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Response of gladiolus to bioregulators and variety under Rajasthan conditions

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Abstract
A field experiment on gladioluswas conducted during winter season of 2015-16 consisting of 20 treatment combinations having Variety and and Plant Growth Regulators (BAP, GA_3, BA) were taken in this study. The experiment was laid out in randomized block design with three replications. Out of the total 20 treatments application GA_3 200 ppm in cv. American Beauty (V_1G_3) was found to have the minimum number of days to sprouting (10.20 days), maximum leaf length (44.13 cm), leaf width (3.19 cm), minimum days to spike emergence (71.40 days) and first floret opening from spike emergence (14.07 days),

Keywords: gladiolus Variety and and Plant Growth Regulators (BAP, GA_3, BA)

Introduction
G Gladiolus (*Gladiolus* x *hybridus* Hort.) is an important cut flower crop, grown commercially in many parts of the world. In this regard gladiolus has gained much importance as it is called as the 'Queen of bulbous flowers'. It has gained popularity owing to its incomparable beauty, attractive colours, variable sizes and shapes of florets, variable spike length and long vase life. Gladiolus produces beautiful spikes from December to March in the plains and from June to September in the hills of India. The genus *Gladiolus* belongs to the family Iridaceae and comprises about 250 species. The inflorescence is a spike and originates as a terminal axis and the floret number may be up to 20 or more (Bhattacharjee and De, 2003) [2]. The potential use of growth regulators in flower production has created considerable scientific interest in recent years. Many studies have indicated that the application of growth regulators can affect the growth and development of gladiolus flowers (Chopde *et al.,* 2011) [3].
IBA (indole-3-butyric acid) is a phyto-hormone of auxin group produced in the shoot and root apices from where it is transported to other plant parts. The primary physiological effects of auxin are cell division and cell elongation in the shoots and roots. Hence, the highest concentration of IBA is found in growing shoot tips, young leaves and developing auxiliary shoots that promote spike length, leaf length and number of corms (Tonecki, 1979) [15].
GA_3 (gibberellic acid) induces the formation of hydrolytic enzymes which regulate the mobilization of food reserves, ultimately resulting in early sprouting of gladiolus corms (Groot and Karssen, 1987) [5]. GA_3 was also very much effective for seed germination, growth promotion, flowering and senescence inhibition (Murti and Upreti, 1995) [11].
BAP (6-benzylaminopurine) is a first generation synthetic cytokinin that elicits plant growth and development responses, setting blossoms and stimulating fruit richness by stimulating cell division. It is an inhibitor of respiratory kinase in plants, and increases post-harvest life of green vegetables. Influence of cytokinin as 6-benzylaminopurine in combination with other methods on postharvest green colour retention on broccoli heads and asparagus spears, showed positive results for quality retention (Siddiqui *et al.,* 2011) [12].

Materials and methods
The present investigation was conducted at the Instructional Farm Department of floriculture and landscaping, College of horticulture and forestry, to find out the optimum variety and Plant Growth Regulators. The soil had organic carbon 0.48 %, available nitrogen 240.68 kg/ha, available phosphorus 16.83 kg/ha and available potash 299.0 kg/ha. A common dose of vermicompost @ 5 kg, Urea @ 4.45 g, Single Super Phosphate @ 40 g and Muriate of Potash

@ 10 g /m2 were uniformly applied to each bed at the time of planting. Two foliar sprays of both fertilizers as per treatment requirement were applied on foliage in the morning hours at 30 and 50 day after transplanting. For the preparation of spray fluid, required total quantity of Plant Growth Regulators were dissolved in distilled water. Tiepolo as sticking agent was used @ 0.1 % for uniform spreading and longer persistence. The observations days to sprouting, leaf length, leaf width, days to spike emergence and first floret opening from spike emergence of each tagged plant was counted and then average duration of flowering was calculated.

