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GROWTH, YIELD AND QUALITY OF GLADIOLUS AS INFLUENCED BY GROWTH REGULATORS AND METHODS OF APPLICATION

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Abstract

A field study on "Growth, yield and quality of gladiolus as influenced by growth regulators and methods of application" was carried out at Satpuda Botanic Garden, College of Agriculture, Nagpur (M.S.), India during winter season of the year 2011-2012 with fifteen treatment combinations in Factorial Randomized Block Design. The treatments comprised of GA_3 100 ppm, GA_3 200 ppm, BA 50 ppm, BA 100 ppm and control (water) along with three methods of application *i.e.*, soaking, spraying and soaking + spraying. The results revealed that significantly minimum days for sprouting of corms and maximum shoots plant^{-1}, leaves plant^{-1}, length of spike, length of rachis, longevity of spike and spikes plant^{-1} in gladiolus were recorded with the application of GA_3 200 ppm, whereas, application of BA 100 ppm produced significantly the highest number of corm and cormels plant^{-1}. However, methods of application of growth regulators had non-significant influence on all the growth and flowering characters except days for sprouting of corms, shoots plant^{-1} and days for first spike emergence. It was observed that the soaking and soaking + spraying method of application of growth regulators sprouted and flowered earlier and produced significantly maximum shoots plant^{-1}. Interaction effect of growth regulators and methods of application was found to be statistically significant in respect of days for first spike emergence. Significantly the earliest first spike emergence was noted with soaking and soaking + spraying of GA_3 200 ppm.

Key words : Gladiolus, spikes, corms, GA_3, BA, soaking, spraying.

Introduction

Gladiolus (*Gladiolus grandiflorus* L.) is the leading cut flower grown worldwide for flower trade and garden display owing to it's magnificent inflorescence and attractive colour. It is herbaceous plant, which belongs to the family Iridaceae. Popularity of this crop as a cut flower is increasing day by day because of its keeping quality and in exhaustive range of colours of the spikes. This flower crop possesses a great potential for export market especially during winter. An increase in flower production and improvement of spikes quality in this crop can be achieved by application of plant growth regulators. Various research workers have reported that, the application of growth regulators and chemicals helps to increase the yield of good quality spikes and corms in gladiolus. Gibberellic acid has been reported to increase the plant height, leaves and shoots plant^{-1} and improves the spike quality (Kirad *et al*., 2001), stimulate flowering and increase the yield of gladiolus spike (Sharma *et al*., 2004). Similarly, benzyl adenine is a growth regulator reported to be useful for enhancing sprouting, increasing sprout plant^{-1} and thereby yield of better quality corms. Thus, it is assumed that, application of GA_3 and BA either by corm soaking, spraying or both can provide the better quality production of gladiolus spikes and corms. Therefore, the present investigation was proposed to study the growth, yield and quality of gladiolus as influenced by growth regulators and methods of application.

Materials and Methods

The experiment was laid out in Factorial Randomized Block Design at Satpuda Botanic Garden, College of Agriculture, Nagpur during *rabi* season of the year 2011-2012 with three replications and fifteen treatment combinations. The treatments comprised of five growth regulator treatments *viz*. GA_3 100 ppm, GA_3 200 ppm, BA 50 ppm, BA 100 ppm and control (water) as main factor and three methods of application *viz*. soaking, spraying and soaking + spraying as sub factor. After preparing the land, the field was laid out with the beds of 45 cm spaced ridges and furrows and the beds were prepared of the dimension 2.25 m × 1.40 m. As per the treatment, required number of rested, cold stored, best

quality, de-husked and uniform sized corms of gladiolus variety American Beauty were soaked in aqueous solution of GA_3 100 and 200 ppm, BA 50 and 100 ppm and water (control) for 24 hours. Then all the corms (soaked as well as unsoaked) were treated with copper fungicide solution for 20 minutes as a preventive measure for *Fusarium wilt* disease before planting. The treated corms were then planted at a spacing of 45 × 20 cm on the ridges at a depth of 5-6 cm. Light irrigation was given immediately after planting. Foliar sprays of GA_3 and BA in the prescribed concentration and water (control) were undertaken twice after 30th and 45th day after planting as per the treatment. Observations on various vegetative parameters *viz*., days for sprouting of corms, shoots plant^{-1} and leaves plant^{-1}, yield parameters *viz*., spikes plant^{-1}, corms plant^{-1} and cormels plant^{-1} and quality parameters *viz*., length of spike, length of rachis and longevity of spike of gladiolus were recorded and the data were analyzed statistically.

