Asian Journal of Biological and Life Sciences | Original Research

Effect of organic manures and biofertilizers on vegetative, floral and post harvest attributes in Tuberose *(Polianthes tuberosa)* var. Shringar

Ranjan Srivastava*, Preetham S.P. and Satish Chand

Department of Horticulture, Govind Ballab Pant University of Agriculture & Technology, Pantnagar, Uttarakhand, India. 263 145.

E-mail : ranjansrivastava25@gmail.com

Submitted : 22.04.2013 Accepted : 10.06.2013 Published : 30.04.2014

Abstract

The present investigation was carried out to study the effect of organic manures and biofertilizers on growth, flowering and post harvest attributes of tuberose var. Shringar during 2010-2012. The experiment was conducted in Randomized Block Design (RBD) with four replications. The maximum plant height, number of leaves/plant, rachis length and yield of spikes/m^2 was obtained with the use of 2 kg vermicompost/m^2 whereas application of 0.5 kg poultry manure/m^2 in tuberose registered the maximum spike weight, number of florets/plant and minimum number of unopened florets/plant. This treatment also found best for maximising the weight and diameter of mother bulb and number of bulblets/m^2. Spikes which were harvested from the plot and treated with *Pseudomonas sp.* (40 g/m^2) resulted in maximum vase life and also in weight of bulblets and number of bulblets/plant.

Key words : Tuberose, Biofertilizers, Vermicompost, Poultry manure.

INTRODUCTION

Tuberose, a member of the family Amaryllidaceae is an important commercial flower crop of India. It is a bulbous perennial perpetuating itself through bulbs. The aerial portion consists of a rosette of leaves, which are narrow, linear and light green. Inflorescence is known as a spike and bears the florets in pairs. It is popular by several vernacular names like Sughanda-Raja, Rajni-Ghanda, Gulcheri and Gulshabo etc. The spikes are used as cut flowers for vase decoration and bouquets, while individual flowers are used for making veni, garland, button holes and extracting essential oil [1].

Nutrition management of tuberose is an important and integral component of organic farming to manage the environment. The importance of organic farming in commercial floriculture has been realised recently throughout the world. There is an increase in demand for homogenous organic substrates, which has led to intensive research for producing high quality products by using low cost substitute. The quantum of inorganic can be reduced by exploring the possibilities of using organic inputs in quality production of this crop. The use of organic manures and biofertilizers as a source of nutrient with or without inorganic fertilizers seems to have great possibilities in avoiding or substituting the shear use of chemical fertilizers. Organic manures and biofertilizers supply the nutrient to the plants from sources which these plants cannot tap themselves. Therefore, keeping the urgency of new age farming system in mind, the present investigation was has been carried out on tuberose var. Shringar to study the effect of organic manures and biofertilizers on growth, Flowering and post harvest attributes

MATERIAL AND METHODS

The experiment was conducted at Model Floriculture Centre of G.B.P.U.A. & T., Pantnagar during 2010-11 and 2011-12. The applications comprises of organic manures [vermicompost (1 and 2 kg/m^2) and poultry manure (0.5 and 1 kg/m^2)], biofertilizers *[Pseudomonas sp. (20 and 40* g/m^2*)* and *Trichoderma sp. (20 and 40* g/m^2*)]* and recommended dose of fertilizer as control. The experiment was laid out in randomized block design with four replications. Application of these organics was done at the time of planting. Uniform size of bulbs of tuberose var. Shringar were planted at 30 x 20 cm distance in the first week of April in both the years in 1 x 1 m beds (16 bulbs/bed). The soil was well drained, sandy loam in texture having pH 6.7 and 97.22, 37.63, 131.40 kg/ha of available N, P & K, respectively. All the cultural practices were kept uniform for all the treatments and standard practices were adopted. Observations on growth, flowering, bulbs and bulblets production attributes were recorded from five randomly selected plants of each replication using standard procedure. Data of both the years were pooled and subjected to analysis of variance [2].

RESULTS

The data, recorded during the investigation and pooled over two years are presented in Tables 1 and 2. It envisages that most of the attributes are significantly affected by different treatments of organic manures and biofertilizers.

Vegetative growth parameters

The maximum plant height (45.10 cm) and highest number of leaves (86.25) per plant were recorded significantly higher in vermicompost (2 kg/m^2) treated plants (T_7) whereas the minimum pant height and number of leaves was recorded in 1 kg poultry manure/m^2 (T_6) (Table 1).

