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EFFECTS OF FARMYARD MANURE, VERMICOMPOST AND *TRICHODERMA* ON FLOWERING AND CORM ATTRIBUTES IN GLADIOLUS

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Abstract

To see the effect of farmyard manure (FYM), vermicompost and *Trichoderma* alone and in combination on flowering and corm yield in gladiolus a field experiment was conducted. Application of vermicompost + *Trichoderma* resulted in early spike emergence, floret colour show, opening of first floret and increased diameter of first, third and fifth floret. Maximum length of spike, no. of florets/spike and duration of flowering was registered with application of farmyard manure. Treatment FYM + vermicompost significantly enhanced shelf life of first and third floret. However, maximum weight of corms/plant and diameter of corm recorded with FYM + vermicompost + *Trichoderma* and FYM + vermicompost treatments, respectively.

Introduction

Gladiolus flower is popular for its majestic spike that bears a large number of attractive elegant florets. It has a great economic potential and hold an important place for a number of reasons specially durability and market value. It is an important commercial bulbous flower crop, having a pivotal place in both domestic and international markets for its cut flowers. Now it ranks next to tulip in the Netherland and fourth in international trade of ornamental cut flowers (Singh 2006). The fascinating spikes that contain attractive, elegant, dazzling and delicate florets are mainly used for garden, interior decoration and for making bouquets. In India it is mainly cultivated in the state of Jammu and Kashmir, Darjeeling, Kalimpong in West Bengal, Chaubattia and Udham Singh Nagar in Uttarakhand, Meerut, Varanasi and Lucknow in Uttar Pradesh, Bangluru in Karnataka, Delhi, Ooty in Tamil Nadu, Pune in Maharashtra and Shimla in Himachal Pradesh. To boost up the yield potential use of organic manure and bio-agents plays an important role in enhancing its flowering and corm yield. Application of farmyard manure found beneficial for plant growth, flowering and corm yield parameters and considered to best for growing a successful crop (Gupta *et al*. 2008).

Similarly *Trichoderma* spp. are the most frequently isolate soil fungi and present in plant root ecosystems. These fungi are opportunistic, avirulent plant symbionts and functions as parasites and antagonists of many phytopathogenic fungi, thus protecting plants from disease. So far, these are among the most studied fungal bio-control agents and commercially marketed as biopesticides, biofertilizers and soil amendments (Harman *et al*. 2004). Therefore, present study was undertaken to find out the response of farmyard manure, vermicompost and *Trichoderma* alone or in various combinations in gladiolus.

Materials and Methods

A field experiment was carried out at the Horticulture Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University,Varanasi during 2011-12. During the experiment, the maximum temperature ranged from 14.2 - 38.2°C and minimum 4.8 - 22° C. The soil of experiment field was alluvial loam with adequate drainage and optimum water holding capacity. Treatment consisted of Farmyard manure (FYM) 5.0 kg/m^2, vermicompost

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5.0 kg/m^2, *Trichoderma*, FYM 2.5 kg/m^2 + vermicompost 2.5 kg/m^2, FYM 2.5 kg/m^2 + *Trichoderma*, vermicompost 2.5 kg/m^2 + *Trichoderma*, FYM 2.5 kg/m^2 + vermicompost 2.5 kg/m^2 + *Trichoderma* and control Experiment was laid out in a randomized block design with three replications. Cultivar Nova Lux was selected for experiment. Corms were planted at 30 × 20 cm distance in 3 × 2 m plot. The corms having uniform size, disease free and insect infestation free were selected for plantation. Corms were treated with *Trichoderma harzianum* treatmentwise, whereas FYM and vermicompost were applied before planting of corms. Uniform cultural practices were followed during experiment. Observations were recorded carefully for the flowering and corm parameters and subjected to statistical analysis.

Results and Discussion

All the flowering parameters were significantly influenced by different treatments (Table 1). Treatment vermicompost + *Trichoderma* was found best to produce earliest flowering (76.69 days) which was statistically at par with control (76.78 days), FYM + vermicompost + *Trichoderma* (77.33 days) and FYM + vermicompost (77.33 days) treatments. However, treatment of FYM took maximum days for flowering (80.75 days) which was at par with treatment *Trichoderma* (80.44 days). Present findings are lent credence to the observation of Gangadharan and Gopinath (2000) in gladiolus cv. White Prosperity and of Sreenivas *et al*. (1998) in China aster. Similarly, minimum days to colour show (88.11 days) as well as earliest opening of first floret (92.00 days) were due to treatment of vermicompost + *Trichoderma*. Whereas, vermicompost alone was found to report maximum days to colour show (93.66 days) and days to opening of first floret (97.77 days). Application of *Trichoderma* along with vermicompost probably found effective to control diseases like fusarium wilt and corm rot and augmented some role to enhance plant growth which ultimately resulted in early flowering and floret opening. These results are in close conformity with those obtained by Kukde *et al.* (2006) and Dubey *et al.* (2008). Treatment of FYM was found to have maximum length of spike (60.61 cm) and number of florets/spike (12.00). Pronounced effect due to application of farmyard manure has been well documented by Singh and Jauhari (2005) and Singh (2006). However, minimum spike length and number of florets/spike were registered with treatment of FYM + vermicompost + *Trichoderma*. These findings were in close conformity with the observations made by Anuje *et al.* (2011) and Atta-Alla *et al.* (2003). Similar to early colour show and opening of first floret, treatment of vermicompost + *Trichoderma* resulted in increased diameter of first, third and fifth floret. However, treatment control reported minimum diameter of first floret (7.74 cm) and treatment FYM + vermicompost + *Trichoderma* records minimum diameter for third floret (7.83 cm) and fifth floret (7.47 cm). These results are lent credence with the findings of Gangadharan and Gopinath (2000).

