

Response of various organic manures and its combinations on growth, flowering and cormels of gladiolus

ABSTRACT

A field experiment was conducted at Agriculture Farm School of Agricultural Sciences and Technology, RIMT University, Mandi Gobindgarh (Punjab) during November-April (2022-23) to study the response of various organic manure and its combination on growth, flowering and corm attributes of gladiolus cultivar Punjab Dawn. The experiment consist ten treatments by combining cow dung, cow urine, milk, curd, ghee, jiggery, flour, soil, water, pulse flour, mustard oil and honey at different amount along with control and replicated thrice. Treatment T₇ recorded with minimum days to sprouting (17.44 days), tallest plant height (88.97 cm), maximum leaf length (38.16 cm), wider leaf breadth (2.80 cm), minimum days to complete sprouting (8.00 days), minimum days to spike emergence (99.55 days) and lesser days to first colour shown (103.11 days) whereas, more number of leaves/plant (10.11), greater weight of individual cormel (0.43 g), weight of cormels/corm (3.04 g) and greater cormel diameter (cm) were measured with treatment T₅ and maximum rachis length (37.96 cm), longer duration of flowering (6.14 days) and more number of cormels/corm (8.51), were resulted by treatment T₂, T₆ and T₃, respectively.

KEYWORDS:

1. INTRODUCTION

Gladiolus botanically called *Gladiolus grandiflorus* L. ($2n = 30$) belonging to the family Iridaceae. It is one in all the foremost cultivated, artificial cut flower worldwide. Gladiolus is native to climate zone climate of African nation [25]. The rubric Gladiolus includes regarding hundred and eighty species with over 10,000 cultivars of that regarding twenty species completed grown commercially for cut flower product [3]. It's a downtime season crop still are frequently completely grown throughout season in low rain areas with delicate climate. Gladiolus is allowed as queen of the bulbous shops, its big selection in shat has forms, color and color duos that makes it all well-liked for floral arrangement [18]. Organic manure is a natural product used by producers to offer food (food nutrients) to crop shops. Organic coprolites include yard ordure, inexperienced coprolites compost made from crop remnants and essential ranch wastes, vermicompost, oil planting galettes and natural wastes - beast bones, bloodbath home rubbish. It is the most natural and chemical-free ingredient for increasing crop output and improving soil product performance. There are two types of organic manure in the market i.e. bulky organic manure, which contains farm yard manure that is a mixture of materials such as bovine dung, urine, litter or crop straw and among others. It is left there to decompose until it is removed and planted in the fields. This compost will be ready in three to four months and contains 0.50% N, 0.20% P₂O₅ and 0.50% K₂O in well-rotted manure. Concentrate Organic Manure is the second sort of organic manure, when oil is removed from oil seeds, the remaining solid part is dried into cake form and can be utilized as manure. It improves the physicochemical and biological composition of the soil as well as removes the deficiency of essential nutrients and this leads to healthy growth of plants and increases the production of crops. Due to this, the storage capacity and food composition of horticultural crops is improved and its quality also improves and their nutritional value is also seen to have a good effect [33]. Another organic manure manufactured from five different cow byproducts, including cow dung, cow urine, cow milk, cow ghee and cow curd, also called

Panchgavya. It could perhaps play a part in fostering growth and supplying immunity in factory systems, consequently supplying resistance against blighters and circumstances. Jeevamrit is made by combining 1 kg dung, 1 liter urine, 200 g jiggery, 200 g flour and 100 g soil in a large tank, keeping the tank in the shade, covering it with a breathable jute bag, and leaving it. The mixes were incubated in the shade for 5 days and forcefully stirred with a wooden stick for 10-15 minutes three times a day. Amritpani is known as elixir for dead soil. It contains wide range nutrients which not only improve the soil physical, chemical and biological health, but also stimulate plant growth, yield and quality. For preparation of Amritpani, cow dung, cow ghee, honey and water are mostly used. Preparation of Amritpani requires 1 kg fresh cow dung, 1 liter fresh cow urine, 1 kg green neem leaves, 1 kg pulse flour, 100 g jiggery and 10 liters water in cow urine for 12 hours. For vegetables, root dipping in Amritpani can be done prior to transplanting of seedlings [28].

