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Effect of growth regulators on growth and flowering of gladiolus

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Abstract : An experiment was conducted to study the effect of growth regulators *viz*., GA_3 and NAA on growth and flowering of three varieties of gladiolus *viz.,* Phule Neelrekha, Phule Tejas and Phule Ganesh in split plot design at Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *Rabi* season of the years 2008-09 and 2009-10. The results revealed that, the maximum leaves plant^{-1} and spikes hectare^{-1}, minimum days required for opening of first pair of florets and 50 per cent flowering were due to the variety Phule Tejas. Whereas, the maximum total chlorophyll content of leaves before the f1owering and the maximum length of spike, distance between two florets, longevity of flower on plant and length and width of florets were observed under the variety Phule Ganesh. However, effect of PGR was non-significant as regards leaves plant^{-1} and chlorophyll content of leaves. However, significantly early opening of first floret and 50 per cent flowering and the maximum spike yield and spike quality parameters *viz*. length of spike, distance between two florets, longevity of flower on plant and length and width of florets were noted under the treatment of GA_3 150 ppm.

Key words : Gladiolus, Varieties, Growth regulators, Growth, Flowering, Yield

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Gladiolus (*Gladiolus grandiflorus* L.), commonly known as sword lily belongs to the family Iridaceae. It is one of the interesting flowers due to its florets with brilliant colours, attractive shapes, varying sizes and numerous forms suited to the different tastes and purposes. It is useful for both cut flowers and garden display.

As a cut flower, it has great potentialities for the export to European countries during the winter months to earn the valuable foreign exchange. Therefore, growing gladiolus on scientific footing is of immense need for getting the quality blooms with exportable standards.

Synthetic growth - regulating chemicals are becoming extremely important and valuable in the commercial floriculture for manipulating the growth and flowering of many of the ornamental plants. The various research workers have reported that, the application of foliar spray of growth regulators like GA_3 and NAA helps to produce the good quality cut flowers as well as yield of gladiolus corms. Hence, the present study was undertaken to find out the suitable concentration of plant growth regulators for the better growth, yield and quality production of gladiolus cut flowers.

RESEARCH METHODS

An experiment was carried out at the Main Garden, Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.) during the year 2008-09 and 2009-10. The experiment was laid out in split plot design with four replications. In the present investigation, the treatments comprised of three varieties of gladiolus *viz*. Phule Neelrekha, Phule Tejas and Phule Ganesh and five treatments of plant growth regulators *viz*., P_1 – GA_3 100 ppm, P_2- GA_3 150 ppm, P_3 - NAA 200 ppm, P_4 – NAA 300 ppm and P_5 – control (water spray). After preparing the experimental land, the field was laid out with the beds of 45 cm spaced ridges and furrows. The rested, cold stored, uniform and bigger size gladiolus corms of three varieties were selected and placed at room temperature for 15 days and treated with 0.3 per cent captaf fungicide for 15 minutes before planting. After drying in shade, the corms were planted 20 cm apart. Solution of plant growth regulators was sprayed as per

the treatment along with control (water spray) at 30th and 60th day after planting. All the intercultural practices were followed as and when necessary. The observations on various growth and flowering characters were recorded. Total chlorophyll content in the middle fresh leaves of gladiolus was estimated before the flowering and at the spikes harvesting stage by adopting the procedure given by Hiscox and Israelstam (1979). Two years data was pooled together and statistically analyzed.

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarised under following heads:

Growth:

The data presented in Table 1 indicated that, different gladiolus varieties exhibited significant differences in respect of leaves plant^{-1} and total chlorophyll content of leaves. Significantly the maximum leaves plant^{-1} were produced by the variety Phule Tejas (13.38) followed by Phule Neelrekha (12.66). However, in respect of total chlorophyll content of leaves, the variety Phule Ganesh (2.50 mg g^{-1}) was found to be significantly superior and it was followed by the variety Phule Tejas (2.42 mg g^{-1}), whereas, leaves plant^{-1} and total chlorophyll content were observed to be minimum with the varieties Phule Ganesh (9.32) and Phule Neelrekha (2.31 mg g^{-1}), respectively. The variations in leaves plant^{-1} of different varieties of gladiolus and total chlorophyll content of leaves might be due to the varied growth rate and differential genetic make-up. The present study confirms the findings of Neeraj *et al*. (2000) and Nagaraju and Parthasarthy (2001) in gladiolus.

