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Effect of Plant Growth Regulators and Micronutrients on Vase Life Characters of Gladiolus (*Gladiolus Grandiflorus* L.)

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ABSTRACT

The investigation was conducted to find out the effect of plant growth regulators and micronutrients on vase life characters of gladiolus (*Gladiolus grandiflorus* L.) cv. Novalux. The experiment was conducted in factorial randomized block design with 12 treatments replicated thrice at the main Experiment Station, Department of Floriculture & Landscape, Acharya Narendra Deva University of Agriculture & Technology, Narendra Nagar (Kumarganj), Ayodhya . The plant growth regulators and micronutrients application significantly influenced the vase life of gladiolus. The maximum per cent increase in spike length, per cent opening of floret per spike, number of florets opened at a specific time and vase life (days) was noted in CCC 500 ppm with $ZnSO_4$ 0.5% + $FeSO_4$ 0.2%. The minimum drooping of florets was obtained with the combinations of CCC 500 ppm with ZnSO4 0.5% + FeSO4 0.2%. and maximum observed under control.

Key Word : Gladiolus, Novalux, vase life, spike increase, Zn, Fe, Cycocel, Gibberellin.

INTRODUCTION

The modern gladiolus hybrids are botanically known as *Gladiolus grandiflorus*. Gladiolus is one of the important monocotyledonous flowering perennial bulbous plant belongs to family Iridaceae and widely grown as a cut flower in the world. It has basic chromosome number n=15 and the majority of South African species are diploid (2n=30). The control over flowering time and floral characteristics according to the demand of the market has been achieved in many cut flowers by adopting modern production techniques including the use of plant growth regulators (PGRs). The application of plant growth regulators has become part of their cultural practices in many ornamental plants to modify their vegetative and floral traits.

GA_3 delays senescence of flowers by reducing the senescence-promoting effect of ethylene. The application of GA_3 was found beneficial to shorten the number of days to flowering, increase spike length, number of flowers per spike, floret diameter, shoot elongation and vegetative growth significantly. Cycocel (Chlormequat chloride, 2-chloroethyl trimethyl ammonium chloride) is a plant growth regulator for ornamentals, including bedding plants and herbaceous crops. Cycocel (CCC) enhances the crop's aesthetic appeal and improves durability during post-production shipping and handling. Cycocel is a gibberellin inhibitor and produces earlier budded plants with multiple buds per shoot. Cycocel can be used to reduce stem elongation induction of seed germination, Enzyme production during germination CCC is required for cell division.

Micronutrients such as zinc is an essential element for plants which acts as a cofactor of various enzymes or as a functional structural or regulatory components of various biosynthesis like protein synthesis, photosynthesis, the synthesis of auxin, cell division, the maintenance of membrane structure RNA and ribosome functions and sexual fertilization. The micronutrients are responsible in activating several enzymes (catalase, peroxidase, alcohol dehydrogenase, carbonic dehydrogenase,

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Table No. 1: Effect of plant growth regulators and micronutrients on vase life characters of gladiolus (*Gladiolus grandiflorus* L.) cv. Novalux

Treatment	Per cent increase in spike length		Per cent opening of floret per spike		Number of florets opened at a specific time		Drooping of florets		Vase life (days)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
G_1	4.74	5.22	46.33	48.26	6.33	7.08	4.11	4.07	10.56	11.78
G_2	5.29	5.82	55.29	57.59	6.83	7.83	3.47	3.37	12.10	13.53
G_3	5.82	6.40	66.47	69.24	7.17	8.83	2.81	2.63	15.10	14.71
SEm±	0.112	0.122	1.851	1.981	0.191	0.193	0.034	0.038	0.197	0.161
C.D.(P=0.05)	0.327	0.359	5.430	5.809	0.560	0.566	0.099	0.112	0.576	0.472
M_1	4.94	5.43	50.97	53.09	6.44	7.44	3.71	3.58	11.82	12.16
M_2	5.17	5.69	54.55	56.82	6.44	7.67	3.55	3.47	12.47	13.26
M_3	5.38	5.92	58.01	60.43	6.78	8.11	3.37	3.25	12.65	13.94
M_4	5.64	6.20	60.60	63.12	7.44	8.44	3.22	3.13	13.40	14.00
SEm±	0.129	0.141	2.138	2.287	0.220	0.223	0.039	0.044	0.227	0.186
C.D.(P=0.05)	0.378	0.415	6.270	6.708	0.646	0.654	0.114	0.129	0.666	0.545
G_1M_1	4.47	4.92	40.62	42.31	6.00	6.33	4.41	4.27	9.97	9.85
G_1M_2	4.66	5.12	46.52	48.46	5.33	7.00	4.09	4.29	10.74	12.16
G_1M_3	4.82	5.30	48.86	50.89	6.67	7.33	4.00	3.96	10.83	12.33
G_1M_4	5.01	5.52	49.34	51.40	7.33	7.67	3.94	3.76	10.71	12.77
G_2M_1	4.93	5.43	50.16	52.25	6.33	7.33	3.77	3.63	11.25	12.90
G_2M_2	5.17	5.69	53.81	56.06	6.67	7.67	3.64	3.55	11.59	13.33
G_2M_3	5.40	5.94	55.78	58.11	7.00	8.00	3.39	3.26	11.62	14.19
G_2M_4	5.66	6.23	61.38	63.94	7.33	8.33	3.07	3.06	13.95	13.69
G_3M_1	5.41	5.95	62.12	64.71	7.00	8.67	2.94	2.84	14.25	13.72
G_3M_2	5.68	6.25	63.31	65.94	7.33	8.33	2.91	2.56	15.10	14.29
G_3M_3	5.94	6.53	69.38	72.28	6.67	9.00	2.73	2.52	15.51	15.31
G_3M_4	6.23	6.85	71.07	74.03	7.67	9.33	2.64	2.58	15.55	15.53
SEm±	0.223	0.245	3.703	3.961	0.382	0.386	0.067	0.076	0.393	0.322
C.D.(P=0.05)	NS	NS	NS	NS	NS	NS	0.197	0.224	1.153	0.943