2. MATERIALS AND METHODS

A field experiment was conducted at Agriculture Farm School of Agricultural Sciences and Technology, RIMT University, Mandi Gobindgarh (Punjab) during November-April (2022-2023). The experiment field has light clay loamy soil with normal organic matter, uniform topography and good drainage facility. The treatments consist of T₀: Control, T₁: Cow urine + cow dung (2 L + 1 kg), T₂: Cow milk + cow curd (1 L + 1 L), T₃: Cow dung + cow urine + milk + curd + ghee (500 g + 500 ml + 100 ml + 100 ml + 500 g), T₄: Cow urine + jiggery + flour (2 L + 500 g + 500 g), T₅: Cow dung + soil + jiggery + water (2 kg + 1 kg + 0.5 kg + 15 l), T₆: Cow dung + cow urine + pulse flour + jiggery (500 g + 400 ml + 100 g + 100 g), T₇: Mustard oil + honey (500 ml + 250 ml), T₈: Cow dung + honey + water (1 kg + 250 ml + 200 ml) and T₉: Water + cow dung + jiggery + mustard oil (1 L + 500 g + 25 gm + 12.50 ml). The experiment contains ten treatments and replicated thrice under randomized block design (RBD). The obtained data on growth, flowering and corms were subjected to statistical analysis of variance method [21].

3. RESULTS AND DISCUSSION

The data pertaining on growth parameters depicted in table 1. The minimum number of days taken to sprouting (17.44 days) was resulted in treatment T₇ whereas, treatment T₀ was recorded with maximum number of days to sprouting (22.33 days). The early sprouting of gladiolus corm may be because the application of organic manures improved soil texture by loosening the soil, preventing the formation of soil crust and increasing water holding capacity as well as proper aeration that may be resulting in earlier corm sprouting. The results can be conformity with the findings of [11] and [30]. The tallest plant height (88.97 cm) was resulted by treatment T₇ while, smallest plant (82.37 cm) was measured under T₀ (control). The probable reason for increasing plant height in the best treatment is due to application of organic manures i.e. FYM act as a slow release and rich in nutrients, a small amount of nitrogen is directly available to the plant while a large portion is made available when the FYM decomposes [24]. Same results were also reported by [37] and [35]. The maximum number of leaves/plant (10.11) were counted with treatment T₅ whereas, lesser number of leaves/plant was counted in treatment T₀ (8.55). Increasing the number of leaves with application of organic manure may be due to increased nitrogen availability as it is a constituent of protein, component of protoplast and increases the chlorophyll content in leaves. All these factors contribute to cell multiplication, cell enlargement and differentiation which could have resulted in better photosynthesis and ultimately exhibited better vegetative growth [9] and [38]. Present findings were according with the findings of [38] and [13]. The maximum leaf length (38.16 cm) was

measured by treatment T₇ whereas, treatment T₀ recorded with minimum leaf length(32.55 cm). The increase leaf length particularly may be due to the availability of more nitrogen continuously due to application of chemical and bio fertilizers resulting into abundant vegetative growth. Phosphorus stimulates root system through efficient translocation of certain growth stimulating substance formed in plant, which may have enhanced the absorption of nutrients thus resulting in a vigorous growth. Plant supplied with high phosphorus and potassium with nitrogen continuously maintains vegetative growth. Nitrogen is a constituent of protein, component of protoplast and increases the chlorophyll content in leaves [4] and [15].The widest leaf breadth (2.80 cm) was measured under by treatment T₇ and narrowest leaf breadth(1.63 cm) was observed by treatment T₀ (control). Application of RDF with biofertilizers promoting the leaf width influenced with nitrogen application, because nitrogen is an essential part of nucleic acid, which play vital role in promoting leaf area. All these factors contribute to cell multiplication, cell enlargement and differentiation which could have resulted in better photosynthesis and ultimately exhibited better vegetative growth [27] and [29].The minimum number of days taken to complete sprouting (8 days) was reported in treatment T₇ whereas, treatment T₁ was recorded with maximum number of days to complete sprouting (10 days). The earliness in sprouting may be due to the inoculation with bacterial mixtures provided a more balanced nutrition for plants and optimum absorption of organic and inorganic by corms enhanced the physiological process and improved the germination. Which promotes the sprouting by enhanced cell division and enlargement, leading to proper germination? Results are in consonance with finding of [10], [2] and [27].