It was found that shelf life of first and third floret was significantly increased with treatment FYM + vermicompost. Similarly days to withering of spike was also prolonged under same treatment which was statistically at par with FYM + *Trichoderma* and vermicompost + FYM, whereas control plants resulted in poor shelf life of flowers (Table 2). These findings were also supported by Waheeduzzama *et al.* (2006) in *Anthurium andreanum* cv. Meringue and Nagalakshmi *et al.* (2010) in *Anthurium* cv. Verdun Red who observed that application of farmyard manure and vermicompost augmented some role in improvement of flower life.

Maximum duration of flowering was recorded with application of farmyard manure which was statistically at par with treatments FYM + vermicompost + *Trichoderma* and vermicompost. Beneficial effect of manures was also observed by Kukde *et al.* (2006) and Dubey *et al.* (2008) in

Table 1. Effect of farmyard manure, vermicompost and *Trichoderma* on flowering attributes in gladiolus.

Treatment	Days to spike emergence	Days to colour show	Days to opening of I floret	Length of spike (cm)	No. of florets/ spike	Diameter of I floret (cm)	Diameter of III floret (cm)	Diameter of V floret (cm)
FYM	80.75	93.11	96.11	60.61	12.00	8.63	8.37	8.09
Vermicompost	81.86	93.66	97.77	58.05	8.99	8.27	8.11	7.64
Trichoderma	80.44	91.66	95.66	56.72	9.33	8.11	8.22	7.65
FYM + vermicompost	77.33	90.00	94.11	56.32	9.55	8.16	8.33	8.17
FYM + *Trichoderma*	79.22	89.00	93.11	50.22	9.90	8.24	8.02	7.83
Vermicompost+ *Trichoderma*	76.69	88.11	92.00	54.44	10.77	8.71	8.42	8.27
FYM + vermicompost + *Trichoderma*	77.33	88.78	93.44	48.61	8.87	8.03	7.83	7.47
Control	76.78	91.33	94.89	52.05	9.33	7.74	7.95	7.53
C.D. at 5%	3.11	3.41	2.93	4.25	1.92	0.57	0.38	0.36

Table 2. Effect of farmyard manure, vermicompost and *Trichoderma* on flowering and corm attributes in gladiolus.

Treatment	Shelf life of I floret (days)	Shelf life of III floret (days)	Days to withering of spike (days)	Duration of flowering (days)	No. of corms/ plant	Weight of corms/ plant (g)	Diameter of corm (cm)	No. of cormels/ plant	Weight of cormels/ plant (g)
FYM	4.66	4.77	10.33	17.45	1.71	22.51	3.47	24. 97	4.10
Vermicompost	5.11	4.78	10.51	16.35	2.35	25.14	3.59	17.00	2.47
Trichoderma	3.77	4.33	9.06	15.11	2.33	25.66	3.3	18.58	2.16
FYM + vermicompost	5.66	5.89	11.89	14.45	2.17	29.66	4.03	21.47	3.01
FYM + *Trichoderma*	5.11	5.55	10.89	14.35	2.28	29.74	3.39	12.45	1.53
Vermicompost + *Trichoderma*	5.00	5.00	9.67	14.67	1.76	24.69	3.52	22.62	2.87
FYM + vermicompost +*Trichoderma*	4.66	4.54	9.67	17.11	1.92	32.34	3.68	24.11	2.81
Control	4.55	4.33	9.88	16.29	1.96	21.05	3.41	14.54	1.87
C.D. at 5%	0.95	0.67	1.60	2.17	0.39	7.08	0.37	7.34	1.34

tuberose and gladiolus, respectively. Treatment of vermicompost was found to record maximum number of corms/plant (2.35) and was statistically at par with *Trichoderma* (2.33), FYM + *Trichoderma* (2.28) and FYM + vermicompost (2.17). It is very clear from the findings that vermicompost was very effective for producing number of corms/plant alone and in combination. Treatment FYM + vermicompost + *Trichoderma* was reported to have maximum weight of corms/plant (32.34 g) which was statistically at par with FYM + *Trichoderma*, FYM + vermicompost and *Trichoderma* treatments. Tesfaye Alemu and Kapoor (2007) observed that application of *Trichoderma* responded well in production of gladiolus against diseases like botrytis corm rot and blight. Maximum diameter of corm/plant (4.03 cm) was obtained with treatment FYM + vermicompost and was statistically at par with treatment FYM + vermicompost + *Trichoderma* (3.68 cm). This finding is in line with the observation made by Gangadharan and Gopinath (2000) in gladiolus. Treatment FYM found to produce maximum number and weight of cormels/plant were found statistically at par with FYM + vermicompost + *Trichoderma*, vermicompost + *Trichoderma* and FYM + vermicompost treatments. Various corm parameters were influenced by application of bio-control agent either alone or in combination or along with vermicompost. This pronounced effect might be due to healthy plants treated with bio-control agent which reduces disease incidence particularly botrytis corm rot and blight and resulted into increased number of corms, number of cormels, weight of corms, weight of cormels and also diameter of corms. Same time application of manure plays some role in increasing plant growth which ultimately improved flowering and corm yield. These findings were experimentally substantiated with the observation made by Tesfaye Alemu and Kapoor (2007), Gangadharan and Gopinath (2000) and Atta-Alla *et al.* (2003) in gladiolus.

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