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Effect of plant growth regulators on emergence of shoots and yield of corms and cormels in gladiolus

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ABSTRACT

The experiment was carried out to study the effect of corm treatment with four growth regulators in three doses each GA (50,100,200 ppm), CCC (100,200,400 ppm), Ethrel (500, 1000, 2000 ppm) and 2,4- D (10, 20, 40 ppm) on the emergence of shoots and yield of corms and cormels in gladiolus cultivars viz., American Beauty, Friendship and Cherry Blossom. Cultivar Friendship proved superior to other varieties, while GA at 100 ppm hastened sprouting of corms in least number of days and CCC at 200 ppm gave maximum yield of corms and cormels in terms of number, weight and size during both the seasons. The minimum yield was however obtained with GA 50 ppm and in control.

Key words : Plant growth regulator, Shoot emergence, Yield, corms, Gladiolus.

INTRODUCTION

Gladiolus is propagated through corms. Freshly harvested corms and cormels undergo a period of dormancy which is regulated by changes in the levels of endogenous promoters or inhibitory substances. Abscisic acid was found to be the major endogenous inhibitor controlling the sprouting of corms and cormels and its levels decreased with release of dormancy. It would be of commercial interest if the growth of the corms can be accelerated to reduce the period required for emergence of shoots. Early or late emergence of shoots plays an important role in the growth and development of plant and ultimately influences the yield. Storage at low temperature and treatment with certain growth regulators such as Ethrel, thiourea, ethylene, chlorohydrin, benzyladenine and GA_3 are known to promote corm and cormel sprouting (Mukhopadhyay and Banker, 1986 & Arora and Grewal, 1992). Since the corms are the main components of gladiolus multiplication, these were dipped in the solution of growth regulators, as dipping has been reported to be better than spraying (Winkler, 1969). The present study was undertaken with a view to study the effect of growth regulators on the emergence of shoots and yield of gladiolus corms and cormels.

MATERIALS AND METHODS

The experiment was carried out at Regional Research and Technology Transfer Station, Semiliguda (Orissa University of Agriculture and Technology), Koraput, Orissa during winter season of 2003-04 and 2004-05. Three gladiolus cultivars, viz., American Beauty, Friendship and Cherry Blossoms were used. Thirteen treatments, three each of Cycocel (100, 200, 400 ppm), 2, 4 – D (10, 20, 40 ppm), Ethrel (500, 1000, 2000 ppm) and GA (50,100,200 ppm) with one control were replicated thrice in a split plot design. Thirty corms of each treatment were soaked in aqueous solution for 16 hours in leakage proof polyethylene bags. Distilled water was used in control treatment. Ten such treated corms were planted in each replication. The corms were pre treated with 0.2% Bavistin uniformly to prevent any fungal infection. The planting was done on 10th November in both the years at a spacing of 30 x 20 cm at 5 cm depth. Uniform cultural operations were adopted throughout the experiment. The number of sprouting corms was recorded daily after planting until all the planted corms had been sprouted visibly. Later on the duration required for emergence of shoots was noted. The corms and cormels were harvested carefully from each plot when the leaves turned yellow and started drying. Both corms and cormels were duly cured in shade for 4-5 days before recording the observations.

RESULTS AND DISCUSSION

In general, all the growth regulators significantly affected corm sprouting in different varieties of gladiolus. GA 50, 100 and 200 ppm, 2,4-D 10, 20 and 40 ppm, Cycocel 100 ppm and Ethrel 500 and 1000 ppm reduced the period required for emergence of shoots, whereas Cycocel 200 and 400 ppm and Ethrel 2000 ppm delayed the emergence of shoots as compared to control in all cultivars. However, GA at 100 ppm was registered for emergence of shoots in minimum period (17.20 and 15.57 days) during 2003-04 and 2004-05 in cultivar Friendship. The maximum period (35.89 and 36.32 days) was recorded in cv. American Beauty with Cycocel 500 ppm in the year 2003-04 and 2004-05 respectively. The soaking of corms in the solution of GA significantly stimulated corm sprouting since GA breaks the dormancy of corms (Halevy *et al*, 1970) by breaking down the reserved food material of the corms by activating hydrolyzing enzymes.

The highest number of corms (1.77) and cormels (8.00), weight per corm (55.2g) and cormel (1.92g) and size of corm (5.10 cm) and cormel (1.76 cm) was obtained in cv. Friendship during 2003-04, while American Beauty recorded the minimum figures in respect of the above characters. Similar trend was also obtained during the year 2004-05 (Table 2 & 3).

Plant growth regulators significantly increased the production of corms and cormels at different concentrations when compared with control except GA 50 ppm which was at par with control in both the seasons. The maximum yield in terms of number of corms (2.30 and 2.20) and cormels per plant (8.90 and 8.10), weight per corm (60.60 and 58.69g) and cormel (2.20 and 2.10g) and size of corm (5.10 and 5.20 cm) and cormel (2.10 and 2.00) during 2003-04 and 2004-05 was recorded respectively in case of Cycocel 200 ppm, whereas the minimum yield was obtained with GA 50 ppm and in control.