Flower parameters

It is evident from the data presented in Table 1 that days taken to spike emergence, spike length, spike weight, diameter of florets, opened florets and yield of spikes were significantly increased under organic treatments. The earliest (102.75 days) spike emergence was recorded in treatment (T_8) *Trichoderma sp.* (40 g/m^2) which was *at par* with (T_9) *Pesudomonas sp.* (40g/m^2) followed by application of (1 kg/m^2) vermicompost and minimum was found in (T_6) poultry manure (1 kg/m^2). The longest (66.20 cm) spike length was recorded in (T_3) vermicompost (1 kg/m^2) followed by (T_2) poultry manure (0.5 kg/m^2) and minimum was found in (T_5) *Pesudomonas sp.* (20g/m^2). The heaviest (59.35 g)

Table 1. Effect of organic culture and biofertilizers on vegetative characters and floral parameters in tuberose var. Shringar

Sl. No.		Treatments	Plant height (cm)	No. of leaves	Days taken to spike emergence	Spike length (cm)	Sipke weight (g)	Rachis length (cm)	Total no. of florets/ plant	Diameter of florets (cm)	Yield of spikes/m^2
1.	T_1	Control	42.06	83.38	107.40	60.60	54.40	19.74	34.58	2.80	62.12
2.	T_2	Poultry manure (0.5 kg)	43.13	84.27	107.38	64.27	59.35	22.58	39.06	3.47	65.62
3.	T_3	Vermicompost (1 kg)	41.05	85.13	106.10	66.20	54.07	21.83	34.20	3.52	64.75
4.	T_4	*Trichoderma* sp. (20 g)	39.53	82.43	109.06	61.25	56.77	17.98	32.45	3.66	60.25
5.	T_5	*Pseudomonas sp.* (20 g)	38.43	79.67	110.30	59.02	58.10	20.49	33.42	3.87	58.00
6.	T_6	Poultry manure (1 kg)	37.39	78.02	115.15	61.37	56.26	17.46	31.33	2.51	57.50
7.	T_7	Vermicompost (2 kg)	45.10	86.25	107.93	64.05	54.95	23.24	34.87	3.91	66.25
8.	T_8	*Trichoderma sp.* (40 g)	40.32	80.66	102.75	63.77	55.60	20.74	36.04	4.27	62.75
9.	T_9	*Pseudomonas sp.* (40 g)	40.75	79.02	102.93	62.12	55.52	19.24	35.20	4.21	63.25
SEm±			0.60	0.52	0.54	0.46	0.44	0.31	0.47	0.11	1.04
CD at (5%)			1.75	1.54	1.59	1.35	1.29	0.91	1.39	0.33	3.04

Table 2. Effect of organic culture and biofertilizers on post harvest parameters and bulb and bulblets characters in tuberose var. Shringar

Sl. No.		Treatments	No. of open florets	No. of unopened florets	Vase life	Bulb weight (g)	Bulb diameter (cm)	No. of bulblets/m^2	Weight of bulblets	Bulb yield/m^2
1.	T_1	Control	23.63	12.40	11.00	54.12	3.94	296.75	14.05	13.06
2.	T_2	Poultry manure (0.5 kg)	24.38	8.81	11.75	64.75	5.05	401.37	15.22	15.62
3.	T_3	Vermicompost (1 kg)	24.41	11.70	12.25	60.87	3.19	281.00	12.00	16.50
4.	T_4	*Trichoderma* sp. (20 g)	22.52	8.54	12.25	62.75	3.68	322.75	15.90	12.87
5.	T_5	*Pseudomonas sp.* (20 g)	26.04	8.83	12.65	61.50	3.38	309.50	16.87	13.75
6.	T_6	Poultry manure (1 kg)	22.78	8.71	11.12	52.12	3.90	308.00	13.12	14.00
7.	T_7	Vermicompost (2 kg)	25.66	10.63	10.60	63.37	4.23	307.25	14.40	14.00
8.	T_8	*Trichoderma sp.* (40 g)	27.35	10.82	13.75	46.50	4.09	372.12	18.67	14.87
9.	T_9	*Pseudomonas sp.* (40 g)	25.87	8.04	13.87	48.23	4.37	355.25	21.10	14.87
SEm±			0.56	0.46	0.31	1.29	0.14	3.77	0.48	0.39
CD at (5%)			1.63	1.36	0.92	3.78	0.42	11.00	1.42	1.16

