The Pharma Innovation Journal 2022; 11(12): 4165-4167

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(12): 4165-4167

www.thepharmajournal.com
Received: 20-10-2022
Accepted: 24-11-2022

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Effect of different plant growth regulators on corm and cormel yield and quality parameters in gladiolus cv. summer sunshine

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Abstract
An experiment on Effect of plant growth regulators on corm and cormel yield per meter square and per hectare and corm and cormel diameter in gladiolus cv. summer sunshine" was conducted at Horticulture research Farm, SHUATS, Allahabad during 2018-19. Experiment was conducted by soaking the corms in different plant growth regulators at different concentrations for 24 hr the soaked corms were dried under shade for 2 hours and then planted. The treatment comprise of GA_3 (50, 100, 150ppm), IAA (100, 1 50, 200ppm), NAA (50, 100, 150ppm), thiourea (1000, 1500, 2000ppm) and control. Maximum diameter of corm (7.65cm) was recorded in the treatment with a GA_3@ 150 ppm, whereas, minimum corm diameter (3.38cm) was recorded in control. Significantly maximum diameter of the cormel was recorded in GA_3 at 150 ppm (2.06 cm). Whereas minimum was recorded in control (T_{13}) (0.64 cm). Corms treated with IAA @ 200ppm (T_3) produced significantly maximum number of corms per meter square (19.48), Whereas control (T_{13}) recorded the minimum number of corms per meter square (16.61).Corms treated with IAA @ 200ppm (T_3) produced significantly maximum number of corms per hectare (1,94,800),Where control (T_{13}) recorded the minimum number of corms per hectare (166066.67). Corms treated with IAA @ 200ppm (T_3) produced significantly maximum number of cormels per meter square (456.82) Where as control recorded the minimum number of cormels per meter square (307.74). Corms treated with IAA @ 200ppm (T_3) produced significantly maximum number of cormels per meter square (456.82). Whereas control recorded the minimum number of cormels per meter square (307.74). Corms treated with IAA @ 200ppm (T_3) produced significantly maximum number of cormels per hectare (4568233.33), Where control (T_{13}) recorded the minimum number of cormels per hectare (3077366.67).

Keywords: Gladiolus hybridus L., Iridaceae, sub-family Crocoideae, sword, sword lily,

Introduction
Gladiolus (*Gladiolus hybridus* L.) is and a high value bulbous ornamental plant cultivated worldwide for cut flowers and also for bedding purpose. The genus gladiolus is a member of family Iridaceae, sub-family Crocoideae and native to Mediterranean region, particularly the Cape of Good Hope South Africa Which is considered as the center of origin for this genus. The name Gladiolus was originally coined by Pliny the Elder (A.D.23-79) from the Latin word *gladius* meaning 'sword', since the leaves of gladiolus resembles the sword like shape and is commonly known as 'sword lily'.
Popularity of this crop as a cut flower is increasing day by day because of its attractive spikes and availability in wide range of colors, varying number and size of florets, wide range of keeping quality and adaptability to different seasons. These characters have made it very attractive for use as a cut flower, vase and bouquet preparation, growing in herbaceous borders, beddings, rockeries and pot cultivation.
Use of plant growth regulators (PGRs) revolutionized the growth of horticulture in both developed and developing countries. In fact plant growth regulators have become an integral part of agro-technical procedures of cultivated ornamental crops, since the regulations for usage of chemicals in ornamental crops are less stringent unlike those in food crops. Thus their application in these crops has been extended to alter a variety of responses.

Materials and Methods
An experiment on "Effect of plant growth regulators on plant growth, spike and corm yield of Gladiolus cv. summer sunshine" was conducted at Horticulture Research Farm, SHUATS, Prayagraj during 2018-19.

There were 13 treatments and 3 replications, it comprising of different growth regulators GA_3 (50, 100, 150ppm), IAA (100, 150, 200ppm), NAA (50, 100, 150ppm), Thiourea (1000, 1500, 2000ppm) and control. Medium sized Mother Corms were soaked for 24 hours in different growth regulators solution, the soaked corms were dried under shade for 2 hours and then planted.

The treatment was laid out in the Randomized Complete Block Design with 13 treatments and three replications.

The corms were planted at 20×30cm spacing in unit of 1.5×1m. The experimental plot is fertilized with 100kg/ha of urea, 60kg/ha of Mop and 60kg/ha of SSP (as per standard recommendation), intercultural operations like weeding, earthing up, and watering were done as and when necessary. The observations were recorded at 30, 45, 60 days after planting.

Results and Discussion

Growth regulators showed significant influence on diameter of corms (Table.1) Significantly maximum diameter of corm (7.65) was recorded in the treatment with GA_3 @ 150 ppm which was followed by treatment of GA_3 at 100 ppm (6.45cm) and 50 ppm (4.61cm). Whereas, minimum corm diameter (3.38cm) was recorded in control. The different growth regulator treatments had significant effect on the corm diameter. The results showed that, the maximum diameter of the corms was achieved by corms treated GA_3 @ 150ppm and it was on par with GA_3 @ 50ppm and 100ppm, while minimum was recorded in control. This might be due to the gibberellins, which lead to increased elongation of root thus that enhances the diameter of the corm. The results in the present study are in agreement with the earlier report in tuberose reported by Maurya and Nagada (2002) in cv. Friendship of gladiolus.

Significantly maximum diameter of the cormel was recorded in GA_3 at 150ppm, GA_3 at 100ppm and 50ppm (1.62 and 1.50cm). Whereas minimum was recorded in control (0.64cm).

