International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(4): 3192-3194

Received: 21-05-2019
Accepted: 24-06-2019

Harish K
Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, Karnataka, India

SY Chandrashekar
Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, Karnataka, India

M Hanumanthappa
Department of Agronomy, College of Horticulture, Mudigere, Karnataka, India

M Ganapathi
Department of Crop Physiology, College of Horticulture, Mudigere, Karnataka, India

SK Nataraj
Department of FLA, College of Horticulture, Mudigere, Karnataka, India

Correspondence
Harish K
Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, Karnataka, India

Effect of foliar application of bio-stimulants on growth, flowering and yield of gladiolus cv. Summer Sunshine

Harish K, SY Chandrashekar, M Hanumanthappa, M Ganapathi and SK Nataraj

Abstract
The present study was conducted to determine the effect of bio-stimulants on growth, flowering and yield of Gladiolus cv. Summer Sunshine with eleven treatments such as two concentrations of bio-stimulants sprayed at three frequencies (first, second and third spray at 30, 45 and 60 days after planting) and untreated control. Each treatment was replicated thrice in randomized complete block design (RCBD). The parameters such as plant height (cm), number of leaves, leaf area (cm^2), and leaf area index, were checked as vegetative parameters. Moreover, days taken for initiation of inflorescence, days taken for first floret opening, days to 50% flowering and duration of flowering are the checked flowering parameters whereas number of spikes per plant, spike yield per plot and spike yield per hectare are the yield parameters. Among the different treatments, Biozyme @ 0.4% registered maximum plant height (76.07 cm), maximum number of leaves (11.33), leaf area (1251.96 cm^2) and leaf area index (2.09). Regarding the flowering parameters; among different treatments, minimum number of days taken for initiation of inflorescence (75.00 days) days taken for first floret opening (80.67days), days to 50% flowering (84.67days) and duration of flowering (22.00 days) was recorded in Biozyme at 0.4 per cent. And yield parameters number of spikes per plant (1.51), spike yield per plot (45.30) and spike yield per hectare (2,26,500.00) recorded in Biozyme at 0.4 per cent. However, control recorded minimum in all the parameters.

Keywords: Bio-stimulants, gladiolus, summer sunshine, vegetative and flowering parameters

Introduction
Gladiolus (*Gladiolus hybridus* L.) is a flower of glamour and perfection which is known as the queen of bulbous flowers due to its flower spikes with florets of massive forms, brilliant colors, attractive shapes, varying size and excellent vase life. Gladiolus is grown on flower bed in gardens and used in floral arrangements for interior decoration as well as making high-quality bouquets (Lepcha *et al.*, 2007) [4]. The name gladiolus was originally coined by Pliny the Elder (A. D. 23-79), from the Latin word *gladiolus*, meaning ‘sword' since the leaves of gladiolus resemble the sword and are commonly known as ‘Sword lily'. In Europe, it is called as ‘Corn flag' because *Gladiolus illyricus* was found to be the weed in the cornfield. The genus *Gladiolus* is a member of family Iridaceae, Sub-family Ixioideae and native to the Cape of Good Hope, South Africa, which is considered as the center of origin for this genus. The individual flower in the spike is called as floret, the floret opens in an acro petal succession *i.e*., from base to top. Florets are two whorled having six perianth segments attached with a funnel - shaped cup and are trimerous. The fascinating spikes bear a large number of florets, which exhibit varying size and forms with smooth, ruffled or deeply crinkled tepals. There is no flower to surpass its beauty due to its long-lasting spikes occurring in striking colors as unicolored or bicolored flowers.

The major limitations in conventional agriculture are the decline in natural resources and environmental damage inflicted by current agricultural practices. Due to the impact of green revolution, in the recent decades, flower growing practices have been evolving towards organic, sustainable or eco-friendly approaches. Therefore, in modern floriculture new insights have been developed to achieve sufficient and sustainable yield with quality blooms. One among such approaches is the use of "Bio-stimulants”. Plant bio-stimulant is referred as "any substance or microorganism, in the form in which it is, applied to plants, seeds or the root environment with the intention to stimulate natural processes of plants benefiting nutrient use

efficiency, tolerance to abiotic stress, regardless of its nutrients content, or any combination of such substances and/or microorganisms intended for this use" (Traon *et al.*,). The use of humic acid (HA) and sea weed extract is a promising natural resource to be utilized as an alternative for increasing crop production. Keeping in view, the need and importance of bio-stimulants the present Investigation was undertaken with an objective to study the effect of Bio-stimulants on vegetative, flowering and yield parameters of gladiolus.

