



Effect of Integrated Nutrient Management on Vegetative Growth and Floral Attributes in Gladiolus

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ABSTRACT

The present experiment was conducted to study the effect of nutrient management on vegetative growth and floral attributes in gladiolus cv. saffron at college premises, Horticultural Research cum Instructional farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur during the year 2021-22. The experiment was laid out in Randomized Block Design (RBD) with three replications having ten treatment combinations. The result showed that T₅ [75% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45 (Once)] recorded earliest 50% sprouting of corms (12.67d), more number of shoots per plant (1.40), maximum plant height 34.20 cm and 69.07 cm at 25 and 50 DAP respectively) and more number of leaves (2.93 and 5.53 at 25 and 50 DAP respectively). Similarly in flowering attributes, earliest in spike emergence (69.20d), first floret open (75.40d), more number of spike per plant (1.40), Maximum spike length (78.50 cm) and rachis length (46.23 cm) was observed in treatment T₅ (75% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45).

Key Words: RDF, FYM, Vermicompost, Azotobacter, PSB

INTRODUCTION

Gladiolus (*Gladiolus grandiflorus* L.) is one of the most popular bulbous cut flowers grown in India and other countries. Gladiolus is known as Queen of bulbous ornamental Plant. It is native of South Africa and belongs to family Iridaceae. Gladiolus is highly nutrient loving crop. It is generally propagated by corms and cormels. Gladiolus spikes are mainly used for interior decoration and bouquet manufacturing. Gladiolus is also utilized in herbaceous borders, bedding purpose and for flower arrangements etc. In some regions of Africa, gladiolus is used for medicinal purpose for treatment of diarrhea, constipation and colds. It is also used to cure hypochondriacs and boosts mood and energy level.

Integrated Nutrient Management (INM) is the judicious application of chemical fertilizers along with organic fertilizers to get higher net returns without affecting the physical conditions of soil. Application of organic manures, bio-fertilizers and

judicious application of fertilizers help to get more yield and good quality of flowers. Organic manures like Farmyard manure (FYM) and vermicompost play a major role in crop production. Bio-fertilizers like Azotobacter and PSB when applied to soil, seed and other planting materials can mobilize the availability of nutrients through biological activity such as biological nitrogen fixation from atmosphere. These also help in the development of micro-flora and hasten certain microbial process to increase the availability of nutrients in a form which can be easily assimilated by the plants.

MATERIALS AND METHODS

The experiment was carried out during the year 2021-22 to study the effect of nutrient management on vegetative growth, floral attributes and corm production in gladiolus cv. saffron at college premises, Horticultural Research cum Instructional farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur. The experiment was laid

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out in Randomized Block Design (RBD) with ten treatments and three replications to analyse the effect of the treatments in vegetative growth, floral attributes and corm production in gladiolus. The field experiment comprised of ten treatments *i.e.* T₁: Control (100% RDF) (150:200:100 kg NPK/ha), T₂: 100% RDF + 0.3% foliar spray of WSF 13:0:45 (Twice), T₃: 75% RDF + FYM@12.5t/ha + 0.3% foliar spray of WSF 13:0:45 (Twice), T₄: 75% RDF + Vermicompost@2.5t/ha + 0.3% foliar spray of WSF 13:0:45 (Twice), T₅: 75% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45 (Once), T₆: 75% RDF + Vermicompost@2.5t/ha + 0.3% foliar spray of WSF 13:0:45 (once), T₇: 60% RDF + FYM@12.5t/ha + 0.3% foliar spray of WSF 13:0:45 (Twice), T₈: 60% RDF + Vermicompost@2.5t/ha + 0.3% foliar spray of WSF 13:0:45 (Twice), T₉: 60% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45 (Once), T₁₀: 60% RDF + Vermicompost@2.5t/ha + 0.3% foliar spray of WSF 13:0:45 (once).