Treatment of growth regulators promote the sprouting of lateral buds resulting in splitting of corms and thus increasing the number of corms and cormels per plant. This may be due to the bud sprouting which arises presumably from the breaking apical dominance as pointed out by Halvey *et. al*. (1970). It is also possible that the increased size and weight of corms and cormels particularly with Cycocel resulted from the inhibition of gibberellin biosynthesis disrupting the movement of metabolites upward and directing them towards roots, thus increased the size and weight of corms and cormels through increased food supply to the underground parts.

Table 1: Duration (days) required for the emergence of shoots in different varieties of gladiolus as affected by growth regulator.

Treatment		2003-04			2004-05		
		A. Beauty	Friendship	C. Blossom	A. Beauty	Friendship	C. Blossom
Cycocel	100 ppm	29.80	21.20	27.85	31.33	22.10	27.30
	200 ppm	32.80	23.89	29.64	34.20	25.11	29.10
	400 ppm	35.89	27.25	31.77	36.32	27.40	22.10
2, 4-D	10 ppm	23.50	19.30	21.06	26.10	20.61	24.20
	20 ppm	25.30	20.30	23.20	27.90	22.70	26.50
	40 ppm	27.30	22.10	25.60	31.30	24.22	27.33
Ethrel	500 ppm	26.14	19.61	22.90	28.60	22.30	26.57
	1000 ppm	30.70	22.95	25.25	31.10	23.10	28.70
	2000 ppm	35.32	24.15	27.97	30.30	24.15	30.32
GA	50 ppm	28.30	22.70	24.84	28.00	20.11	19.20
	100 ppm	23.80	17.20	19.70	23.10	17.57	24.30
	200 ppm	24.82	19.20	22.90	25.00	18.57	29.10
Control		31.18	22.86	26.84	32.89	23.50	29.00
CD at 5%	Varieties		0.83			0.62	
	Treatments		0.75			1.00	
	Interaction		1.30			1.78	

Table 2 : Effect of plant growth regulators on the yield of Corms in gladiolus.

Treatment	2003-04			2004-05		
	No. of corm	Corm Weight (gm)	Size of Corm (cm)	No. of corm	Corm Weight (gm)	Size of Corm (cm)
Varieties						
American Beauty	1.30	43.30	3.50	1.27	40.10	3.30
Friendship	1.77	55.20	5.10	1.70	51.27	5.24
Cherry Blossom	1.45	46.50	4.20	1.48	45.10	4.14
CD at 5%	0.04	1.05	0.24	0.11	2.34	0.32
Growth Regulators						
CCC 100 ppm	1.68	51.42	4.20	1.65	48.70	4.20
CCC 200 ppm	2.30	60.60	5.10	2.20	58.69	5.20
CCC 400 ppm	2.00	52.95	4.40	1.95	54.10	4.30
2, 4-D 10 ppm	1.80	50.10	4.52	1.63	47.10	4.60
2, 4-D 20 ppm	1.46	47.20	4.06	1.34	44.50	4.00
2, 4-D 40 ppm	1.25	43.50	3.70	1.10	40.20	3.85
Ethrel 500 ppm	2.20	56.20	4.70	1.93	54.52	4.74
Ethrel 1000 ppm	1.67	51.20	4.30	1.53	48.30	4.32
Ethrel 2000 ppm	1.45	42.30	3.87	1.35	42.80	3.90
GA 50 ppm	1.00	37.50	3.36	1.00	35.56	3.52
GA 100 ppm	1.38	43.54	4.32	1.31	42.80	3.80
GA 200 ppm	1.20	42.67	3.80	1.16	39.40	3.89
Control	1.10	39.00	3.20	1.07	37.30	3.20
CD at 5%	0.12	1.54	0.11	0.06	1.20	0.21

Table 3 : Effect of plant growth regulators on the yield of Cormels in gladiolus.

Treatment	2003-04			2004-05		
	No. of corm	Corm Weight (gm)	Size of Corm (cm)	No. of corm	Corm Weight (gm)	Size of Corm (cm)
Varieties						
American Beauty	5.20	1.32	1.42	4.70	1.32	1.48
Friendship	8.00	1.92	1.76	7.82	1.90	1.85
Cherry Blossom	7.00	1.60	1.54	6.67	1.54	1.62
CD at 5%	0.15	0.10	0.10	0.36	0.10	0.11
Growth Regulators						
CCC 100 ppm	7.10	1.83	1.60	6.90	1.70	1.72
CCC 200 ppm	8.90	2.20	2.10	8.10	2.10	2.00
CCC 400 ppm	7.80	2.10	1.80	7.56	2.00	1.80
2, 4-D 10 ppm	7.60	1.53	1.82	7.16	1.70	1.80
2, 4-D 20 ppm	6.90	1.47	1.63	6.63	1.34	1.60
2, 4-D 40 ppm	6.50	1.38	1.27	6.27	1.30	1.42
Ethrel 500 ppm	8.20	2.02	1.84	7.95	1.97	1.65
Ethrel 1000 ppm	7.80	1.80	1.70	7.00	1.76	1.64
Ethrel 2000 ppm	6.80	1.62	1.48	6.95	1.58	1.50
GA 50 ppm	5.00	1.21	1.26	4.75	1.18	1.31
GA 100 ppm	6.20	1.38	1.68	5.70	1.40	1.65
GA 200 ppm	5.38	1.30	1.40	5.10	1.26	1.45
Control	5.00	1.28	1.30	4.59	1.24	1.35
CD at 5%	0.30	0.08	0.06	0.14	0.05	0.06

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