Material and Methods

The experiment was carried out at research block of Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere (University of Agricultural and Horticultural Sciences, Shivamogga) during 2018-19. The planting material for the experiment comprising of gladiolus cultivar "Summer Sunshine" was procured from Department of FLA, Mudigere. Healthy and uniform corms measuring about 3-4 cm diameter were selected for planting. They were planted at a spacing of 30 x 20 cm on flat beds and light irrigation was given immediately after planting. The crop was raised and maintained by standard cultural practices. The experiment was laid out in randomized complete block design with three replication and eleven treatments, T_1-Humic acid 0.4%, T_2 Humic acid 0.6%, T_3-Biovita-0.4%, T_4-Biovita 0.6%, T_5 Biozyme 0.4%, T_6- Biozyme 0.6%, T_7- Spic cytozyme 0.4%, T_8-Spic cytozyme 0.6%, T_9-Recharge 0.4%, T_{10}- Recharge 0.6%, and T_{11}-Control. Spraying of bio-stimulants was done at 30, 45 and 60, days after planting (DAP). Observations recorded systematically at monthly interval and analyzed as per the standard procedure.

Results and Discussion

The data pertaining to vegetative parameters are presented in Table 1. Among the different treatments Biozyme at 0.4 per cent recorded the maximum plant height (76.07 cm), number of leaves (11.33), leaf area (1251.96 cm^2) and leaf area index (2.09) Since Biozyme might have helped in increasing the plant height and number of leaves was probably due to presence of cytokinin and auxin precursors, which increase the cell division, cell enlargement with better utilization of chemical fertilizers resulting in to rapid vegetative growth. These findings corroborates the results reported by Kadam *et al.* (2002) [5] in China aster and Khandelwal *et al*. (2003) [8] in marigold and Karthiraj *et al*. (2008) [6] in China aster.

The increase in leaf area could be due to the effective components of seaweed extract such as major and minor elements, growth regulator and vitamins which enhanced cell division metabolism and other biological reactions, This idea goes in parallel with those of Karthiraj *et al*. (2008) [6] in china aster, EL-Naggar (2010) [3] in lilium, Dhutraj (2003) [2] in gaillardia and Khan *et al.* (2009) [7]. Leaf area index It might be attributed to the presence of macro and micronutrients and some growth promoting substances in the seaweed extracts which in turn increased photosynthates and growth that could be responsible for the increased leaf area and ultimately leaf area index. The findings are in accordance with the results obtained by Russo *et al*. (1994) [9] in marigold.

A perusal of data on flowering parameters is presented in Table 2. Among the different treatments Flowering parameters include the days taken for initiation of inflorescence, days taken for first floret opening, days taken for 50 per cent flowering and duration of flowering. The enhancement was more pronounced in the treatment Biozyme at 0.4 per cent (75.00 days) which enhanced the flowering process by 18 days than control. The same treatment took first floret opening (80.67 days), least number of days required for 50 per cent flowering (84.67 days) and increased the total duration of flowering (22.00 days). It might be due to the early production of florigen and other flower inducing substances in Biozyme treated plants which might have resulted in early flowering while control recorded the maximum number of days to first flowering, 50 per cent flowering and minimum duration of flowering. These results are corroborated with the findings of Shinde *et al.* (2010) [10] in Marigold and Bhargavi *et al.* (2018) [1] in chrysanthemum.

The data with respect to yield parameters are presented in Table 3. The number of spikes per plant was very much important, as it decides the productivity and total production per hectare. In the present investigation, foliar application of Biozyme at 0.4 per cent recorded maximum number of spikes yield per plant (1.51), spikes yield per plot (45.30) and spikes yield per hectare (2,26,500.00). The increase in flower number might be due to seaweed extract produced significant increase in vegetative growth which in turn produced the more photosynthates which were probably diverted towards the more flower production. The similar results were reported by Dhutraj (2003) [2] in gaillardia, Shinde *et al.* (2010) [10] in marigold and Karthiraj *et al*. (2008) [6] in China aster.

Table 1: Effect of bio-stimulants on vegetative parameters of gladiolus

Treatments	Plant height (cm)	Number of leaves per plant	Leaf area (cm^2)	Leaf area index (LAI)
T_1 - Humic acid @ 0.4%	70.60	9.73	803.69	1.34
T_2 - Humic acid @ 0.6%	70.80	9.80	875.87	1.46
T_3 - Biovita @ 0.4%	69.00	9.93	835.69	1.39
T_4 - Biovita @ 0.6%	70.73	9.40	862.87	1.44
T_5 - Biozyme @ 0.4%	76.07	11.33	1251.96	2.09
T_6 - Biozyme @ 0.6%	71.20	9.73	862.72	1.44
T_7 - Spic cytozyme @ 0.4%	67.40	9.33	801.10	1.38
T_8 - Spic cytozyme @ 0.6%	71.80	9.87	828.97	1.34
T_9 - Recharge @ 0.4%	73.60	10.67	1079.09	1.80
T_{10} -Recharge @ 0.6%	72.67	9.53	840.08	1.40
T_{11} -Control (water spray)	64.93	7.80	481.34	0.80
S.Em ±	1.36	0.42	25.59	0.042
CD @ 5%	4.03	1.24	75.50	0.12

