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Effect of GA_3 and fungicides on vegetative and corm attributes of single budded cut corms in gladiolus

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Abstract

An investigation was performed on effect of GA_3 and fungicides (carbendazim and mancozeb) on vegetative and corm attributes of cut corms in gladiolus cv. Punjab Morning at Horticultural Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, U.P. during winter season during the year 2017-18. The experiment was laid out in Randomized Block Design (RBD) with three replications. The experiment consisted of twelve treatments *viz*., GA_3 50 and 100 ppm, carbendazim 0.4%, mancozeb 0.4%, carbendazim 0.4% + mancozeb 0.4%, GA_3 50 ppm + carbendazim 0.4%, GA_3 50 ppm + mancozeb 0.4%, GA_3 50 ppm + carbendazim 0.4% + mancozeb 0.4%, GA_3 100 ppm + carbendazim 0.4%, GA_3 100 ppm + mancozeb 0.4%, GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% including control. All the single budded cut corms of gladiolus were pre-soaked in various concentrations of GA_3, carbendazim 0.4% and mancozeb 0.4% solution. Maximum plant height at 50 and 65 days after planting was noted with treatment GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% (48.73 cm and 53.06 cm, respectively) while leaf width of 1st leaf at 20, 35 and 50 days after planting was observed with treatment carbendazim 0.4% (1.34 cm), carbendazim 0.4% (1.85 cm) and GA_3 50 ppm 0.4% (2.03 cm), respectively. Leaf width of 3rd leaf at 65 days after planting resulted maximum with treatment carbendazim 0.4% (1.99 days) when compared to control (1.85 days). Maximum number of cormels per hill was registered with treatment GA_3 50 ppm + carbendazim 0.4% + mancozeb 0.4% (7.25).

Keywords: Gladiolus, single budded cut corms, pre-soaking, GA_3, carbendazim and mancozeb

Introduction

Environmental influence on instigation of the dormant state has been studied earlier in numerous bulbous species including gladiolus. Hence, hormonal regulation in consecutive steps in formation of corms and cormels has been exploited and studied in gladiolus and also in other bulbous crops. Gladiolus is a genus of tender herbaceous perennial bulbous plant that comes with a sword like leaf structure along with attractive spikes having florets of dazzling colours, varying sizes and prolonged vase life. Traditionally, gladiolus is propagated by corms and cormels. Node in corms bears one or two buds that have potential to develop into a shoot (Singh and Sisodia, 2017) [20]. However, number of cormels production varies depending on variety to variety. Its profuse flowering and longevity determines the flexibility of market that depends on suitable growing condition of corms as well as cormels. Factors like cut corm, size of corms and cormels, planting time and fertilizer management influence the quality production gladiolus spikes as well as corms and cormels (Khanna and Gill, 1983 and Mukhopadhyay and Yadav, 1984) [9, 13]. Cut corms with one or two sprouts produces flowers two times higher than single corms as the production cost becomes half. Depending on size of the corms, it can be divided into number of pieces as each piece contains at least a single sprout (Singh and Sisodia, 2017) [20]. A large corm can be divided into 7-10 pieces while small corms can be divided into 3-4 pieces (Gromov, 1972) [6]. The largest cut corm produced the maximum number of spikes and leaves per plant, number of florets per spike, spike length, number of corms per plant, diameter of new corm (Yadav and Tyagi, 2007). Better results can be achieved with radial cuts to gladiolus corms. Another aspect of quality corm production is to break the physiological dormancy that exists in corms and cormels for 4-5 months. Also incidence of corm rot and some fungicidal attack in vegetative stage also decline the quality flower production in gladiolus. Various growth regulators help in minimizing constrains exist in quality production of spikes, corms and cormels as well as breaking dormancy (Singh, 2006) [21]. External application of gibberellins influences the internal chemistry of plant cell and interaction among cells depending on plant species, plant stage of development and environment. While fungicides also helps in suppressing disease incidence in bulbous crops like gladiolus favouring healthy growth of plants.

Keeping the ideas in background, the present study was undertaken to evaluate the effect of growth regulator as well as various fungicides on growth and corm attributes in gladiolus.