spikes were recorded in (T_2) poultry manure (0.5 kg/m^2) which was *at par* with (T_5) *Pesudomonas sp.* (20g/m^2) and minimum spike weight was observed in (T_7) vermicompost (2 kg/m^2) (54.07 g). The current investigation revealed maximum rachis length (23.24 cm) in (T_7) vermicompost (2 kg/m^2) which was *at par* with (T_2) poultry manure (0.5 kg/m^2) followed by (T_3) vermicompost (1 kg/m^2) and minimum was found in (T_6) poultry manure (1 kg/m^2). The total number of florets per plant were recorded significantly higher (39.06) by application of (T_2) poultry manure (0.5 kg/m^2) followed by (T_8) *Trichoderma sp.* (40 g/m^2) and (T_9) *Pseudomonas sp.* (40 g/m^2) whereas minimum was found in poultry manure (T_6) (1 kg/m^2) [Table 1]. The diameter of florets was found to be significantly maximum (4.27 cm) in case of (T_8) *Trichoderma sp.* (40 g/m^2) which was *at par* with (T_9) *Pseudomonas sp*. (40 g/m^2) and followed by (T_7) vermicompost (2 kg/m^2) but minimum was recorded in (T_6) poultry manure (1 kg/m^2). The maximum yield of spikes/ m^2 (66.25) was recorded in treatment (T_7) vermicompost (2 kg/m^2) which was *at par* with (T_2) poultry manure (0.5 kg/m^2) and followed by (T_3) vermicompost (1 kg/m^2) and minimum was recorded in (T_6) poultry manure (1 kg/m^2) [Table 1].

Post harvest parameters

A perusal of data presented in Table 2 reveals that the total number of open florets/ spike was found significantly higher (27.35) in *Trichoderma sp.* (40 g/m^2) (T_8) followed by (T_5) *Pseudomonas sp*. (20 g/m^2) and (T_7) vermicompost (2 kg/m^2) whereas minimum was observed in (T_4) *Trichoderma sp*. (20 g/m^2). However, minimum number unopened florets/spike (8.04) was recorded in (T_9) *Pseudomonas sp.* (40 g/m^2) which was *at par*

(T_4) *Trichoderma sp*. (20 g/m^2) and (T_6) poultry manure (1 kg/m^2) whereas, maximum was observed in (T_1) control. Vase life recorded when from lowest floret to top florets withered completely was found significantly highest (13.87 days) in *Pseudomonas sp.* (40 g/m^2) which was *at par* with (T_9) *Pseudomonas sp*. (40 g/m^2) followed by (T_5) *Pseudomonas sp*. (20 g/m^2) and minimum was recorded in (T_7) vermicompost (2 kg/m^2) [Table 2].

Bulb and bulblets parameter

The bulb character was significantly affected by biofertilizers and organic manures [Table 2]. The average bulb weight (64.75 g), average bulb diameter (5.05 cm) and average numbers of bulblets/m^2 (401.37), was found maximum under (T_2) poultry manure (0.5 kg/m^2). In bulb weight, treatment (T_2) was statistically *at par* with vermicompost (2 kg/m^2) and *Trichoderma sp*. (20 g/m^2) (T_4) and in bulb diameter, treatments *Pseudomonas sp.* (40 g/m^2) (T_9) and (T_7) vermicompost (2kg/m^2) were found next best to poultry manure (0.5 kg/m^2). *Trichoderma sp.* (40 g/m^2) treatment was followed by T_2 in number of bulblets/m^2. Among the above three parameters the lowest bulb weight was observed in (T_8) *Trichoderma sp.* (40 g/m^2), bulb diameter as well as number of bulblets/m^2 was recorded in (T_3) vermicompost (1 kg/m^2). The maximum weight of bulblets/plant (21.10 g) was recorded in treatment (T_9) *Pseudomonas sp.* (40 g/m^2) which was significantly higher than rest of the treatments and followed by (T_8) *Trichoderma sp.* (40 g/m^2) (18.67 g) and *Pseudomonas sp.* (40 g/m^2) whereas, minimum was found in *Trichoderma sp*. (20 g/m^2) (12.00 g). The maximum bulb yield per square meter (16.50) was recorded in treatment (T_3) vermicompost (1 kg/m^2) followed by (T_2) poultry manure (0.5 kg/m^2) and (T_7) vermicompost (2 kg/m^2) and minimum was found in (T_4) *Trichoderma sp*. (20 g/m^2).