Table 1 is having the result related on flowering parameters.The minimum days to spike emergence (99.55 days) were counted in treatment T₇ and treatment T₂ counted with maximum number of days to spike emergence(102.73 days). It may be due to the early loss of apical dominance, followed by easier and better nutrient translocation to the plant, that may improved plant growth due to increased nutrient availability, and accelerated mobility of photosynthates from source to sink as influenced by growth hormones released or synthesized from organic manures that may be enhanced to early spike emergence. These findings are conformity with the results obtained by [26], [20] and [17]. The minimum days to first colour shown (103.11days) was counted in treatment T₇ whereas, treatment T₈ observed with maximum number of days to first colour shown (111.44 days). Initiation in the best treatment is due to application of FYM increases the concentration of phosphorus and potassium due to solubility effect of certain organic matter, the increased microbial activity due to the application of FYM enhanced the process of mineralization that lead to more uptake phosphorus and potassium. Similar results were also reported by [1], [22],[23] and [16].The longest rachis length (37.96 cm) was found in treatment T₂ whereas, treatment T₀ resulted smallest rachis length(33.32 cm). Rachis length may have increased due to increased nutrient availability from organic manure and translocation of higher amounts of photosynthesis, and maintenance of proper physiological activities of the plant, resulting in more food, which may have been used for better rachis length development. Similar findings were also reported by [19], [32], [34], [10] and [6].The maximum duration of flowering (6.14 days) was counted in treatment T₆ while, treatment T₀ shows minimum duration of flowering(5.03 days). The beneficial effect of INM of earliness of spike emergence could be attributed to the good vegetative and reproductive growth of plant which in turn resulted in early floret opening [12].

The cormel parameters are cited in table 1.The more number of cormels/corm (8.51) were counted in treatment T₃ whereas, treatment T₉ was recorded with minimum number of cormel/corm (7.11).Treatment T₆ resulted maximum

weight of individual cormel(0.45 g) and minimum weight of individual cormel(0.38 g) was obtained with treatment T₀.The maximum weight of cormel/corm (3.04 g) was resulted in treatment T₅ whereas, treatment T₁ (control) was recorded with minimum weight of cormel/corm (3.02 g).Better cormels production might be due to combine application of organic manure and bio fertilizers, they have stored more carbohydrates through effective photosynthesis. The increase in corms weight might be due to storage of carbohydrates and nitrogen compounds in the corms. Sufficient N and P continuously maintain vegetative growth leading to increase in photosynthetic area, resulting in more accumulation of assimilates and partitioning to the developing corms and cormels. This may be due to ability of organic manure and bio fertilizers to produce growth promoting substances such as IAA and gibberellins like substances viz., vitamins and riboflavin's etc. which might have helped in increasing size and weight of corms and cormels. Similar findings were also reported by [5], [14], [7] and [31].The maximum cormel diameter (0.51 cm) was measured in treatment T₅ and treatment T₃ was recorded with minimum cormel diameter (0.43 cm). Increase in average diameter and weight of corms and cormels due to application of biofertilizers might be due to fact that it increased nutrients availability to the plants, which increases photosynthetic activity of the plants and thereby, hastening the movement of photosynthetic sink towards the source (corm). Moreover, it also increases carbohydrates and auxin concentration in the roots resulting in thicker and well branched roots as observed by [29] and [8].