etc.) and involve themself in chlorophyll synthesis and various physiological activities by which plant growth and development are encouraged (Kumar and Arora, 2000), Zinc also controls the metabolism of a plant by stimulating the hydrogenase and carbonic anhydrase activities, stabilization of ribosomal fractions and synthesis of cytochrome.

There is evidence that iron deficiency impairs many plant physiological processes because it is involved in chlorophyll and protein synthesis and root tip meristem growth. Tagliavini and Rombola (2001) illustrated that iron deficiency (chlorosis) is a common disorder which affects plants grown on soils of high pH. Iron application through foliar spray is a common practice to cure iron-deficiency (Mortvedt, *et al,* 1991). The treatment 20 per cent sugar results in a greater number of opened flowers of Gladiolus, marketable condition of spike and longer vase life of spike in days for the gladiolus cv. American Beauty. The parameter of vase life was studied indicated that the sugar levels increased ultimately increasing the greater number of opened flowers per spike over control (Babaji *et al,* 2014), the higher temperature, there was a significant reduction in fresh weight of cut spike of gladiolus at harvest. Senescence was accelerated by increased temperature (Kadam and Singh, 2009). Increase in storage duration causes a decrease in the size of floret and water absorption in spikes of gladiolus being higher in spikes given pulsing treatment with sucrose (Avneet *et al,* 2016).

MATERIALS AND METHODS

This work was carried out at the Lab. of Floriculture, Department of Horticulture, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya during the year 2017-18 and 2018-19 to elicited the response of vase life of Gladiolus spp. uniform-sized spikes were harvested from all the experimental plots early in the morning when the basal 1-2 florets showed colour break and immediately brought to the laboratory by putting them in a bucket containing water. Lowermost leaves of the spikes were removed and the basal 2 cm portion was recut under water before placing them in holding solution. A solution containing sucrose (4 %) was used as the holding solution. There were three replications and three spikes per replication from each treatment plots. The treatments are G_1M_1 (water dipping + water spray), G_1M_2 (water dipping + $ZnSO_4$ 0.5%), G_1M_3 (water dipping + $FeSO_4$ 0.2%), G_1M_4 (water dipping + $ZnSO_4$ 0.5%+ $FeSO_4$ 0.2%), G_2M_1 (GA_3 200 ppm + water spray), G_2M_2 (GA_3 200 ppm + $ZnSO_4$ 0.5%), G_2M_3 (GA_3 200 ppm + $FeSO_4$ 0.2%), G_2M_4 (GA_3 200 ppm + $ZnSO_4$ 0.5%+ $FeSO_4$ 0.2%), G_3M_1 (CCC 500 ppm + water spray), G_3M_2 (CCC 500 ppm + $ZnSO_4$ 0.5%), G_3M_3 (CCC 500 ppm + $FeSO_4$ 0.2%) and G_3M_4 (CCC 500 ppm + $ZnSO_4$ 0.5%+ $FeSO_4$ 0.2%). The observation was recorded for the character viz. per cent increase in spike length, per cent opening of floret per spike, number of florets opened at a specific time, drooping of florets and vase life (days). The obtained data had statistically analysed adopting procedure as given by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The effect of plant growth regulators and micronutrients on vase life are presented in Table 1. The plant growth regulator significantly affects the per cent increase in spike length significantly influenced under all the growth regulator treatments as compared to control. The highest per cent increase in spike length (5.82 and 6.40 % during 2017-18 and 2018-19, respectively), per cent opening of floret per spike (66.47 and 69.24 during 2017-18 and 2018-19, respectively), the maximum number of florets at a specific time (3.92 and 4.25 during 2017-18 and 2018-19, respectively), spike life of gladiolus (15.10d and 14.71d during 2017-18 and 2018-19, respectively) and the minimum drooping of florets (2.81 and 2.63 during 2017-18 and 2018-19, respectively) were obtained with CCC 500 ppm. However, the minimum was noticed with control (no growth regulators). The maximum vase life of flower was observed with CCC treatment which might be due to delaying in senescence of flower resulting in an extension of vase life. Similar results were also reported by Khan and Bahadur (2013) in gladiolus and Kumar and Singh (2004) in tuberose,