Materials and methods

The study was carried out during 2017-18 under open field condition at Horticulture Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. During the experiment, the temperature ranged in day time was 15°C-38.5°C while during night hour, it ranged from 6 °C-23 °C. The experiment carried out on alluvial soil with adequate drainage and optimum waster holding capacity. Gladiolus variety Punjab Morning was taken for experiment. Disease, infestation free corms were selected with uniform size for planting. The corms were divided into several pieces having a single sprout on each piece. Experiment was laid out in a Randomized Block Design (RBD) with twelve treatments *viz*., control, GA_3 50 an 100 ppm, carbendazim 0.4%, mancozeb 0.4%, carbendazim 0.4% + mancozeb 0.4%, GA_3 50 ppm + carbendazim 0.4%, GA_3 50 ppm + mancozeb 0.4%, GA_3 50 ppm + carbendazim 0.4% + mancozeb 0.4%, GA_3 100 ppm + carbendazim 0.4%, GA_3 100 ppm + mancozeb 0.4%, GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% and three replications. The cut corms were treated with GA_3, carbendazim 0.4%, mancozeb 0.4% solution according to the treatments for 24 hours and in control treatment, cut corms were soaked in distilled water. After that planting was done at 30×25 cm spacing in 2.70×1.25 m plot size. Well rotten FYM and vermicompost were applied before planting of cut corms. Uniform cultural practices were practiced followed by recording observations for flowering and corm parameters and subjected to statistical analysis.

Results and discussion

A brief look into Table 1 reveals that various treatments of GA_3, carbendazim 0.4% and mancozeb 0.4% at various concentrations failed to exert a significant effect on plant height at 20 and 35 days after planting in gladiolus. Although a significant effect was observed on plant height at 50 and 65 days after planting due to application of GA_3, carbendazim 0.4% and mancozeb 0.4% at different concentrations. Maximum plant height at 20 and 35 days was noted with treatment GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% (21.09 days) followed by GA_3 50 ppm + carbendazim 0.4% (20.10 days), GA_3 50 ppm + carbendazim 0.4% + mancozeb 0.4% (19.22 days). While minimum plant height at 20 days after planting was observed with treatment carbendazim 0.4% + mancozeb 0.4% (14.98 days). At 35 days after planting, maximum plant height was observed with treatment GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% (42.11 days) followed by treatments carbendazim 0.4% (36.80 days), GA_3 50 ppm + carbendazim 0.4% + mancozeb 0.4% (36.58 days) while minimum was obtained with GA_3 50 ppm (33.83 days). Maximum plant height exerted at 50 days after planting in gladiolus was perceived with treatment GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% (48.73 days) which found statistically at par with treatments carbendazim 0.4% (44.17 days), carbendazim 0.4% + mancozeb 0.4% (43.71 days) and significant to other treatments. While minimum plant height at 50 days after planting was obtained with treatment GA_3 100 ppm + mancozeb 0.4% (38.02 days). At 65 days after planting, maximum plant height was remarked with treatment GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% (53.06 days) which found statistically at par with treatments carbendazim 0.4% + mancozeb 0.4% (52.58 days), carbendazim 0.4% (50.10 days), GA_3 100 ppm (48.48 days) including control (49.85 days) treatment. While minimum plant height was obtained with treatment GA_3 100 ppm + mancozeb 0.4% (42.95 days) at 65 days after planting. The inclining plant height was due to the effect of GA_3 that helps in dividing cells, cell enlargement which would elongate the internodal length in gladiolus. The results were in agreement with Sindhu and Verma (1997) [19] and Kumar (2008) [11] in gladiolus, Padhi *et al*. (2018) [8] in gladiolus cormels, Kapri *et al*. (2018) [15] in lily and Al-Khassawreh *et al*. (2006) [1] in black iris. While different fungicides were found effective in controlling disease (D'-Aulerio *et al*., 1994) [5]. The fungicides carbendazim and Mancozeb would help in reducing the mycelial growth that respond to healthy plant growth (Urban and Filipowicz, 2004 and Kopacki and Wagner, 2006) [23, 10].

