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EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON YIELD AND VASE LIFE OF GLADIOLUS CV. H.B. PITT.

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ABSTRACT

An investigation was undertaken at Department of Horticulture, Late Shri.Vasantrao Naik Marathwada Agricultural University, Parbhani during *kharif* season of year 2008-2009 to analyse the effect of organic and inorganic fertilizers on yield and vase life of gladiolus cv. H. B. Pitt. In the present study, it was found that the maximum number of spikes plot^{-1} (35.5) and ha^{-1} (1.5 lakhs), weight of spikes plot^{-1} (555.6 g) and ha^{-1} (24.6 q), number of corms plot^{-1} (37.5) and ha^{-1} (1.6 lakhs), number of cormels plot^{-1} (72.5) and ha^{-1} (3.7 lakhs), weight of corms plot^{-1} (1192 g) and ha^{-1} (49 q), weight of cormels plot^{-1} (81.7g) and ha^{-1} (36.3 q) and vase life of spikes (8.5 days) were recorded in the treatment 50% RDF+50% vermicompost. Lowest number of spikes plot^{-1} (25) and ha^{-1} (1.1 lakhs), weight of spikes plot^{-1} (256.7 g) and ha^{-1} (11.4 q), number of corms plot^{-1} (25) and ha^{-1} (1.1 lakh), number of cormels plot^{-1} (30) and ha^{-1} (1.3 lakhs), weight of corms plot^{-1} (946.6 g) and ha^{-1} (42 q), weight of cormels plot^{-1} (37.5g) and ha^{-1} (16.6 q) were recorded under the treatment T_4 (25% RDF + 75% FYM). Minimum vase life of spikes (6.4 days) was recorded under the treatment T_1 (control). Thus, on the basis of present study, it can be inferred that nutrition in the form of 50% RDF + 50% vermicompost ha^{-1} was effective for obtaining better yield and vase life of gladiolus cv. H.B.Pitt.

(Key words : Organic, inorganic fertilizer, yield, vase life, gladiolus)

INTRODUCTION

Gladiolus (*Gladiolus grandiflora* L.) commonly called sword lilly or corn flag is the seventh most important flowers of the world. Gladiolus is native of South Africa belonging to family Iridaceae. In India, Gladiolus is cultivated on an area of 500 ha. Gladiolus occupies about 0.05 per cent of the total cut flowers produced which is too much less. In Maharashtra, Gladiolus is cultivated on large scale in Pune, Nashik, Solapur, Kolhapur, Aurangabad and Nagpur District. In Maharashtra, the total area under floriculture was 23000 ha during 2014-15 with a production of 122.65 (000 t) (Anonymous, 2015). The latest technology of quality and flower production required to be adopted. The technology are selection of corms, treatments to corms, judicious use of fertilizers, disease and pest control and post harvest management, etc. However the yield, quality production of flower and flower vase life is low which needs to be increased by adopting improved agrotechniques. Use of organic manures and inorganic fertilizer sources are essential to maintain the soil health and also to sustain productivity. An investigation was therefore conducted to find out the effect of organic and inorganic fertilizers on yield and vase life of gladiolus flower cv. H. B. Pitt.

MATERIALS AND METHODS

The present investigation on effect of organic and inorganic fertilizers on yield and vase life of gladiolus cv. H.B. Pitt was conducted at Department of Horticulture, Late Shri. Vasantrao Naik Marathwada Agricultural University, Parbhani during *kharif* season of year 2008-09. A field experiment was laid out in Randomized block Design with three replications and ten treatments (Table 1). The soil of experimental plot was medium black with uniform texture and well drained. Soil samples of the experimental plot were analyzed to determine the physico-chemical properties of experimental soil before planting. The treatments consisted were T_1-100% RDF (control), T_2-75% RDF + 25% FYM, T_3-50% RDF + 50% FYM, T_4-25% RDF + 75% FYM, T_5-75% RDF + 25% Vermicompost, T_6-50% RDF + 50% Vermicompost, T_7-25% RDF + 75% Vermicompost, T_8-75% RDF + 25% Biomeal, T_9-50% RDF + 50% Biomeal, T_{10}-25% RDF + 75% Biomeal. Organic manures, viz-Biomeal, Vermicompost and FYM each were applied at 75, 50 and 25 per cent of recommended dose and light irrigation was given. The recommended dose of N, P_2O_5 and K_2O i.e. 100:50:50 kg ha^{-1} was applied through urea, single super phosphate and muriate of potash, respectively. Remaining