RESULTS AND DISCUSSION

Growth Parameters

Days to sprouting of corm

For sprouting of 50 percent of corms, minimum number of days (12.67) was taken by treatment T₅ [(75% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45 (Once)] which was significantly superior over T₁, T₂, T₇, T₈, T₉ and T₁₀. However, the result obtained in T₅ was statistically *at par* with the treatments T₆, T₃ and T₄. The maximum number of days (20.33) taken for sprouting of 50 per cent of corms was recorded in treatment T₁ (Control: 100% RDF). It might be due to the inoculation with bacterial mixtures like *Azotobacter* and PSB which provide more balanced nutrition to the plant and optimum absorption of bio-fertilizers by corm hasten the physiological process and also help in increasing the availability of nitrogen and phosphorus into the plant system and improve the sprouting phenomenon. The result was in

accordance with the findings of Ali *et al* (2013) and Adhikari *et al* (2018).

Number of shoots per plant

The result of the number of shoots per plant indicates that application of different treatments was found non-significant with respect to number of shoots per plant. Maximum number of shoots per plant (1.40) was obtained in the treatment T₅, whereas minimum number of shoots per plant (1.13) was observed in T₁.

Plant height (cm)

Application of different treatments was found non-significant with respect to plant height at 25 DAP. Maximum plant height at 25 DAP (34.20 cm) and minimum plant height at 25 DAP (28.67 cm) were noticed in treatment T₅ and T₁ respectively. But in 50 DAP, the treatment was found significant difference among the treatments and maximum plant height (69.07 cm) was observed in treatment T₅. The result of maximum plant height at 50 DAP in the treatment T₅ was found superior over T₁, T₂, T₇, T₈, T₉ and T₁₀ and the result obtained in T₅ were found statistically *at par* with the treatments T₆, T₃ and T₄. However, minimum plant height was observed in treatment T₁ (60.50 cm). Maximum plant height in treatment T₅ at 50 DAP may be due to the presence of readily available form of nitrogen by the application of *Azotobacter* inoculum. The increased availability of nutrient with increase in organic sources like FYM and vermicompost (T₅ and T₆) that may be resulted in the enhancement of vegetative growth and thus increase the plant height. This result was in accordance to the findings of Ali *et al* (2013) and Basant *et al* (2020) in gladiolus and tuberoses respectively. Mandavi *et al* (2018) and Devi *et al* (2019) also found alike results in gladiolus.

Number of leaves per plant

Non-significant result was obtained by the application of different treatments at 25 DAP. Maximum number of leaves per plant (2.93) in

Table 1. Effect of Integrated Nutrient Management on Vegetative growth in Gladiolus cv. Saffron.

Treatment	Days to sprouting of corm	Number of shoots per plant	Plant height		Number of leaves per plant	
			25 DAP	50 DAP	25 DAP	50 DAP
T ₁	20.33	1.13	28.67	60.50	2.13	4.40
T ₂	18.67	1.20	29.83	63.27	2.33	4.67
T ₃	14.67	1.33	32.60	68.07	2.73	5.33
T ₄	15.33	1.33	32.63	67.17	2.67	5.33
T ₅	12.67	1.40	34.20	69.07	2.93	5.53
T ₆	13.33	1.33	33.63	68.63	2.87	5.47
T ₇	17.67	1.13	30.40	64.33	2.60	4.87
T ₈	17.33	1.13	30.40	64.07	2.40	4.87
T ₉	16.00	1.20	31.83	65.20	2.67	4.27
T ₁₀	16.67	1.20	30.77	65.07	2.67	4.20
SEm±	0.72	0.07	1.65	1.47	0.16	0.13
C.D(p=0.05)	2.16	NS	NS	4.40	NS	0.38

