2: 3.8: 2.4 t ha^{-1}) including control (no. additional fertilizers and manures) and 100% RDF. The treatment as 50% RDF + 15.2 t FYM ha^{-1} was found to be statistically significant compared to other treatment combination, which recorded maximum plant height (31.03 cm), number of leaves (7.86), days to first flower bud initiation (138.14), durability of flower (6.32 days), flower bud length (6.56 cm), flower bud diameter (2.77 cm), numbers of flowers per plant (3.32), number of bulb lets per plant (1.86), weight of bulb lets (3.48g) and yield of flowers (Lakh) per hectare (1.84), followed by treatment 50% RDF + 3.8 t Vermicompost ha^{-1} and lowest yield was obtained from control respectively.

Keywords Asiatic lily, NPK, Farm yard manure, Vermicompost, Poultry manure.

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Introduction

Lily is a non- traditional flower and consider as the king of flower bulbs, belongs to genus *Lilium* which comprises of around 100 species, 7 sections and 10,000 documented cultivars [1]. Lilies are high demanded cut flower in international flower trade due to its wide diversity of flower color, attractive flower shape, long multi-flowering stalk, and having long post-harvest shelf life [2]. *Lilium* is well distributed in mostly northern hemisphere i.e. South-East Asia, North America, and Europe. Compared with other ornamentals, lily systematic breeding history is short and first Asiatic hybrid cultivar was developed in the 19^{th} century [3].

Lilium longiflorum is a monocotyledon belonging to lilaceae. *Lilium* is a native to Japan and southern parts of liukiu islands, and demands tropical loca-

tion for growth. The plants within liliaceae family have high value due to their scented nature, wide range of colors, resistance and their effecting adaptation to their imperfect surroundings [4]. In general, carrying out plant nourishing experiments on bulbous flowers is difficult because the plant bulb itself stores nutrition required by the plant and on the other hand, most of horticulture soils used for planting also store minerals needed for the bulb [5].

Nitrogen (N) has the quickest most pronounced effect on the plant growth that ultimately leads to good yield. Nitrogen is the constituent of different amino acids, proteins and chlorophyll which is essential for good growth of plant. Following study was done with objective to determine N deficiency can be characterized by stunted growth, flowering and yield.

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Materials and Methods

Experimental site selected on the basis of all requirement at Department of Horticulture, Allahabad school of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed To-Be University), Allahabad, during the year (2014-2015). The soil of experimental plots was well drained, clay loam in texture and having pH 6.87 and E.C. 0.05. The bulbs of Aisatic hybrid lily (4.5 cm. diameter) were planted at the spacing of 60 × 30 cm. (row to row and bulb to bulb) in the month of October in open conditions on the plots. The experiment was laid out in a randomized block design with three replications of the all treatments 75% RDF + 7.6 t FYM ha^{-1}, 75% RDF + 1.9 t vermicompost ha^{-1}, 75% RDF + 1.2 t Poultry manure ha^{-1}, 50% RDF + 15.2 t FYM h^{-1}, 50% RDF + 3.8 t Vermicompost ha^{-1}, 50% RDF + 2.4 t Poultry manure ha^{-1}, 25% RDF + 22.8 t FYM ha^{-1}, 25% RDF +5.7 t, Vermicompost ha^{-1}, 25% RDF + 3.6 t, Poultry manure ha^{-1}, 7.6 t FYM + 1.9 t, Vermicompost + 1.2t, Poultry manure ha^{-1} (33.33% FYM + 33.33% VC+ 33.33 PM),25% RDF + 10 t FYM + 2.5 t Vermicompost + 1.5 Poultry manure 1 ha^{-1}, individual- ly and in all combinations with control (N_0 P_0 K_0). Organic manure used viz. FYM (farm yard manure) vermicompost,poultry manure, and inorganic fertilizer viz. phosphorus and potassium in the form of single super phosphate (SSP), and muriate of potash (MOP), respectively were incorporated to the soil before planting of bulbs. Nitrogen was applied in the form of urea in three equal split doses i.e. at time of planting, at 40 and 89 day after planting. Data on various parameters on vegetative growth, flowering and bulb production were recorded. The data were pooled and analyzed using the analysis of variance (ANOVA) technique, outlined by Panse and Sukhatme [6] and treatment were compared at 5% level of significance.