Data pertaining to the width of 1st and 3rd leaf at 20, 35, 50 and 65 days revealed that different concentrations of GA_3, carbendazim 0.4% and mancozeb 0.4% could influence the leaf width significantly (Table 1). However, treatment with carbendazim 0.4% produced significantly maximum width of 1st leaf (1.34 cm) at 20 days after planting followed by carbendazim 0.4% + mancozeb 0.4% (1.26 cm) and GA_3 50 ppm + carbendazim 0.4% (1.24 cm) when compared with treatment control (1.18 cm) and found statistically significant to other treatments. Cut corms treated with carbendazim 0.4% was reflected a significantly maximum width of 1st leaf at 35 days which found statistically at par with mancozeb 0.4% (1.73 cm), carbendazim 0.4% + mancozeb 0.4% (1.71 cm) including control (1.74 cm) and found significant to other treatments. This may related to the reason that GA_3 treatment might not be affected for increasing the width of leaf. It might reduce the number of stomata in epidermis that significantly narrower the stomatal pores (Pogroszewska, 2002 and Janowska *et al*., 2014) [18, 7]. Although this growth hormone might help in inducing length of leaves, yet it failed to broaden the width of leaves. Similar results were also obtained by Padhi *et al*. (2018) [15] in gladiolus cormels and Janowska *et al*. (2014) [7] in *Zantedeschia*. While at 50 days, it was observed that cut corms treated with GA_3 50 ppm (2.03 cm) were perceived a significantly maximum width of 1st leaf which was found statistically at par with carbendazim 0.4% (1.95 cm) followed by control (1.94 cm), mancozeb 0.4% (1.79 cm), carbendazim 0.4% + mancozeb 0.4% (1.78 cm) and also found significant to other treatments. While cut corms treated with carbendazim 0.4% (1.99 cm) resulted maximum leaf width of 3rd leaf at 65 days which was statistically at par with treatment carbendazim 0.4% + mancozeb 0.4% (1.86 cm) and control (1.85 cm) and significant to other treatments. Minimum width of 1st and 3rd leaf at 20, 35, 50 and 65 days were remarked with treatment GA_3 100 ppm + mancozeb 0.4% (0.78 cm, 1.15 cm, 1.24 cm and 1.18 cm, respectively). Fungicides registered a positive response on vegetative growth in gladiolus. This might be due to the carbon containing fungicides that would help in enhancing photosynthesis rate and its management in carbohydrates reserves (Petit *et al*., 2012) [17]. However, application of growth hormones like GA_3 after a certain period might help in inducing cell division process that sometimes helps in widening the leaf. The present result is in line with the findings of Singh and Srivastava (2009) [22] in tuberose and Patel *et al*., (2010) [16] in gladiolus.

The significant difference was failed to exert for all the corm and cormels characters due to application of various concentrations of GA_3, carbendazim 0.4% and mancozeb 0.4% except for the character number of cormels per hill in single bud section of gladiolus (Table 2). Maximum number of corms per hill was found with treatment GA_3 100 ppm + carbendazim 0.4% (5.33) while minimum with mancozeb 0.4% (4.33) and control (4.33). Cut gladiolus corms treated with GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% was obtained for maximum weight of corm per hill (38.96 g) and diameter of corms (49.62 mm) while minimum was obtained with GA_3 100 ppm + carbendazim 0.4% (26.65 g and 41.72 mm). Maximum weight of cormels per hill was perceived with treatment carbendazim 0.4% + mancozeb 0.4% (1.57 g) while minimum was noted with treatments mancozeb 0.4% and GA_3 50 ppm + carbendazim 0.4% (0.46 g). A significant effect on number of cormels per hill was noticed that was ascribed to various applications of GA_3, carbendazim 0.4%, mancozeb 0.4% including control treatment in cut corms of gladiolus. An increase in number of cormels per hill was found with treatment GA_3 50 ppm + carbendazim 0.4% + mancozeb 0.4% (7.25) which found statistically at par with treatment GA_3 100 ppm + mancozeb 0.4% (6.40) followed by GA_3 50 ppm (6.32), GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% (6.15), carbendazim 0.4% + mancozeb 0.4% (5.40), GA_3 100 ppm (5.33), carbendazim 0.4% (5.27) and significant to other treatments. The effect of fungicides might help in suppressing the disease incidence that promotes a healthy growth of corms and cormels (Omeje *et al*., 2017) [14]. While GA_3 treatments might help in enhancing assimilate mobilization as the water potential of corms remained high, aiding cormel production. Also high degree of cell division might be occurred due to application of GA_3 producing more number of cormels. The results are in line with findings of Bhattacharjee (1984) [4], Arora *et al*. (1992) [2], Bhalla and Kumar (2008) [3] and Laishram and Hatibarua (2009) [12] in gladiolus. While an inclined number of cormels per hill was noticed with treatment GA_3 50 ppm + carbendazim 0.4% (1.98). All the concentrations of GA_3, carbendazim 0.4% and mancozeb 0.4% failed to exert a significant effect on diameter of cormels on cut corms in gladiolus. Maximum diameter being obtained with GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% (9.20 mm) treatment while minimum with control (6.68 mm).