treatment T₅ [(75% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45 (Once)] and minimum number of leaves per plant (2.13) in treatment T₁ (Control: 100% RDF) were observed at 25 DAP. At 50 DAP, significant difference was observed among the treatments. Maximum number of leaves (5.53) was noted in treatment T₅ which was superior over T₁, T₂, T₇, T₈, T₉ and T₁₀ and was found close to the result of the treatments T₆, T₃ and T₄. Minimum number of leaves (4.40) was recorded in treatment T₁. More number of leaves in treatment T₅ is probably due to the availability of essential nutrient through chemical fertilizer and organic nutrient (FYM). The availability of nutrients especially nitrogen is also increased due to the application of foliar spray of water soluble Potassium nitrate fertilizer (13:0:45) that may be leads to the multiplication and enlargement of plant cell which might enhance the photosynthetic rate and ultimately helped in increasing number of leaves. This result has similarity with the findings of Rajhansa *et al* (2010), Kumar and Saravanan (2019) and Dhakad *et al* (2019) in gladiolus.

Flowering Attributes

Days to spike emergence

Days to spike emergence was found significantly differ among the treatments. Minimum number of days taken for spike initiation (69.20) was observed in treatment T₅ [(75% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45 (Once)]. From the result, significant difference was observed in treatment T₁, T₂, T₇ and T₈, whereas it was observed statistically *at par* with the treatments T₆, T₃, T₄, T₉ and T₁₀, whereas maximum number of days taken for spike emergence (75.47) was observed in T₁ (Control: 100% RDF).

Days to first floret open

Earliest opening of first floret (75.40) was noticed in treatment T₅ [(75% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45 (Once)]. In treatment T₁, T₂, T₇ and T₈ significant difference was observed, whereas treatment T₅ was found statistically *at par* with the treatments T₆, T₃, T₄, T₉ and T₁₀. However, maximum number of days taken for first floret open (82.73) was observed

Table 2. Effect of Integrated Nutrient Management on floral attributes in Gladiolus cv. Saffron.

Treatment	Days to spike emergence	Days to first floret open	Number of spike per plant	Length of spike (cm)	Length of rachis (cm)	Number of florets per spike
T ₁	75.47	82.73	1.13	72.10	41.07	12.27
T ₂	74.47	82.00	1.20	73.70	41.63	12.33
T ₃	70.73	78.47	1.33	77.27	44.87	13.80
T ₄	71.60	78.53	1.33	77.20	44.33	13.73
T ₅	69.20	75.40	1.40	78.50	46.23	14.20
T ₆	70.27	76.87	1.33	77.60	45.07	14.00
T ₇	72.60	79.73	1.13	76.43	42.27	12.67
T ₈	73.33	80.20	1.13	75.67	42.17	12.60
T ₉	71.67	78.60	1.20	76.67	43.10	12.87
T ₁₀	72.33	78.80	1.20	76.57	42.90	12.80
SEm±	1.06	1.20	0.07	0.50	0.72	0.18
C.D(p=0.05)	3.19	3.60	NS	1.50	2.16	0.54

[T₁: Control (100% RDF) (150:200:100 kg NPK/ha), T₂: 100% RDF + 0.3% foliar spray of WSF 13:0:45 (Twice), T₃: 75% RDF + FYM@12.5t/ha + 0.3% foliar spray of WSF 13:0:45 (Twice), T₄: 75% RDF + Vermicompost@2.5t/ha + 0.3% foliar spray of WSF 13:0:45 (Twice), T₅: 75% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45 (Once), T₆: 75% RDF + Vermicompost@2.5t/ha + 0.3% foliar spray of WSF 13:0:45 (once), T₇: 60% RDF + FYM@12.5t/ha + 0.3% foliar spray of WSF 13:0:45 (Twice), T₈: 60% RDF + Vermicompost@2.5t/ha + 0.3% foliar spray of WSF 13:0:45 (Twice), T₉: 60% RDF + FYM@12.5 t/ha + 0.3% foliar spray of WSF 13:0:45 (Once), T₁₀: 60% RDF + Vermicompost@2.5t/ha + 0.3% foliar spray of WSF 13:0:45 (once)]