DISCUSSION

Vegetative and Flower parameters

Plant height may be attributed to the presence and synthesis of gibberellins in vermicompost. Gibberellins cause both cell elongation and division that stimulates elongation and resulted in increase in plant height. The increase in plant height and number of leaves with the application of vermicompost are in conformity with the findings of earlier worker [3] in statice. Production of more number of leaves might be due to the increased availability of nitrogen, which is an important component of chlorophyll and protein thus causing more growth. These finding are in conformity with the findings of [4] in China aster. The application of biofertilizer *viz.*, *Trichoderma* would have helped in uptake of micronutrients and have provided essential plant growth promoting substances which results in early flowering. The results are in accordance with the results of [5] in gladiolus. The results pertaining to spike length are in accordance with earlier reports of [6]. The balanced supply of nitrogen from biofertilizers and organic sources promotes the translocation of phytohormones to the shoots [7]. The results are in accordance with [8] in gladiolus. Vermicompost might have role in supply of macro and micronutrients, enzymes and growth hormones and provides micronutrients such as Zn, Fe, Cu, Mn, etc in an optimum level which help in proper flower development [9]. Increased rachis length (21.33 and 31.08%, respectively) was observed upon treatments of FYM + biofertilizers as compared to the untreated plants in tuberose [10].

Poultry manure is good source of nitrogen and other nutrients and releases nitrogen at slower rate which is helpful for the plant growth at later stages of the plant [11] In marigold, maximum flowering duration, flower diameter, number of petals per flower, number of flowers per plant was obtained in the treatment of poultry manure (12.5%) [12] The results of diameter of florets support the role of six kinds of organic substrates along with inorganic fertilizers in improving the flower yield of *Anthurium andreanum* cv "Meringue" by using [13]. Additions of organic manures add a wide range of nutrients to the plants that help in the maintenance of healthy status and increase in various flowers attributes. It has been reported that maximum flower yield was found in rose with application of VAM + vermicompost + FYM (14).

Post harvest parameters

Biofertilizers acts an effective fungal antagonist which helps in better uptake of micronutrients and also gives strength to combat diseases [15] The activity of fungus might have helped in retaining quality of flower for long time. The above results were in agreement with the findings that biofertilizers and reduced doses of nitrogen improved the flowering and yield of gladiolus [16]. This variation in vase life in different spikes of the plants treated types of manures and biofertilizers might be due to overall food and nutrient status of flowers under these treatments. Application of organic manures influenced flower longevity due to the increased nutrient uptake by plant and greater development of water conducting tissues. It might also be due to the presence of ethylene inhibitors or due to presence of cytokinins which delay senescence of florets. These findings were in conformity with the findings in carnation [17]

Bulb and bulblets parameter

Beneficial effect of organic manures and biofertilizers in improving plant growth and yield has been reported in china aster [18]. Increase in bulb yield due to the application of biofertilizers might be due to enhanced N availability to the plants which might increase average number of bulblets, average diameter and weight of bulbs. Pseudomonas has plant growth promoting activity along with it helps in solubilisation of 'P' and other micro nutrients. This might have helped in production of more bulblets and growth of bulblets and increasing the bulb weight. These results were in line as reported in gladiolus [8,19]. The bulb yield, colour and consistency by the application of 50 or 100 t /ha farmyard manure and vermicompost increased the bulb yield in tulip [20]. Vermicompost is a rich source of micro and macro nutrients, Fe and Zn might have enhance the microflora and enzymatic activity which might have augmented the plant growth [21]. The positive effect of vermicompost on plant growth has been reported in gladiolus cv. White Prosperity [22]

CONCLUSION

It may be concluded that the application of vermicompost (2 kg/ m^2), poultry manure (0.5 kg/ m^2) and *Pseudomonas fluoroscens* (40 g/ m^2) showed significant improvement in vegetative growth, flowering and bulb and bulblets attributes through increased availability of various nutrients in the soil. Therefore, it is beneficial for tuberose cultivation and may be recommended for quality flower production of tuberose var. Shringar in *Tarai* region.

REFERENCES

1. Maiti, R.G.1999. Tuberose. In: T.K. Bose (ed) Floriculture and Landscaping. Naya Prokash, Calcutta, pp 505-514.

2. Gomez, L.A. and Gomez, A.A. 1984. Statistical Procedure for Agricultural Research, *John Wiley and Sons*, 680p.

3. Gayathri, H. N., Jayaprasad, K. V. and Narayanaswamy, P. 2004. Response of biofertilizers and their combined application with different levels of inorganic fertilizers in statice (*Limonium caspia*).*Journal of Ornamental Horticulture*, 7: 70-74.