Table 2: Effect of bio-stimulants on flowering parameters in gladiolus

Treatments	Days taken for intiation of inflorescence	Days taken for first floret opening	Days taken for 50% of flowering	Duration of flowering (days)
T_1 - Humic acid @ 0.4%	88.00	94.00	98.67	15.67
T_2 - Humic acid @ 0.6%	85.00	91.33	95.67	17.33
T_3 - Biovita @ 0.4%	87.33	93.33	97.67	16.33
T_4 - Biovita @ 0.6%	86.00	92.00	96.00	16.00
T_5 - Biozyme @ 0.4%	75.00	80.67	84.67	22.00
T_6 - Biozyme @ 0.6%	80.00	87.00	91.00	18.67
T_7 - Spic cytozyme @ 0.4%	87.00	92.67	96.67	19.00
T_8 - Spic cytozyme @ 0.6%	84.67	89.00	93.67	17.00
T_9 - Recharge @ 0.4%	78.67	86.33	91.33	16.00
T_{10} -Recharge @ 0.6%	82.33	96.00	99.67	18.33
T_{11} -Control (water spray)	93.00	100.00	105.67	11.67
S.Em ±	1.05	1.67	1.61	1.00
CD @ 5%	3.09	4.92	4.76	2.96

Table 3: Effect of bio-stimulants on flower yield parameters in gladiolus

Treatments	Spike yield per plant (Nos.)	Spike yield per plot (Nos.)	Spike yield per hectare (Nos.)
T_1 - Humic acid @ 0.4%	1.18	35.00	175000.00
T_2 - Humic acid @ 0.6%	1.24	37.10	185500.00
T_3 - Biovita @ 0.4%	1.23	37.00	185000.00
T_4 - Biovita @ 0.6%	1.31	39.33	196666.67
T_5 - Biozyme @ 0.4%	1.51	45.30	226500.00
T_6 - Biozyme @ 0.6%	1.22	36.50	182500.00
T_7 - Spic cytozyme @ 0.4%	1.25	37.00	185000.00
T_8 - Spic cytozyme @ 0.6%	1.22	36.00	180000.00
T_9 - Recharge @ 0.4%	1.44	42.47	212333.33
T_{10} -Recharge @ 0.6%	1.20	36.00	180000.00
T_{11} -Control (water spray)	1.00	30.00	150000.00
S.Em ±	0.10	3.05	15272.66
CD @ 5%	0.30	9.01	45055.09

Conclusion

On the basis of the result obtained in the present investigation it is concluded that Biozyme at 0.4 percent proved significant for improving the vegetative, flowering and yield of gladiolus, the present study also confirmed that the use of bio-stimulant is an eco-friendly technique to enhance crop production. Thus, it may be recommended that the gladiolus plants can be sprayed with Biozyme at 0.4 per cent to get maximum flower and yield which may ensure us to get a maximum net return.

References

1. Bhargavi SP, Naik BH, Chandrashekar SY, Ganapathi M, Kantharaj Y. Efficacy of biostimulants on morphology, flowering and yield of chrysanthemum (*Dendranthema grandiflora*) cv. Kolar local under fan and pad greenhouse. Int. J Chem. Stud. 2018; 6(5):1831-1833.
2. Dhutraj SV. Effect of various bioenzymes on growth, flower yield and vase life of Gaillardia. M.Sc. (Agri) Thesis, MAU, Parbhani, 2003.
3. El-naggar A. Effect of biofertilizer, organic compost and mineral fertilizers on the growth, flowering and bulbs production of *Narcissus tazetta*. J Agric. Env. Sci. 2010; 9(1):24-45.
4. Lepcha B, Nautiyal MC, Rao VK. Variability studies in gladiolus under mid hill conditions of Uttarakhand. J Orn. Hort. 2007; 10(3):169-172.
5. Kadam RE, Bankar GJ, Bhosale AM, Rathod NG, Dhengle RP. Effect of growth regulators on growth and flower yield of China aster. Annuals. Plt. Physiol. 2002; 16(1):44-47.
6. Karthiraj K, Patil RF, Vasmate SD, Digrase SS, Manolikar RR. Effect of bio enzyme on growth, flower yield and vase life of China aster. The Asian J Hort. 2008; 3(1):178-179.
7. Khan W, Rayirath UP, Subramanian S, Jithesh MN, Rayorath P, Hodges DM. Seaweed extracts as biostimulants of plant growth and development. J Plt. Growth. Regul. 2009; 28:386-399.
8. Khandelwal S, Jain N, Singh P. Effect of biozymes and pinching on growth and yield of African marigold (*Tagetes erecta* L.). J Ornam. Hort. 2003; 6(3):271-273.
9. Russo R, Poincelot R, Berlyn P. The use of commercial organic biostimulant for improved production of marigold cultivars. J Home Consumer Hort. 1994; 1(1):83-93.
10. Shinde DH, Naik DM, Barkule SR, Bhosale AM, Shinde SB. Effect of bioenzymes on flowering, yield and vase life of marigold (*Tagetes erecta* Linn.). The. Asian. J Hort. 2010; 5(2):420-422.
11. Traon D, Amat L, Zotz F, Du Jardin P. A legal framework for plant biostimulants and agronomic fertiliser additives in the eu, 2014.