The influence of plant growth regulators on leaves plant^{-1} and total chlorophyll content of gladiolus leaves was found to be non-significant.

Similarly, an interaction effect due to the gladiolus varieties and plant growth regulator treatments on leaves plant^{-1} and total chlorophyll content of leaves was also found to be non-significant.

Flowering :

The data revealed that, in respect of days required for opening of first pair of florets and 50 per cent flowering significant differences were observed due to the gladiolus varieties and foliar application of plant growth regulators and also their interaction. Significantly early opening of

Table 1 : Effect of growth regulators on growth, flowering and spike yield of gladiolus

Treatments	Leaves plant^{-1}	Total chlorophyll content of leaves (mg g^{-1}) before flowering	Days required for opening of first pair of florets	Days required for 50 per cent flowering	Spikes hectare^{-1} (lakh)
Main factor – Varieties (V)					
V_1 – Phule Neelrekha	12.66	2.31	80.52	87.80	1.49
V_2 – Phule Tejas	13.38	2.42	66.82	74.52	1.81
V_3 – Phule Ganesh	9.32	2.50	70.62	79.00	1.61
'F' test	Sig.	Sig	Sig.	Sig	Sig.
S.E. ±	0.08	0.02	0.66	0.44	0.03
C.D. (P=0.05)	0.27	0.06	2.28	1.52	0.09
Sub factor – Plant growth regulator sprayings (P)					
P_1 – GA_3 100 ppm	11.68	2.44	67.45	75.79	1.80
P_2– GA_3 150 ppm	11.77	2.44	66.58	74.25	1.88
P_3 – NAA 200 ppm	11.90	2.40	78.67	86.37	1.53
P_4 – NAA 300 ppm	12.04	2.39	80.87	88.17	1.42
P_5 – Control (Water spray)	11.53	2.37	69.71	77.62	1.55
'F' test	Sig	Sig.	Sig.	Sig	Sig.
S.E. ±	0.14	0.02	0.34	0.32	0.04
C.D. (P=0.05)	-	-	0.99	0.92	0.12
Interaction effect (V X P)					
'F' test	NS	NS	NS	NS	NS
S.E. ±	0.24	0.03	0.60	0.55	0.08
C.D. (P=0.05)	-	-	1.32	1.58	-

NS=Non-significant

first pair of florets and 50 per cent flowering were registered with the variety Phule Tejas (66.82 and 74.52 days, respectively), however, the maximum days were required for opening of first pair of florets and 50 per cent flowering in the variety Phule Neelrekha (80.52 and 87.80 days, respectively). Differential behaviour of the gladiolus varieties might be due to the individual response to low temperature prevailing during colour break stage of flowers. Similar results were also obtained by Kamble *et al*. (2004) in gladiolus.

Among the different plant growth regulator treatments, spraying with 150 ppm GA_3 had registered minimum days required for opening of first pair of florets (66.58 days) and 50 per cent flowering (74.25 days) followed by 100 ppm GA_3 treatment, however, significantly the maximum days were required for opening of first pair of florets (80.87 days) and 50 per cent flowering (88.17 days) due to the treatment of NAA 300 ppm which was followed by the treatment of NAA 200 ppm. This might be due to an early spike emergence in gladiolus caused due to the treatment of GA_3 150 ppm which might have reduced the days required for opening of first pair of florets and 50 per cent flowering from the planting of corms. The results obtained are in close conformity with the findings of Maurya and Nagda (2002) and Rana *et al*. (2005) in gladiolus.