Table 1: Evaluation of single budded cut corms in gladiolus for vegetative characters

Treatment	Plant height (cm)				Width of 1st and 3rd leaf (cm)			
	Plant height at 20 days	Plant height at 35 days	Plant height at 50 days	Plant height at 65 days	Width of 1st leaf at 20 days	Width of 1st leaf at 35 days	Width of 1st leaf at 50 days	Width of 3rd leaf at 65 days
Control	15.72	35.28	43.27	49.85	1.18	1.74	1.94	1.85
GA_3 50 ppm	15.98	33.83	43.38	48.00	1.04	1.61	2.03	1.59
GA_3 100 ppm	18.63	36.26	42.62	48.48	1.07	1.51	1.72	1.34
Carbendazim 0.4%	15.69	36.80	44.17	50.10	1.34	1.85	1.95	1.99
Mancozeb 0.4%	16.11	35.88	40.17	45.04	1.22	1.73	1.79	1.62
Carbendazim 0.4% + Mancozeb 0.4%	14.98	35.69	43.71	52.58	1.26	1.71	1.78	1.86
GA_3 50 ppm + Carbendazim 0.4%	20.10	36.33	39.16	46.21	1.24	1.39	1.40	1.32
GA_3 50 ppm + Mancozeb 0.4%	18.60	34.57	39.63	46.64	0.95	1.23	1.27	1.33
GA_3 50 ppm + Carbendazim 0.4% + Mancozeb 0.4%	19.22	36.58	40.66	45.71	0.99	1.40	1.49	1.40
GA_3 100 ppm + Carbendazim 0.4%	17.93	34.84	41.46	45.21	1.01	1.49	1.50	1.43
GA_3 100 ppm + Mancozeb 0.4%	16.44	33.91	38.02	42.95	0.78	1.15	1.24	1.18
GA_3 100 ppm + Carbendazim 0.4% + Mancozeb 0.4%	21.09	42.11	48.73	53.06	1.14	1.64	1.65	1.55
C.D. at 5%	NS	NS	5.27	4.65	0.27	0.23	0.30	0.21

Table 2: Evaluation of single budded cut corms in gladiolus for corms and cormels characters

Treatment	Number of corms per hill	Weight of corm per hill (g)	Diameter of corm (mm)	Number of cormels per hill	Weight of cormels per hill (g)	Diameter of cormels (mm)
Control	4.33	36.07	47.39	4.05	0.95	6.68
GA_3 50 ppm	4.66	31.06	44.73	6.32	1.48	6.90
GA_3 100 ppm	5.00	28.24	44.62	5.33	1.20	8.92
Carbendazim 0.4%	5.00	32.71	47.02	5.27	1.18	8.38
Mancozeb 0.4%	4.33	28.34	42.74	2.37	0.46	6.88
Carbendazim 0.4% + Mancozeb 0.4%	5.00	39.91	49.09	5.40	1.57	8.50
GA_3 50 ppm + Carbendazim 0.4%	5.00	28.18	43.03	1.98	0.46	7.10
GA_3 50 ppm + Mancozeb 0.4%	4.66	30.28	44.01	4.80	0.92	7.70
GA_3 50 ppm + Carbendazim 0.4% + Mancozeb 0.4%	4.66	37.97	47.78	7.25	1.47	7.27
GA_3 100 ppm + Carbendazim 0.4%	5.33	26.65	41.72	3.41	0.91	7.50
GA_3 100 ppm + Mancozeb 0.4%	5.00	28.05	43.30	6.40	1.16	7.87
GA_3 100 ppm + Carbendazim 0.4% + Mancozeb 0.4%	5.00	38.96	49.62	6.15	1.52	9.20
C.D. at 5%	NS	NS	NS	3.17	NS	NS

Conclusion

In the present study it was concluded that, from all the twelve treatments, GA_3 100 ppm + carbendazim 0.4% + mancozeb 0.4% was found to be the most effective for plant height (after 50 and 65 days), carbendazim 0.4% for maximum width of 1st and 3rd leaf in gladiolus. However for corm parameters, GA_3

50 ppm + carbendazim 0.4% + mancozeb 0.4% was reported for maximum number of cormels per hill.

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