A significant increment in per cent increase in spike length (5.64% in 2017-18 and 6.20 % in 2018-19, respectively), per cent opening of floret per spike (60.60 in 2017-18 and 63.12 per cent in 2018-19), number of florets opened at a specific time (4.11 and 4.00 during 2017-18 and 2018-19) and spike life (13.40 d and 14.00 d during 2017-18 and 2018-19, respectively) and the minimum drooping of florets (3.22 in 2017-18 and 3.13 in 2017-18, respectively) was observed with $ZnSO_4$ 0.5% + $FeSO_4$ 0.2%. The maximum vase life of flower was observed with $ZnSO_4$ 0.5% + $FeSO_4$ 0.2% treatment because the positive impact of micronutrients like zinc and iron might be due to the ability of these nutrients in activating several enzymes and its involvement in chlorophyll synthesis and various physiological activities ultimately increase the vase life. Similar findings are also reported by Muthumanicham *et al*. (1999) in gerbera and Nagaraju *et al.* (2002) in gladiolus.

It was clear from the data that the interaction effect of growth regulators and micronutrients was found non-significant on per cent increase in spike length, per cent opening of floret per spike and number of florets opened at a specific time. A perusal of data indicated that interaction effects of plant growth regulators and micronutrients found significant on drooping of florets and vase life. The minimum drooping of florets (2.64 and 2.58 in 2017-18 and 2018-19, respectively) and that the combination of CCC 500 ppm with $ZnSO_4$ 0.5% + $FeSO_4$ 0.2% gave maximum vase life of gladiolus spike (15.55 days and 15.53 days during 2017-18 and 2018-19, respectively).

REFERENCES

Avneet K, Kushal S and Nirmaljit K (2016). Post-harvest keeping quality of gladiolus (*Gladiolus spp*.) in relation to pulsing treatment and refrigerated storage. *Indian J Ecol* **43**(1):219-223.

Babaji J P, Bharat P N, Suresh D S and Davabhai J P (2014). Effect of different levels of sugar in pulsing treatment on post-harvest quality of gladiolus cv. American Beauty. *Annals of Res* **5**(8):13-17.

Bharti A, Ram D and Kumar A (2021). Genetic variability, heritability, genetic advance and genetic divergence for yield and its contributing traits in Gladiolus (*Gladiolus grandiflorus* L.) *J Krishi Vigyan* **10**(1):

Kadam G B and Singh K P (2009). Postharvest quality of gladiolus (*Gladiolus (Tourn)* L.) cut spike as affected by variable temperature and elevated carbon dioxide regimes. *J Ornamental Hort* **12**(3):175-181.

Khan A and Bahadur V (2013). Effect of plant growth regulators on growth and spike yield of gladiolus cultivars. *Hort Flora Res Spect* **2**(4): 341-345.

Kumar J and Singh D (2004). Post-harvest life of tuberose cv. Pearl Double spike as affected by GA_3, NAA and Sucrose. *J Ornamental Hort* **7**(2): 188-191.

Kumar P and Arora J S (2000). Effects of Micronutrients on Gladiolus. Journal of Ornamental Horticulture (New Series) **3**: 91-93.

Mortvedt J J, Cox F R, Shuman L M and Welch R M (1991). *Micronutrients in Agriculture*. 2nd ed. Soil Science Society of America, Madison, WI.

Muthumanickam D, Rajmani K and Jawaharlal M (1999). Effect of micronutrients on flower production in Gerbera. *J Ornamental Hort* **2**(2): 131-132.

Nagaraju H T, Narayanagowla J Y and Nagaraju G S (2002). Effect of non-toxic minerals on vase life of gladiolus. *Crop Res* **23**(2): 344-348.

Panse V G and Sukhatme B V (1985). *Statistical Method for Agricultural Workers*, IInd. Ed., Indian Council of Agricultural Research, New Delhi.

Tagliavini, Massimo and Rombola, Adamo Domenico (2001). Iron deficiency and chlorosis in orchard and vineyard ecosystems. *European J Agron* **15**(2):71-92.

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