Results and Discussion

The results of the present investigation presented in Tables 1 and 2 showed that growth parameters, flower parameters, quality parameters and flower yield parameters.

Table 1. Effect of organic manure and inorganic fertilizer on plant growth of Asiatic lily at different intervals in days.

Treatments	Treatment combination	Plant height (cm) 120 DAT	Number of leaves per plant 120 DAT
T_0	Control	26.60	3.71
T_1	150:100:80 kg NPK h^{-1} (100%RDF)	27.43	4.67
T_2	112:75:60 kg NPK+7.6 t FYM ha^{-1}	29.63	6.35
T_3	112:75:60 kg NPK+1.9t Vermicompost ha^{-1}	28.80	6.03
T_4	112:75:60 kg NPK+1.2 t Poultry manure ha^{-1}	28.70	6.00
T_5	75:50:40 kg NPK+15.2 t FYM ha^{-1}	31.03	7.86
T_6	75:50:40 kg NPK+3.8 t Vermicompost ha^{-1}	30.53	7.13
T_7	75:50:400 kg NPK+2.4 t Poultry manure ha^{-1}	30.37	6.36
T_8	38:25:20 kg NPK+22.8 t FYM ha^{-1}	28.63	5.72
T_9	38:25:20 kg NPK+5.7 t Vermicompost ha^{-1}	28.50	5.66
T_{10}	38:25:20 kg NPK+3.6 t Poultry manure ha^{-1}	28.43	5.43
T_{11}	38:25:20 kg NPK+7.6 t FYM+1.91 t Vermicompost+1.2 t Poultry manure ha^{-1}	27.90	5.10
T_{12}	10 t FYM+2.5 t Vermicompost+1.5 Poultry manure t ha^{-1}	28.33	5.37
	SEd (±)	1.09	0.79
	CD at 5%	2.24	1.64

Table 2. Effect organic manures and inorganic fertilizer on flowering and yield of Asiatic Lily at different intervals in days.

Treatment combination	Days to first flower bud initiation (earliness)	Flower bud diameter (cm)	Number of flowers per plant	Flower bud length (cm)	Flower stalk length (cm)	Flower width (cm)	Durability of flower (days)	No. of bulb lets/plant	Weight of bulb lets (g)	Benefit: Cost ratio
T_0	142.05	2.12	2.34	5.60	41.24	12.82	3.65	1.53	2.37	3.03:1
T_1	141.05	2.16	2.90	5.80	43.71	13.18	4.79	1.56	2.54	3.51:1
T_2	139.32	2.51	3.26	6.40	49.83	13.85	5.57	1.78	2.91	3.95:1
T_3	139.81	2.49	3.16	6.34	49.59	13.77	5.51	1.76	2.82	3.86:1
T_4	140.29	2.44	3.10	6.33	49.06	13.71	5.50	1.75	2.81	3.80:1
T_5	138.14	2.77	3.32	6.56	50.01	14.31	6.32	1.86	3.48	4.03:1
T_6	138.33	2.54	3.30	6.47	49.98	14.21	6.10	1.79	3.31	4.02:1
T_7	138.68	2.53	3.28	6.43	49.93	13.93	5.58	1.78	2.97	4.00:1
T_8	140.49	2.42	3.09	6.23	48.71	13.66	5.42	1.72	2.72	3.68:1
T_9	140.81	2.30	3.06	6.20	48.63	13.61	5.35	1.65	2.71	3.72:1
T_{10}	141.04	2.27	3.03	6.10	47.93	13.51	5.25	1.64	2.69	3.70:1
T_{11}	141.78	2.20	2.96	5.83	43.72	13.27	4.88	1.54	2.56	3.56:1
T_{12}	141.25	2.23	3.00	6.01	45.15	13.42	5.14	1.62	2.59	3.65:1
SEd (±)	1.28	0.16	0.17	0.25	1.43	0.38	0.33	0.11	0.17	
CD at 5%	2.64	0.33	0.34	0.52	2.94	0.78	0.68	0.22	0.35	