Results and Discussion

Growth

The data presented in table 1 indicated that, growth parameters in gladiolus *viz*., days for sprouting of corms, shoots plant^{-1} and leaves plant^{-1} in gladiolus were significantly influenced by growth regulator treatments. Significantly the earliest sprouting of gladiolus corms (3.89 days) and maximum shoots and leaves plant^{-1} (4.11 and 21.93, respectively) were noted with the application of GA_3 200 ppm and it was found statistically at par with the treatment of GA_3 100 ppm (4.00 days, 3.95 and 21.55, respectively), whereas, late sprouting of corms (6.33 days) and minimum shoots (3.50) and leaves plant^{-1} (17.58) were counted with the control treatment (water).

An increase in growth parameters with the application of GA_3 might have been resulted due to promotory action of gibberellic acid on dormancy of gladiolus corms and an enhanced cell division in shoot tip and cell elongation. These results can be correlated with the findings of Quyoom (2011) and Sudhakar and Rameshkumar (2012) in gladiolus.

Growth parameters *viz*., days for sprouting of gladiolus corms and shoots plant^{-1} were significantly influenced, whereas, leaves plant^{-1} was non- significantly influenced by the methods of application of growth regulators.

Significantly minimum days for sprouting of gladiolus corms were required with the soaking method of application (4.46 days), which was found statistically at par with soaking + spraying treatment, whereas, significantly maximum shoots plant^{-1} were noted with soaking + spraying method of application (3.97), which was found to be at par with soaking method of application (3.94) and minimum shoots (3.21) were counted plant^{-1} with the spraying method of application.

This might be due to the absorption of chemicals (growth regulators) by the gladiolus corms under soaking and soaking + spraying methods of application, which might have been further utilized for various physiological processes to influence favorably the growth parameters under study. However, spraying treatment was followed after sprouting of gladiolus corms. Earliness in corm sprouting and maximum shoots plant^{-1} due to the treatment of soaking with growth regulators was also observed by Baskaran and Misra (2007) in gladiolus.

An interaction effect of growth regulators and their methods of application on all vegetative parameters *viz*., days for sprouting of corms and shoots and leaves plant^{-1} of gladiolus was found to be non-significant.

Flowering and yield

Flowering, spike yield and quality attributes of gladiolus *viz*., days for spike emergence, length of spike and rachis, longevity of spike, number of spikes plant^{-1} and corm and cormel yield plant^{-1} were significantly influenced by various treatments of growth regulators (tables 1 and 2). Significantly the earliest first spike emergence (49.06 days) and maximum length of spike (94.19 cm) and rachis (34.97 cm), longevity of spike (13.53 days) and number of spikes plant^{-1} (2.88) were registered with the treatment of GA_3 200 ppm, which was statistically at par the treatment of GA_3 100 ppm in respect of days for first spike emergence (49.36 days), length of spike (92.39 cm) and rachis (34.43 cm), longevity of spike (13.16 days) and spikes plant^{-1} (2.69), whereas, significantly late first spike emergence (58.38 days) and minimum length of spike (69.04 cm) and rachis (30.82 cm), longevity of spike (10.29 days) and number of spikes plant^{-1} (1.60) were noted with no application of growth regulators (*i.e*. control).

Gibberellic acid treatment brought significant improvement in overall flowering, yield and quality parameters of gladiolus by virtue of cell elongation and production of maximum food material by enhancing photosynthesis, which might have produced higher yield of good quality spikes of gladiolus which in turn might have helped the spikes to last longer on plant in the field. Further gibberellin is quite effective in reducing juvenile period of plant and inducing reproductive phase. The present findings are similar with the results obtained by Singh and Srivastava (2009) in tuberose and Sudhakar

Table 1 : Effect of growth regulators and methods of application on growth, yield and quality of gladiolus.