4. CONCLUSION

It is concluded that a significant effect of various organic manures and its consortium was observed on growth, flowering and cormel attributes of gladiolus. Most of the parameters i.e. days to sprouting (days), plant height (cm), leaf length (cm), leaf breadth (cm) days to complete sprouting (days), days to spike emergence (days) and days to first colour shown (days) are significantly enhanced by the application of mustard oil + honey (500 ml + 250 ml) while, application of cow dung + soil + jiggery + water (2 kg + 1 kg + 0.5 kg+ 15 l) exerted highly positive effect on number of leaves/plant, weight of individual cormel (g), weight of cormels/corm (g) and cormel diameter(cm).

References:

1. Anuburani A, Kavita R. Effect of integrated nutrient management on growth and yield in jasmine (*Jasminum auriculatum*). South Indian journal of Horticulture. 2006;54(1-6):323-328.
2. Chaudhary N, Swaroop KJ, Biswas T, Singh G. Effect of integrated nutrient management on vegetative growth and flowering characters of gladiolus. Indian Journal Horticulture. 2014;70(1):156-159.
3. Chauhan LS. Performance study of different Gladiolus cultivars under Indore condition (*Gladiolus hybridus* H.) M. Sc. Thesis. 2005.
4. Dalve PD, Mane SV, Nimbalkar RR. Effect of biofertilizers on growth, flowering and yield of ladiolus. The Asian Journal of Horticulture. 2009;4(1):227-229.
5. Dubey RK, Misra RL. Response of chemical and biofertilizers on corm and cormel production in gladiolus. Progressive Horticulture. 2005;37(2):412-4118.
6. Durga LM, Raju DVS, Pandey RN, Pandey R, Kumar P, Singh KP. Integrated use of NPK fertilizer with FYM influences growth, floral attributes, soil fertility and nutrient uptake of Gladiolus in an Inceptisol of semi-arid tropics. Indian Journal of Horticulture. 2018;75(1):119-123.

7. Jha S, Sharma GL, Dikshit SN, Patel KL, Tirkey T, Sarnaik DA. Effect of vermin compost and FYM in combination with inorganic fertilizer on growth, yield and flower quality of Gladiolus. *Journal of Soils and Crops*. 2012;22(2):253-257.
8. Karthiresan C, Venkatesha J. Effect of bio-fertilizers with the levels of N and P on gladiolus. *Floriculture research trend in India. Proceedings of National Symposium on Indian Floriculture in the New Millennium, Bangalore*. 2002;118-121.
9. Kashyap R, Chaudhary SVS, Diltla BS, Sharma BP, Gupta YC. Integrated nutrient management in tuberose (*Polianthes tuberosa* L.). *International Journal of Farm Sciences*. 2014;4(1):55-59.
10. Kumar M. Effect of different sources of nutrients on growth and flowering in, gladiolus (*Gladiolus hybridus*) cv. Peater Pears. *Annals of Horticulture*. 2014;7(2):154-158.
11. Kumar R, Misra RL, Singh SK. Postharvest life of Gladiolus cv. Jester Gold as influenced by different doses of nitrogen, phosphorus and potassium. *Indian Journal of Horticulture*. 2010;67(1):399-402.
12. Kumari RV, Kumar DP, Arunkumar B, Mahadevamma M. Effect of integrated nutrient management on floral and cormel parameters in gladiolus (*Gladiolus hybridus*). *International Journal of Agriculture Science*. 2014;10(1): 15-22.
13. Kumari S, Yadav KS, Kaur H, Kishor S. Effect of *Azotobacter* and *Pseudomonas* along with various levels of NPK on growth and flowering of marigold cv. Pusa Narangi Gainda. *International Journal of Agricultural Sciences*. 2021;17(2):522-527.
14. Lehri SM, Kurd AA, Rind MA, Bangulzai NA. The response of *Gladiolus tristis* L. to N and P₂O₅ fertilizers. *Sarhad Journal of Agriculture*. 2011;27(2):185-188.
15. Monika, Yadav KS, Chandla A. Effect of different potting mixtures on growth and flowering characters of Chrysanthemum cv. Haldighati. *Flora and Fauna*. 2021;27(1):20-26.
16. Monika, Yadav KS, Chandla A. Response of potting mixtures against growth and flowering of chrysanthemum cv. Haldighati. *International Journal of Agricultural Science and Research*. 2021;11(2):15-20.
17. Narendra C, Swaroop K, Janakiram T, Biswas DR, Singh G. Effect of integrated nutrient management on vegetative growth and flowering characters of Gladiolus. *Indian Journal of Horticulture*. 2013;70(1):156-159.
18. Negi R, Kumar S, Dhiman SR. Evaluation of different cultivars of Gladiolus suitable for low hills of Himachal Pradesh. *Indian Journal of Science Research and Technology*, 2014;2(6): 6-11.
19. Padanagur VG, Mokashi AN, Patil VS. Flowering, Flower quality and yield of Tuberose as influenced by vermicompost, farmyard manure and Fertilizers. *Karnataka Journal of Agriculture Science*. 2005;18(3):729-734.
20. Panchal RV, Parekh NS, Parmar AB, Patel HC. Effect of biofertilizers and nitrogenous fertilizer on growth, flowering and yield of annual white chrysanthemum (*Chrysanthemum coronarium* L.) under middle Gujarat agroclimatic conditions. *Asian Journal of Horticulture*. 2010;5(1):22-25.
21. Panse VG, Sukhatme PV. *Statistical methods of agricultural workers*. Indian Council of Agricultural Research, New Delhi. 1964;359-372.
22. Prasad L, Saravanan S, Lall D, Singh V. Effect of Organic Manure and Inorganic Fertilizer on Plant Growth and Flower Yield of Asiatic Lily (*Lilium longiflorum*) sp. *Zephyranthes*. *Environment and Ecology*. 2017;35:929-932.