The different growth regulator had significant effect on cormel diameter. The result showed that, maximum diameter of the cormel was achieved by corms treated with GA_3 @ 150ppm and it was par with GA_3 50ppm and 100 ppm, while minimum diameter was noticed in control. This might be due to the gibberellins, Which leads to increased elongation of root thus that enhances the diameter of the cormel. The results in the present study are in agreement with the earlier report in tuberose by Khan, *et al.* (2013) [2]. Similar results of increase in size and weight of gladiolus corms have ported by Maurya and Nagada (2002) in cv. Friendship of gladiolus.

The data indicated the existence of significant difference with respect to corm yield as influenced by different concentration of plant growth regulators in gladiolus (Table 2).

Corms treated with IAA @ 150ppm and 200ppm (T_2 and T_3) produced significantly maximum number of corms per meter square (18.63 and 19.48) which was followed by corms treated with GA_3 at 150ppm, whereas control recorded the minimum number of corms per meter square (16.61).

Corms treated with IAA @ 200ppm (T_3) produced significantly maximum number of corms per hectare (1, 94, 800) which was followed by corms treated with IAA @ 150ppm (T_2) (186266.67). Where control (T_{13}) recorded the minimum number of corms per hectare (166066.67). The corms treated with growth regulators showed a significant variation in terms of yield of corms. Significantly maximum number of corms per meter square and per hectare as noticed from the corms which were treated with 200ppm of IAA, which was on par with IAA @ 100ppm and 150ppm. Whereas, minimum corm yield was recorded from control, IAA might have resulted in splitting of the corms and multiple shooting that may lead to produce maximum number of corms per meter square and hectare reported by M.K Jamil, *et al* (2015) [4].

Corms treated with IAA @ 200ppm (T_3) produced significantly maximum number of cormels per meter square (456.82) which was followed by corms treated with IAA @ 150ppm recorded cormels of (432.41), Whereas control recorded the minimum number of cormels per meter square (307.74). Corms treated with IAA @ 200ppm (T_3) produced significantly maximum number of cormels per hectare (4568233.33) which was followed by corms treated with IAA @ 150ppm(T_2) (4324066.67). Where control (T_{13}) recorded the minimum number of cormels per hectare (3077366.67). The corms treated with growth regulators showed a significant variation in terms of yield of corms. Significantly maximum number of corms per meter square and per hectare as noticed from the corms which were treated with 200ppm of IAA, which was on par with IAA @ 100ppm and 150ppm. Whereas, minimum corm yield was recorded from control, IAA might have resulted in splitting of the corms and multiple shooting that may lead to produce maximum number of corms per meter square and hectare reported by M.K Jamil *et al* (2015) [4].

Table 1: Effect of plant growth regulators on diameter of corm and cormel in gladiolus cv. summer sunshine

Treatments		Corm Diameter (cm)	Cormel diameter (cm)
No	**Details**		
T_1	IAA @ 100ppm	3.55	1.03
T_2	IAA @ 150ppm	3.51	1.00
T_3	IAA @ 200ppm	3.57	1.22
T_4	GA_3 @ 50ppm	4.61	1.50
T_5	GA_3 @ 100ppm	6.45	1.62
T_6	GA_3 @ 150ppm	7.65	2.06
T_7	NAA @ 50ppm	4.73	0.96
T_8	NAA @ 100ppm	5.05	1.04
T_9	NAA @ 150ppm	5.26	0.98
T_{10}	Thiourea @ 1000ppm	6.20	1.51
T_{11}	Thiourea @ 1500ppm	6.22	1.52
T_{12}	Thiourea @ 2000ppm	6.26	1.60
T_{13}	Control	3.38	0.64
S.E.M±		0.12	0.15
CD @ 5%		0.36	0.43

Table 2: Effect of plant growth regulators on corm and cormel yield in gladiolus cv. summer sunshine

	Treatments	Corm yield		Cormel yield	
No	**Details**	**Per m^2 (NOS)**	**Per ha (NOS)**	**Per m^2 (NOS)**	**Per hectare (NOS)**
T_1	IAA @ 100ppm	17.63	176266.67	364.28	3642800.00
T_2	IAA @ 150ppm	18.63	186266.67	432.41	4324066.67
T_3	IAA @ 200ppm	19.48	194800.00	456.82	4568233.33
T_4	GA_3 @ 50ppm	17.51	175133.33	334.66	3346600.00
T_5	GA_3 @ 100ppm	17.52	175166.67	347.69	3476933.33
T_6	GA_3 @ 150ppm	18.63	182166.67	358.17	3581700.00
T_7	NAA @ 50ppm	17.66	176633.33	346.51	3465066.67
T_8	NAA @ 100ppm	17.61	176066.67	356.95	3569500.00
T_9	NAA @ 150ppm	18.46	184600.00	364.28	3642800.00
T_{10}	Thiourea @ 1000ppm	17.35	174600.00	331.07	3310666.67
T_{11}	Thiourea @ 1500ppm	17.27	172733.33	345.23	3452300.00
T_{12}	Thiourea @ 2000ppm	16.66	166633.33	362.50	3625033.33
T_{13}	Control	16.61	166066.67	307.74	3077366.67
S.E.M±		0.10	1009.65	9.35	93471.43
CD @ 5%		0.29	2946.96	27.28	272823.79

Conclusion

On the basis of the above results obtained during the research conducted, it can be concluded that application of GA_3 @ 150 ppm gave best results in terms of corm and cormel diameter in gladiolus and IAA @ 200ppm is best for corm and cormel yield per meter square and per hectare in Gladiolus (Cv. Summer Sunshine).

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