4. Vijay Kumar and Singh, A. 2007. Effect of vermicompost and VAM inoculation on vegetative growth and floral attributes in China aster (*Callistephus chinensis* L.) Journal of Ornamental Horticulture, 10(3): 190-192

5. Dubey, R.K., Kumar, P., Singh, N. and Kumar, R. 2008. Effect of *Trichoderma viride* and *Pseudomonas fluorescens* on growth and flowering of gladiolus. *Indian Journal of Ecology,* 35(1): 97-98.

6. Shankar, L., Lakhawat, S. S. and Choudhary, M. K. 2010. Effect of organic manures and biofertilizers on growth, flowering and bulb production in tuberose. *Indian Journal of Horticulture*, 64(4): 554-556.

7. Marschner, H. 1983. Introduction to the mineral nutrition of plants. *A Handbook of Plant Physiology,* 154 : 31-38.

8. Preetham, S.P., Kumar, P. and Sah, H. 2010. Effect of organic manures and biofertilizers on growth, yield and flower quality of gladiolus (*Gladiolus hybrida*) cv. White Prosperity. *Annals of Horticulture,* 3(2): 195-198.

9. Vasanthi, D. and Kumarswamy, K. 1999. Efficacy of vermicompost to improve soil fertility and rice yield. *Journal of Indian Society of Soil Sciences,* 47(1) : 268-271.

10. Barman, D., Datta, M., De L.C. and Banik, S. 2003. Efficacy of phosphate solublizing and phytohormone producing bacteria on growth and yield of tuberose in acid soil of Tripura. *Indian Journal of Horticulture,*60(3): 303-306.

11. Joshi, M. and Prabakarshetty, T.K. 2005. Sustainability Through Organic Farming, Kalyani Publishers. New Delhi, 209-210p.

12. Shubha, B. M. 2006. Integrated nutrient management for growth, flowering and xanthophyll yield of marigold (*Tagetes erecta* L.). M.Sc. (Ag.) Horticulture thesis submitted to University of Agricultural Sciences, Dharwad, Karnataka.

13. Waheeduzzama M, Jawaharlal M, Arulmozhiyan R and Indhumathi K. 2006. Effect of integrated nutrient management practices on flower quality and vase life of *Anthurium andreanum* cv. Meringue. *Journal of Ornamental Horticulture,* 9(2): 142-144.

14. Singh, B. R., Gurav, S. B., Katwate, S. M., Chaudhary, S. M., Kakade, D. S. and Patil, M. T. (2006). Integrated nutrient management in rose. National Symposium on Ornamental Bulbous Crops.5-6 Dec.2006, SVBPUA&T, Meerut.pp-66

15. Mazhabi, M., Nemati, H., Rouhani, H., Tehranifar, A., Mahdikhani., E. and Kaveh, H. 2011. How May *Trichoderma* Application Affect Vegetative and Qualitative Traits in Tulip "Darwin Hybride" Cultivar. *J. Biol. Environ. Sci.,* 5(15), 177-182

16. Dalve, P. D., Mane, S. V. and Nimbalkar, R. R. 2009. Effect of biofertilizers on growth, flowering and yield of gladiolus. *Asian Journal of Horticulture*, 4(1): 227-229.

17. Bhalla, R., Kanwar, P., Dhiman, S. R. and Jain, R. 2006. Effect of biofertilizers and biostimulants on growth and flowering in gladiolus. *Journal of Ornamental Horticulture*, 9(4): 248-252.

18. Mogal S A, Khiratkar S D, Chopde N K, Dalvi A M, Kuchanwar O D and Khobragade Y R. 2006. Effect of organic manures and biofertilizers with reduced doses of nitrogen on growth, yield and quality of china aster. *Indian Journal of Soils and Crops,* 16(1): 180-185.

19. Dubey, R. K. and Misra, R. L. 2005. Response of chemical and bio-fertilizers on corm and cormel production in gladiolus. *Progressive Horticulture,* 37 (2): 412-18.

20. Jhon, A. Q., Mir, M. M., Nelofar. and Khan, F. U. 2007. Response of organic manure and inorganic fertilizers on growth and bulb production in tulip (*Tulipa gesneriana* Linn.). *Journal of Ornamental Horticulture*, 10(3): 157-160.

21. Atiyeh, R. M., Edwads, C. A., Subler S. and Metzer, J. D. 2000. Earthworm processed organic wastes as components of horticultural potting media for growing marigold and vegetable seedlings. *Compost Science and Utilization,* 8: 215-233.

22. Gangadharan, G. D. and Gopinath, G., 2000. Effect of organic and inorganic fertilizers on growth, flowering and quality of gladiolus cv. White Prosperity. *Karnataka Journal of Agricultural Sciences*, 11 (3) : 401-405.