23. Prasad SH, Prasad VM, Kumar S, Bose SC. Effect of Integrated Nutrient Management on Growth of Dahlia (*Dahlia variabilis* L.) cv. Kenya orange. *Bulletin of Environment, Pharmacology and Life Sciences*. 2018;1(1):04-10.
24. Sahu D, Prasad VM, Fatmi U. Effect of NPK on organic manures of flowering and flower yield of dahlia (*Dahlia variabilis* L.) cv. Kenora Sunburst. *International Journal of Current Microbiology and Applied Sciences*. 2021;10(3):643-650.
25. Saleem M, Ahmad I, Khan MA. Cultivar Effects on Growth, Yield and Cormel Production of Gladiolus. *Journal of Ornamental and Horticultural Plants*. 2013;3(1):39-48
26. Sharma U, Chaudhary SVS, Chauhan J. Effect of sources of applied nutrients on the growth, flowering and seed production of China aster under protected conditions. *Haryana Journal of Horticulture Science*. 2009;38(3&4):189-190.
27. Sharma U, Chaudhary SVS, Thakur R. Response of gladiolus of to integrated nutrient management. *Haryana Journal Horticulture Science*. 2008;37(3&4):285-286.
28. Solanki SPS, Telkar SG, Hota D, Kant K, Dey JK. Folk liquid manures for sustainable horticulture. *International Journal of Economic Plants*. 2015;2(4):175-77.
29. Srivastava R, Govil M. Influence of biofertilizers on growth and flowering in gladiolus cv. American Beauty. *ISHS Acta Horticulture International Conference and Exhibition on Soil less Culture (ICESC)*. 2004;42:183-188
30. Susheela T, Chandrasekhar R, Vijaya BV, Salomi SDR, Umakrishna K. Effect of spacing, bulb size and depth of planting on growth, flowering and vase life of tuberose (*Polianthes tuberosa* L.) cv. Suvasini. *The Bioscan*. 2016;11(4):2715-2720.
31. Tirkey P, Kullur LR, Prasad VM. Effect of organic and Inorganic source of NPK on growth and yield parameters of gladiolus (*Gladiolus grandiflorus*) cv. Jester. *Journal of Pharmacognosy and Phytochemistry*. 2017;6(5):1004-1006.
32. Tripathi SK, Malik S, Singh IP, Dhyani BP, Kumar V, Dhaka SS, Singh JP. Effect of integrated nutrient management on cut flower production of tuberose (*Polianthes tuberosa* L.) var. Suvasini. *Annals of Horticulture*. 2012;5(1):108-115.
33. Verma P, Tomar B, Tripathi KL. Role of Organic Manure in Agriculture: A Review. *MarumeghKisaan E- Patrika*. 2021;6(3):22-28.
34. Wasim M, Gupta NK, Dubey S, Mohanty A. Effect of Inorganic Fertilizers in Combination with Bio-fertilizers on Growth and Yield of Tuberose (*Polianthes tuberosa*). *Indian Horticulture Journal*. 2014;(1):37-42.
35. Yadav KS, Kumari S, Chingangbam RS, Kishor S. Response of different biofertilizers and NPK levels on growth and flowering of marigold cv. Pusa NarangiGainda. *Agriways*. 2021;9(2):153-157.
36. Yadav KS, Pal AK, Singh AK, Yadav D, Mauriya SK. Effect of different bio-fertilizers on growth and flowering of marigold. *Journal of Pharmacognosy and Phytochemistry*. 2018;7(1):1548-1550.
37. Yadav KS, Pal AK, Singh AK, Yadav D, Mauriya SK. Influence of different bio-fertilizers and its consortium on growth, flowering and seed yield of marigold. *International Journal of Pure and Applied Biosciences*. 2017;5(6):1660-1665.
38. Yadav SK, Kumar C, Singh R. Effect of biofertilizers on floral characters of gladiolus. *Orissa Journal of Horticulture*. 2005;33(2):66-72.