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half dose of N was applied about 30 days after planting. Total number of spikes plant^{-1} were taken into account for measurement of maximum number of spikes plot^{-1} and ha^{-1}. Weight of spike was measured in g. The average weight of five spikes were estimated and recorded as weight of spike in g. Number of corms and cormels plant^{-1} were recorded from five previously marked plants and average was worked out. The number of corms and cormels net plot^{-1} was taken and number of corms and cormels net plot^{-1} was multiplied by hectare factor for number of corms and cormels ha^{-1}. Weight of corm harvested from previously marked five plants were taken and average was found out. Similarly for cormels, 10 cormels plant^{-1} were randomly selected from previously marked five plants and their weight was taken and average was found out. The weight of corms and cormels net plot^{-1} was taken. Weight of corms and cormels net plot^{-1} was multiplied by hectare factor for weight of corms and cormels ha^{-1}. Spikes were kept in measuring cylinder containing distilled water according to various treatments. The end of vase life was decided when florets start fading or drop down and accordingly vase life in days were recorded. The observations were recorded and statistically analyzed as per method given by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Effect on number of spikes plot^{-1}

Data presented in table 1 clearly indicated that maximum number of spikes plot^{-1} (35.50) were produced by treatment T_6(50% RDF + 50% vermicompost) followed by T_9 (50% RDF + 50% Biomeal) i.e. 34.00. Treatment T_4(25% RDF + 75% FYM) produced less number of spikes plot^{-1} (25.00). Treatment T_5(75% RDF + 25% vermicompost) was significantly superior over T_8 (75% RDF+25% Biomeal), T_2(75% RDF+25% FYM), T_1(100% RDF) i.e. control, T_7(25% RDF+75% vermicompost) and T_{10}(25% RDF+75% Biomeal). Treatments T_5(75%RDF+25% vermicompost), T_8(75%RDF+25% Biomeal), T_1(100% RDF) i.e. control and T_9(50% RDF+50% Biomeal), T_3(50% RDF+50%FYM) and T_2(75% RDF+25% FYM) were at par with each other.

Effect on number of spikes ha^{-1}

The data presented in table 1 indicated that spike production ha^{-1} varied with treatment. The number of spikes produced ha^{-1} was calculated on the basis of spikes produced plot^{-1} (by multiplying the areas). Maximum number of spikes ha^{-1} (1.59 lakhs) were produced by treatment T_6(50% RDF + 50% vermicompost) followed by T_9(50% RDF + 50% Biomeal) i.e. 1.51 lakhs. Treatment T_4(25% RDF + 75% FYM) produced less number of spikes ha^{-1} (1.11 lakhs). Treatment T_5(75% RDF + 25% vermicompost) i.e. 1.33 lakhs was significantly superior over the treatments T_8(75% RDF + 25% Biomeal) i.e. 1.31 lakhs, T_2 (75% RDF + 25% FYM) i.e. 1.28 lakhs, T_1(100% RDF) i.e. 1.25 lakhs, T_7(25% RDF+75% vermicompost) i.e. 1.16 lakhs and T_{10}(25% RDF + 75% Biomeal) i.e. 1.15 lakhs. Treatments T_5(75% RDF + 25% vermicompost) i.e. 1.33 lakhs, T_8(75% RDF + 25% Biomeal) i.e. 1.31 lakhs, T_1(100% RDF) i.e.1.25 lakhs and T_9(50%RDF+50% Biomeal) i.e. 1.51 lakhs, T_3(50%RDF + 50% FYM) i.e. 1.44 lakhs and T_2(75% RDF+25% FYM) i.e. 1.28 lakhs were at par with each other. The reason for increased yield by the application of NPK along with vermicompost or FYM could be attributed to solubilization effect of plant nutrients by the addition of vermicompost or FYM to increase uptake of NPK by Subiah *et al.* (1982). Similar results were observed by Patil and Chitra (2009) in China aster. They concluded that treatment receiving Azospirillum, PSB, Vermi-compost and 50% recommended dose of NPK recorded highest growth, flower yield and flower quality characters in China aster. Gharat (2004) revealed that the maximum flower yield plant^{-1} (101.6 g) and flower quality were recorded in the treatment receiving RDF + vermicompost which was followed by RDF + FYM (89.1 g) in gladiolus. Pansuriya and Chauhan (2015) found that maximum number of spikes plant^{-1} (2.2), number of spikes square meter^{-1} (19.8) were recorded with an application of 75% RDF + NC @ 1 t ha^{-1} + Azotobacter @ 2 kg ha^{-1} + PSB @ 2 kg ha^{-1} in gladiolus.