Growth parameters

The growth parameters like the plant height (31.03 cm), number of leaves per plant (7.86) were showed the significant difference in recorded due to application of different combinations of NPK and organic manures. The treatment T_5 as 112:50:40 kg NPK + 15.2 t FYM ha^{-1} recorded of the maximum, followed by T_6 as 75:50:40 :kg NPK + 3.8 t Vermicompost ha^{-1}.Minimum was recorded to be in treatment (T_0) control respectively. The increase in growth parameters in the treatment T_5 is due to the beneficial effect of FYM (farm yard manure) with 50% recommended dose of fertilizers (75:50:40 kg NPK). The probable reason for increasing the growth parameters in the best treatment due to application of FYM act as a slow release nutrients and its natures the microbial activity of soil due to the largest amount of carbon rich material available for organism. Similar result was finding conformity by Longchar and Keditsu [7] in Gerbera Parya art al. [8] in Golden rod.

Flowering parameters

Flowering parameters like days to first flower bud initiation (138.14 cm), Durability of flower in days (6.32) were showed the significant difference in recorded due to application of different combinations of NPK and organic manures. The treatment T_5 as (112:50:40 kg NPK + 15.2 t FYM ha^{-1}) recorded of the maximum, followed by T_6 as (75:50:40 kg NPK+3.8 t Vermicompost ha^{-1}). Minimum was recorded to be in treatment (T_0) control respectively. The increase in growth parameters in the treatment T_5 is due to the beneficial effect of FYM (farm yard manure) with 50% recommended dose of fertilizers (75:50:40 kg NPK).Similar results was in conformity with Anuburani et al. [9] found in *Jaminum sambac* and Mohanty et al. [10] closely associated with marigold.

Quality parameters

Flower bud diameter (2.77 cm), flower bud length (6.56 cm), flower stalk length (50.01cm), flower width (14.31 cm) were showed the significant difference in recorded due to application of different combinations of NPK and organic manures. The treatment T_5 as (112:50:40 kg NPK+ 15.2 t FYM ha^{-1}) recorded of the maximum, followed by T_6 as (75:50:40 kg NPK + 3.8 t Vermicom-

post ha^{-1}). Minimum was recorded to be treatment (T_0) control respectively. The increase in growth parameters in the treatment T_5 is due to the beneficial effect of FYM (farm yard manure) with 50% recommended dose of fertilizers (75:50:40 kg NPK) found in *Lilium* [11] and similar results were also reported in marigold research findings [12].

Yield parameters

Yield parameters like weight of number of flower per plant (3.32 cm), number of bulb lets per plant (1.86 cm), weight of bulb lets (3.48 cm) were showed the significant difference is recorded due to application of different combinations of NPK and organic manures. The treatment T_5 as (112:50:40 kg NPK + 15.2 t FYM ha^{-1}) recorded of the maximum, followed by T_6 as 75:50:40 kg NPK+3.8 t Vermicompost ha^{-1}). Minimum was recorded to be in treatment (T_0) control respectively. The increase in growth parameters in the treatment T_5 is due to the beneficial effect of FYM (farm yard manure) with 50% recommended dose of fertilizers (75:50:40 kg NPK) in marigold [13] and similarly in glory lily [14].

Conclusion

From the present investigation it is concluded that in respect of cultivation of Asiatic lily (*Lilium longiflorum* Sp. Zephyranthes). The application of treatment T_5 i.e. 50% RDF (75:50:40 NPK kg ha^{-1}) along with 50% farm yard manure (15.2 t FYM ha^{-1}) were showed the significant effect on maximum plant growth, flower yield and flower quality of Asiatic lily. The treatment T_5 was also found to be most economically viable in terms of gross returns (Rs 14,16,300 ha^{-1}), net returns (Rs 10,65,507 ha^{-1}) and benefit : Cost ratio (4.03:1).

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