UNDER PEER REVIEW

Table 1. Response of various organic manures and its combination on growth, flowering and cormel parameters of gladiolus.

Treatments	Days to Sprouting (days)	Plant height (cm)	Number of leaves/plant	Leaf length (cm)	Leaf breadth (cm)	Days to complete sprouting (days)	Days to spike emergence (days)	Days to first colour shown (days)	Rachis length (cm)	Duration of flowering (days)	Number of cormels/corn	Weight of individual cormel (g)	Weight of cormels /corn (g)	Cormel diameter (cm)
T ₀	22.33	82.37	8.55	32.55	1.63	9.00	101.57	107.88	33.32	5.03	7.33	0.38	3.02	0.50
T ₁	19.67	84.17	9.84	35.26	2.24	10.00	102.42	108.00	36.53	5.78	8.00	0.38	3.03	0.47
T ₂	18.26	86.64	9.11	34.27	2.56	9.00	102.73	109.69	37.96	6.13	7.29	0.43	3.02	0.46
T ₃	18.33	82.58	8.82	33.56	2.04	8.33	99.88	108.55	37.12	6.10	8.51	0.43	3.02	0.43
T ₄	20.75	86.03	9.86	35.66	2.08	10.00	102.22	105.66	37.71	5.22	7.59	0.41	3.03	0.43
T ₅	17.55	87.41	10.11	36.00	2.77	9.00	102.48	106.66	37.74	5.83	8.29	0.45	3.04	0.51
T ₆	20.01	84.97	9.23	35.46	2.04	8.66	101.07	109.11	35.40	6.14	7.66	0.41	3.02	0.36
T ₇	17.44	88.97	10.10	38.16	2.80	8.00	99.55	103.11	37.73	6.06	7.85	0.38	3.03	0.49
T ₈	20.41	85.68	10.00	32.55	2.28	10.33	100.95	111.44	36.34	5.65	8.40	0.43	3.03	0.47
T ₉	19.14	87.60	9.23	34.76	2.23	9.33	101.22	108.66	37.25	5.90	7.11	0.43	3.04	0.41
Sem	0.72	1.015	0.250	1.082	0.210	0.426	0.784	1.62	0.82	0.18	0.37	0.0199	0.0049	0.0282
CD at 5%	2.14	3.017	0.743	3.217	0.624	1.265	2.33	4.82	2.459	0.54	1.10	0.0590	0.0144	0.0837