Flower yield and quality:

In the present investigation, the flower yield (Table 1) and quality parameters (Table 2) were significantly influenced by gladiolus varieties and different treatments of plant growth regulators. Significantly the maximum spike yield hectare^{-1} (1.81 lakh) was registered with the variety Phule Tejas, however, the variety Phule Ganesh had recorded significantly the maximum spike length (107.34 cm), distance between two florets (2.57 cm), longevity of flowers on plant (13.57 days) and length and width of floret (8.20 and 8.53 cm, respectively). Whereas, significantly minimum spike yield hectare^{-1} (1.49 lakh) and length of floret (6.88 cm) were observed with the variety Phule Neelrekha, while, the other flower quality parameters *viz*., length of spike (78.33 cm), distance between two florets (2.25 cm), longevity of flower on plant (13.25 days) and width of floret (8.16 cm) were found to be significantly minimum with the variety Phule Tejas. The variations in flower quality parameters might be attributed due to the genetic differences in the varieties. Similar variations due to the cultivars are reported earlier by the workers like Dilta *et al*. (2004) and Rani *et al*. (2007) in gladiolus.

Among the different plant growth regulator treatments, spraying with GA_3 150 ppm had registered significantly the maximum spikes hectare^{-1} (1.88 lakh), length of spike (102.61 cm), distance between two florets

Table 2 : Effect of growth regulators on quality of gladiolus spikes

Treatments	Length of spike (cm)	Distance between two florets (cm)	Longevity of flower on plant (days)	Length of floret (cm)	Width of floret (cm)
Main factor – Varieties (V)					
V_1 – Phule Neelrekha	106.03	2.40	13.37	6.88	8.31
V_2 – Phule Tejas	78.33	2.25	13.25	7.63	8.16
V_3 – Phule Ganesh	107.34	2.57	13.57	8.20	8.53
'F' test	Sig.	Sig	Sig.	Sig	Sig.
S.E.±	0.33	0.02	0.05	0.04	0.03
C.D. (P=0.05)	1.04	0.06	0.17	0.14	0.09
Sub factor – Plant growth regulator sprayings (P)					
P_1 – GA_3 100 ppm	101.55	2.60	14.65	7.91	8.57
P_2– GA_3 150 ppm	102.61	2.70	15.02	8.00	8.81
P_3 – NAA 200 ppm	95.77	2.31	12.87	7.42	8.21
P_4 – NAA 300 ppm	92.49	2.18	11.81	7.21	7.94
P_5 – Control (Water spray)	93.75	2.26	12.65	7.33	8.14
'F' test	Sig	Sig.	Sig.	Sig	Sig.
S.E.±	0.37	0.02	0.08	0.08	0.04
C.D. (P=0.05)	1.06	0.05	0.24	0.24	0.11
Interaction effect (V X P)					
'F' test	NS	NS	NS	NS	NS
S.E.±	0.64	0.04	0.14	0.14	0.06
C.D. (P=0.05)	-	-	-	-	-

NS=Non-significant Sig.=Significant

(2.70 cm), longevity of flower on plant (15.02 days), length (8.00 cm) and width (8.81 cm) of florets which were found to be at par with the treatment of GA_3 100 ppm. However, significantly minimum spike yield (1.42 lakh) and inferior quality parameters *viz*., length of spike (92.49 cm), distance between two florets (2.18 cm), longevity of flower (11.81 days) and length (7.21 cm) and width (7.94 cm) of floret were recorded with the treatment of NAA 300 ppm. Gibberelin is well known for its promotary effect on the cell division and cell elongation due to which the gladiolus plants might have produced the good quality spikes with the better physical parameters. These results are in line with the findings of Maurya and Nagda (2002) and Kumar and Singh (2005) in gladiolus. However, NAA due to its higher concentration might have caused more ethylene formation which ultimately might have resulted less production of spikes with inferior quality (Krishnamurthy, 1981).

The data regarding interaction effect due to the gladiolus varieties and plant growth regulators on spike yield and quality parameters were found to be non-significant..

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