Effect on weight of spike plot^{-1} and ha^{-1}

The data regarding weight of spike plot^{-1} and ha^{-1} are presented in table 1. It was calculated by multiplying average weight by number of spikes plot^{-1}. Maximum weight of spikes plot^{-1} (555.65g) was produced in treatment T_6(50% RDF + 50% vermicompost) followed by treatments T_9(50% RDF + 50% Biomeal) i.e. 531.75g and T_3(50% RDF + 50% FYM) i.e. 526.25g. Lowest weight of spikes plot^{-1} (256.75g) was obtained by 25% RDF + 75% FYM in treatment T_4.

Weight of spikes ha^{-1} was calculated on the basis of spikes produced plot^{-1} (by multiplying the area). Hence, the results were similar to those described under the weight of spikes produced plot^{-1}. Maximum weight of spikes ha^{-1} (24.69q) was obtained in treatment T_6(50% RDF + 50% vermicompost) followed by treatments T_9(50% RDF + 50% Biomeal) i.e. 23.63q and T_3(50% RDF + 50% FYM) i.e. 23.38q. Minimum weight of spikes ha^{-1} (11.41q) was obtained in treatment T_4(25% RDF + 75% FYM). Treatments where the plants were supplied nutrients through 50% RDF + 50% vermicompost produced more spikes weight as compared to the plants which were supplied nutrients through 75% RDF + 25% FYM. Similar results were observed by Pansuriya and Chauhan (2015) in gladiolus Cv. Psittacinus hybrid. They found that maximum fresh weight of whole spikes (90.03gm), maximum number of spikes plant^{-1} (2.20), number of spikes sqm^{-1} (19.82), yield of spikes ha^{-1}(2.87 lakhs) were recorded in treatment 75% RDF + NC @ 1t ha^{-1} + Azotobacter @ 2kg ha^{-1} + PSB @ 2kg ha^{-1}. The results are in confirmation with Godse *et al.* (2009) and Gupta *et al.* (2008) in Gladiolus. Godse *et al.* (2009) revealed that gladiolus plants receiving treatment vermicompost 8 t ha^{-1} + Azotobacter and PSB @ 25 kg ha^{-1} each + 80 % RDF significantly increased growth, yield and quality attributes of gladiolus. This treatment exhibited highest B:C ratio (3.7) when compared with RDF (2.8). Gupta *et al.* (2008) revealed that among the three

treatments i.e. (F_1) vermicompost (125 gm sqm^{-1}), (F_2) NPK (75 gm sqm^{-1}) and (F_3) FYM (2.5 kg sqm^{-1}), F_3 treatment (2.5 kg sqm^{-1}) was recorded the best results for plant growth, flowering and corm yield parameters in gladiolus.

Effect on number of corm plot^{-1} and ha^{-1}

The data in respect of number of corm $plot^{-1}$ and $hectare^{-1}$ yield of corms was worked out and presented in table 1. The results obtained in present studies revealed that there was significant differences among treatments in respect of number of corms $plot^{-1}$ and ha^{-1}. It was observed that the highest yield of corms $plot^{-1}$ (37.53 g) and ha^{-1} (1.66 q) was obtained under the treatment T_6(50% RDF + 50% vermicompost) followed by treatment T_9(50% RDF + 50% Biomeal) and treatment T_3(50% RDF + 50% FYM). Treatment T_6(50% RDF + 50% vermicompost) was significantly superior over all other treatments. The lowest number of corm $plot^{-1}$ (25.04 g) and ha^{-1} (1.11q) was obtained under the treatment T_4(25% RDF + 75% FYM). It is evident from data that combined use of organic manures and inorganic fertilizer at both the levels produced more number of corms and cormels as compared with the application of inorganic fertilizer. Treatments receiving larger amount of nitrogen might have produced more number of corms and cormels $plot^{-1}$ and ha^{-1}. The significant increase in corm yield might be due to combined application of 50% RDF and vermicompost which had synergistic effect giving high Choudhary *et al.* (2013) in gladiolus. They reported that application of integrated nutrients i.e. 50% RDF (90:60:60 kg ha^{-1} NPK) + 10 tonnes ha^{-1} each of FYM and vermicompost + 2g $plant^{-1}$ each of *Azospirillum* and PSB produced significantly maximum length of spike, number of florets $spike^{-1}$, duration of flowering and yield of corms. The results were in agreement with Keisam *et al.* (2014) and Baldotto and Baldotto (2013) in gladiolus. Keisam *et al.* (2014) observed that maximum number of corms and cormels (1.0 and 8.1 respectively) were observed from plants treated with vermicompost @ 2.5 t ha^{-1} + humic acid @ 0.2 per cent (FS) + VAM in gladiolus. Baldotto and Baldotto (2013) reported that humic acid increased flowering and yield of gladiolus when applied at higher concentration.