Treatments	Days for sprouting (days)	Shoots Plant^{-1}	Leaves plant^{-1}	Length of spike (cm)	Length of rachis (cm)	Longevity of spike (days)	Spikes plant^{-1}	Corms plant^{-1}	Cormels plant^{-1}
Growth Regulators (A)									
A_1 - GA_3 100 ppm	4.00	3.95	21.55	92.39	34.43	13.16	2.69	2.88	24.58
A_2 - GA_3 200 ppm	3.89	4.11	21.93	94.19	34.97	13.53	2.88	3.26	24.77
A_3 - BA 50 ppm	4.86	3.63	18.51	86.28	32.55	12.51	2.28	3.28	28.11
A_4 - BA 100 ppm	5.89	3.53	18.39	73.38	32.29	11.24	1.69	3.37	31.55
A_5 - Control	6.33	3.50	17.58	69.04	30.82	10.29	1.60	2.65	24.48
SE (m)±	0.31	0.13	0.63	1.61	0.94	0.51	0.18	0.13	1.55
CD @ 5%	0.91	0.39	1.83	4.65	2.51	1.47	0.52	0.39	4.49
Methods of application (B)									
B_1 - Soaking	4.46	3.94	20.59	84.87	34.32	12.67	2.47	3.12	29.00
B_2 - Spraying	6.40	3.21	19.16	81.56	31.85	11.68	2.08	3.05	26.98
B_3 - Soaking + Spraying	5.00	3.97	19.04	82.80	32.86	11.92	2.13	3.11	27.86
SE (m)±	0.24	0.10	0.49	1.24	0.73	0.39	0.14	0.10	1.20
CD @ 5%	0.71	0.30	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**
Interaction (A × B)									
SE (m)±	0.54	0.23	1.09	2.78	1.62	0.88	0.31	0.23	2.68
CD @ 5%	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**

Sig. – Significant, **N.S.** – Non-significant.

Table 2 : Interaction effect of growth regulators and methods of application on days for first spike emergence in gladiolus.

Treatments	Days for first spike emergence (days)			
Growth regulators	**Methods of application**			
	B_1- Soaking	**B_2- Spraying**	**B_3- Soaking + spraying**	**Mean**
A_1 - GA_3 100 ppm	49.80	48.47	49.80	49.36
A_2 - GA_3 200 ppm	48.20	50.80	48.20	49.06
A_3 - BA 50 ppm	51.53	52.73	53.20	52.49
A_4 - BA 100 ppm	51.13	64.87	55.70	57.24
A_5 - Control	50.40	69.00	55.75	58.38
Mean	50.21	57.17	52.53	
	Growth regulators (A)	**Method of application (B)**	**Interaction (A × B)**	
SE (m)±	0.50	0.39	0.87	
CD at 5%	1.46	1.13	2.53	

and Rameshkumar (2012) in gladiolus.

As regards yield of corms and cormels in gladiolus, significantly maximum number of corms and cormels in gladiolus were produced plant^{-1} with the treatment of BA 100 ppm (3.37 and 31.55, respectively), which was found to be at par with BA 50 ppm (3.28 and 28.11, respectively), however, minimum corms (2.65) and cormels (24.48) plant^{-1} were noted with the control treatment. Benzyl adenine is known to promote cell division and anabolism, which might have been resulted into an increase in number of daughter corms as well as cormels plant^{-1}. The present findings are in close agreement with the findings of Sharma *et al*. (2006) and Baskaran *et al*. (2009) in gladiolus.

The data from present investigation (tables 1 and 2) revealed that, the effect of methods of application of growth regulators was found to be non-significant for all the yield and quality parameters of gladiolus spikes and corms, however, in respect of days for first spike emergence, it was found significant. The earliest spike emergence was noted with soaking method of application (50.21 days) followed by soaking + spraying method of application (52.53 days), whereas, emergence of first spike was late with the treatment of spraying of growth regulators (57.17 days). Similar results were also found by Attia (2011), who reported that, soaking method of application of growth regulators was superior to foliar application in respect of days for spike emergence in gladiolus.

Interaction effect of growth regulators and methods

of application on various flowering, yield and quality parameters of gladiolus spikes and corms was found to be non significant, except days for first spike emergence. The data presented in table 2 revealed that, the treatment combination of GA_3 200 ppm with soaking and soaking+ spraying methods of application recorded minimum days for emergence of first spike (48.20 days each) and the treatment combination of control (water treatment) with spraying method of application took maximum days for emergence of first spike (55.75 days). The results might have been due to combined effect of gibberellic acid @ 200 ppm and soaking method of application.

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