in T₁ (Control: 100% RDF). Earliness in spike emergence in the plant was possibly due to increased availability of nutrient with the application of RDF, organic manure along with foliar application of water soluble potassium nitrate (13:0:45) which probably stimulates the faster mobilization of photosynthates and help in early transformation of plant parts from vegetative to reproductive stage. Thus, it may stimulate early emergence of spike and ultimately lead to early opening of first floret. The results can be confirmed from the findings of Meena *et al* (2018) and Baruati *et al* (2018) in gladiolus. Similar observation was also recorded by Meena *et al* (2015) and Kumar and Saravanan (2019) and in tuberose and gladiolus respectively. Application of different treatment was found non-significant with

respect to number of spike per plant. Maximum number of spike per plant (1.40) was obtained in the treatment T₅ while, minimum number of spike per plant (1.13) noticed in T₁.

Length of spike (cm)

Maximum spike length (78.50 cm) was observed in treatment T₅, which was found superior over treatments T₁, T₂, T₇, T₈, T₉ and T₁₀, whereas the result obtained in T₅ were found statistically *at par* with the treatments T₆, T₃ and T₄. Minimum spike length was observed with treatment T₁ (72.10 cm). The longest spike length in treatment T₅ might be due to the application of bio-fertilizer like *Azotobacter* and PSB in combination with inorganic fertilizers that might increase the availability of nitrogen and

other nutrient elements and enhance the level of macronutrients which have positive impact on floral characteristics and ultimately increased the spike length. The results were in confirmation with the findings of Ali *et al* (2013) and Meena *et al* (2018) in gladiolus. Similar results were also reported by Devi *et al* (2019) in gladiolus and Meena *et al* (2015) in tuberose.

Length of rachis (cm)

Longest rachis length (46.23 cm) was observed in treatment T₅. The result was found superior over treatment T₁, T₂, T₇, T₈, T₉ and T₁₀, whereas the result obtained in T₅ were found statistically *at par* with the treatments T₆, T₃ and T₄. Shortest length of rachis was observed in treatment T₁ (41.07 cm). Longest rachis length found in treatment T₅ possibly due to that application of bio-fertilizer like *Azotobacter* accumulate nitrogen near the root zone and PSB increases the availability of phosphorus to the plants resulted in enhancement of the level of macronutrients and other growth promoting substances like vitamin, enzymes and antibiotics to the plant which have positive impact on floral characteristics that may be enhance the plant height and ultimately increase the rachis length. The results were in confirmation with the findings of Adhikari *et al* (2018) in gladiolus and Kabir *et al* (2011) and Basant *et al* (2020) in tuberose.

Number of florets per spike

Highest number of florets per spike (14.20) was noticed in treatment T₅, which give better performance than treatment T₁, T₂, T₇, T₈, T₉ and T₁₀, whereas the result obtained in T₅ were found statistically *at par* with the treatments T₆, T₃ and T₄. However, minimum number of florets per spike observed in treatment T₁ (12.27). Application of bio-fertilizers that may be favourable for the rapid multiplication of bacteria in the rhizosphere which created favourable condition for nitrogen fixation and solubilization of phosphorus along with supply of nitrogen and other essential nutrients for longer

period through inorganic fertilizer and foliar spray that may be responsible for increasing the internodal length and ultimately the number of florets per spike. This result was in close conformity with the findings of Rajhansa *et al* (2010) and Sathyanarayana *et al* (2017) in gladiolus. The result was alike to the observations of Kumar and Saravanan (2019) and Pandey *et al* (2020) in gladiolus and Hadwani *et al* (2013) in tuberose.

CONCLUSION

Different types of treatment combinations significantly influenced vegetative growth and flowering in gladiolus. From the above experiment, it was observed that the treatment T₅ [75% RDF + FYM@12.5t/ha + Azotobacter@ 4 kg/ha + PSB@ 4kg/ha + 0.3% foliar spray of WSF 13:0:45 (Once)] performed better in giving earliest 50% sprouting of corms, more number of shoots per plant, maximum plant height, more number of leaves, earliest in spike emergence, first floret open, more number of spike per plant, Maximum spike and rachis length and more number of florets per spike.

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