Effect on number of cormels plot^{-1} and ha^{-1}

The data in respect of number of cormels $plot^{-1}$ and ha^{-1} are presented in table 1. The maximum number of cormels were obtained in treatment T_6(50% RDF + 50% vermicompost) $plot^{-1}$ i.e. 72.5 $plot^{-1}$ and 3.72 lakhs ha^{-1} followed by T_9(50% RDF + 50% Biomeal) and T_3(50% RDF + 50% FYM). Treatments T_1(100% RDF), T_7(25% RDF + 75% Vermicompost), T_4(25% RDF + 75% FYM) and T_{10}(25% RDF+ 75% Biomeal) were at par with each other. The lowest number of cormels were obtained in treatment T_4(25% RDF + 75% FYM) $plot^{-1}$(30.0) and ha^{-1} (1.33 lakhs). These results are in line with the findings of Keisam *et al.* (2014) in gladiolus. They reported that the maximum number of corms and cormels (1.02 and 8.10 respectively) were observed from gladiolus plants treated with vermicompost @ 2.5 ton ha^{-1} + humic acid @ 0.2 per cent + VAM.

Effect on weight of corms plot^{-1} and ha^{-1}

The data represented regarding the weight of corms $plot^{-1}$ and ha^{-1} are presented in table 1. Data from table 1 clearly indicates that maximum weight of corm $plot^{-1}$ (1192.2g) and $hectare^{-1}$ (49.3q) was obtained in treatment T_6(50% RDF + 50% vermicompost) followed by treatments T_9(50% RDF + 50% Biomeal) and T_3(50% RDF + 50% FYM). Treatment T_6(50% RDF + 50% vermicompost) was significantly superior over all other treatments. Treatments T_3(50% RDF + 50% FYM), T_5(75% RDF+25% vermicompost), T_8(75% RDF +25% Biomeal), T_2(75% RDF+25% FYM) and T_1 (100% RDF) were at par with each other. The lowest weight of corms $plot^{-1}$ (946.6g) and ha^{-1}(42.0 q) was obtained under the treatment T_4(25% RDF + 75% FYM).

Effect on weight of cormels plot^{-1} and ha^{-1}

The data indicated significant differences under different treatments in respect of weight of cormels $plot^{-1}$ and ha^{-1} (Table 1). Maximum weight of cormels $plot^{-1}$ (81.75g) and ha^{-1} (36.33q) was observed in treatment T_6(50% RDF+50% vermicompost) followed by treatments T_9(50% RDF + 50% Biomeal), T_3(50% RDF+50% FYM). Treatment T_6(50% RDF + 50% vermicompost) was significantly superior over all other treatments. Treatments T_5(75% RDF + 25% vermicompost), T_3 (50%RDF + 50% FYM), T_9(50% RDF+50% Biomeal), T_8 (75% RDF + 25% Biomeal), T_2(75% RDF + 25% FYM), T_1(100% RDF) and T_7(25%RDF +75% Vermicompost) were found at par with each other. The minimum weight of cormels $plot^{-1}$ (37.5g) and ha^{-1} (16.6 q) was observed under the treatment T_4(25% RDF + 75% FYM). The results indicated that the application of combination of inorganic fertilizers with organic manures were found highly beneficial due to healthy vegetative growth might have responsible for higher photosynthesis which might account for increasing weight of corms and cormels. Similar results were observed by Gangadharan and Gopinath (2006) in gladiolus. They found that maximum fresh weight of corms (55.60g) and fresh weight of cormels (2.35 g) was observed in the plot treated with the combination of vermicompost @ 10 tonnes ha^{-1} + 80 per cent recommended NPK dose compared to other combinations. The results were in agreement with Sisodia and Singh (2015) in gladiolus and Jha *et al.* (2012) in gladiolus. Sisodia and Singh (2015) found that maximum weight of corms $plant^{-1}$ and diameter of corm were recorded with FYM + vermicompost + Trichoderma and FYM + vermicompost treatments, respectively in gladiolus. Jha *et al.* (2012) reported that the treatments receiving 75% RDF + FYM 10 t ha^{-1} recorded maximum diameter of corm, weight $corm^{-1}$, total corm weight $plot^{-1}$ and number of corms $plant^{-1}$.

Vase life of spikes

Data presented in table 1 showed that maximum vase life of spikes was observed in distilled water in treatment T_6(50% RDF + 50% vermicompost) i.e. 8.50 days and found at par with treatments T_7(25% RDF + 75% vermicompost) i.e. 8.32 days, T_4(25% RDF + 75% FYM) i.e.

Table 1. Effect of organic and inorganic fertilizers on spike yield, corms and cormels yield and vase life of spikes of gladiolus cv. 'H.B. Pitt'

Tr. No.	Treatments	Number of spikes plot^{-1}	Number of spikes ha^{-1} (in lakhs)	Weight of spikes plot^{-1} (g)	Weight of spikes ha^{-1}(q)	Vase life of spikes (days)	Number of corms plot^{-1}	Number of corms ha^{-1} (in lakhs)	Number of cormels plot^{-1}	Number of cormels ha^{-1} (in lakhs)	Weight of corms plot^{-1} (g)	Weight of corms ha^{-1} (q)	Weight of cormels plot^{-1} (g)	Weight of cormels ha^{-1} (q)
T_1	100% RDF (Control)	28.25	1.25	340.98	15.15	6.4	30.01	1.33	33.3	1.48	978.3	43.3	44.25	19.66
T_2	75% RDF + 25% FYM	29.00	1.28	342.63	15.22	7.09	33.01	1.44	36.6	1.62	985.0	43.7	46.75	20.77
T_3	50% RDF + 50% FYM	32.50	1.44	526.25	23.38	7.81	35.02	1.55	58.3	2.40	1024.2	45.5	70.75	31.44
T_4	25% RDF + 75% FYM	25.00	1.11	256.75	11.41	8.17	25.04	1.11	30.0	1.33	946.6	42.0	37.5	16.66
T_5	75% RDF + 25% vermicompost	30.00	1.33	456.67	20.14	7.32	32.54	1.44	42.5	1.88	1000.8	44.4	65.0	28.88
T_6	50% RDF + 50% vermicompost	35.50	1.59	555.65	24.69	8.50	37.53	1.66	72.5	3.72	1192.2	49.3	81.75	36.33
T_7	25% RDF + 75% vermicompost	26.30	1.16	321.75	14.29	8.32	27.53	1.22	33.3	1.48	967.5	42.9	42.5	18.88
T_8	75% RDF + 25% Biomeal	29.50	1.31	430.08	19.14	6.90	32.52	1.44	40.8	1.81	995.00	44.2	48.5	21.55
T_9	50% RDF + 50% Biomeal	34.00	1.51	531.75	23.63	7.60	35.04	1.55	61.6	2.59	1097.5	48.7	73.25	32.55
T_{10}	25% RDF + 75% Biomeal	26.00	1.15	262.15	11.64	8.01	27.50	1.22	33.3	1.48	950.0	42.2	40.0	17.77
	SE ±	0.1	0.014	0.27	0.015	0.28	0.71	0.08	2.1	1.3	6.4	0.3	1.60	0.90
	CD at 5%	0.3	0.04	0.80	0.040	0.84	2.10	0.25	6.3	4.0	19.1	0.9	4.74	2.69

8.17 days, T_{10}(25% RDF + 75% Biomeal) i.e. 8.01 days and T_3(50% RDF + 50% FYM) i.e. 7.81 days. Treatment T_1(100% RDF i.e. control) recorded minimum vase life (6.40 days). Remaining treatments T_5(75% RDF + 25% vermicompost), T_9(50% RDF + 50% Biomeal), T_2(75% RDF + 25% FYM) and T_8(75% RDF + 25% Biomeal) were statistically at par with each other. On the basis of present studies it can be inferred that in respect of cultivation of gladiolus, nutrition in the form of 50% RDF + 50% vermicompost ha^{-1} was effective for obtaining better yield and vase life of gladiolus. There was improvement in the soil pH towards the neutrality after the application of vermicompost. Hence, the vase life of flowers in treatment RDF + vermicompost at 50% and 75% might be increased. Similar results were observed by Pansuriya and Chauhan (2015) in gladiolus. They observed that maximum vase life (14.32 days), longevity of spike (15.17 days) were recorded in gladiolus spikes with an application of 75% RDF + NC(@ 2 ton ha^{-1} + Azotobacter @ 2 kg ha^{-1} + PSB @ 2 kg ha^{-1}.

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