Results & discussion

The various characters differed significantly for the various optimum variety and Plant Growth Regulators. (Table 1). The application GA_3 200 ppm in cv. American Beauty (V_1G_3) was found to have the minimum number of days to sprouting (10.20 days), maximum leaf length (44.13 cm), leaf width (3.19 cm), minimum days to spike emergence (71.40 days) and first floret opening from spike emergence (14.07 days), whereas the maximum number of days taken for sprouting (14.93 days).shortest leaves (37.53 cm) narrowest leaves (2.69 cm) most late first floret opening (20.93 days)maximum days to spike emergence (85.40 days)..The increase in the various characters with variety and different plant growth regulators application might be attributed to promote vegetative growth by increasing both cell division and cell elongation (Kumar *et al*., 2008) [6]. GA_3 has been reported to activate α-amylase enzyme that stimulates the hydrolyzation of stored starch into simple sugar and provides energy during sprouting of bulbs (Kucera *et al*., 2005) [9] Kumar *et al.* (2008) [6] reported that application of BA broken dormancy and enhanced corm sprouting in gladiolus. The growth regulators promoted cell division, cell elongation and further enhanced the translocation of sugars there by significantly influencing the leaf length (Kumar *et al.,* 2008) [6]. found higher leaf width in growth regulator treated plants due to growth enhancing capability. The earlier flowering with the application of bioregulators could be attributed to increased photosynthetic area enhancing CO_2 fixation in plants as evident from the results.

The accelerated flowing with application of bioregulators could be due promotion of vegetative growth and increased photosynthetic and metabolic activities causing more transport and utilization of photosynthets (Dogra *et al.,* 2012) [4]. Application of GA_3 could have favoured factors influencing floral initiation (Sudhakar and Kumar, 2012) [14]. The comparative delayed first floret opening in BA treatments may be due to the role of BA in cell division and splitting and formation of two competitive sinks *i.e.* inflorescence and corm production ultimately delaying the first floret opening from spike emergence in gladiolus cv. Red Candyman (Aier *et al.,* 2015) [1]. The findings are in agreement with the observations of Sharma *et al.* (2006) [13], Kumar *et al.* (2010) [7] and Montessori *et al.* (2013) [10] in gladiolus.

Table 1: Effect of variety and bioregulators on various parameter on gladiolus

Treatment	Number of days taken for sprouting	Leaf length (cm)	Leaf width (cm)	Days to spike emergence	Days to first floret opening from spike emergence
American Beauty (Control)	14.93	39.33	2.77	85.40	17.67
American Beauty + BAP 50 ppm	12.80	40.60	2.80	78.47	16.27
American Beauty + BAP 100 ppm	12.47	40.40	2.83	77.47	16.13
American Beauty + BAP 200 ppm	12.40	40.13	2.84	76.13	16.03
American Beauty + GA_3 50 ppm	10.60	42.00	3.09	73.60	14.20
American Beauty + GA_3 100 ppm	10.40	43.87	3.14	72.27	14.13
American Beauty + GA_3 200 ppm	10.20	44.13	3.19	71.40	14.07
American Beauty + IBA 50 ppm	12.33	41.47	2.89	74.73	15.63
American Beauty + IBA 100 ppm	12.27	42.53	2.91	73.60	15.53
American Beauty + IBA 200 ppm	12.00	44.00	2.93	72.60	15.47
Psittacinus Hybrid (Control)	13.80	37.53	2.69	78.73	20.93
Psittacinus Hybrid + BAP 50 ppm	12.60	38.40	2.75	77.33	19.47
Psittacinus Hybrid + BAP 100 ppm	12.53	38.33	2.77	76.13	19.40
Psittacinus Hybrid + BAP 200 ppm	12.27	38.27	2.81	75.67	19.33
Psittacinus Hybrid + GA_3 50 ppm	10.60	41.40	3.07	74.07	17.67
Psittacinus Hybrid + GA_3 100 ppm	10.53	41.57	3.12	73.60	17.60
Psittacinus Hybrid + GA_3 200 ppm	10.27	42.07	3.14	72.53	17.53
Psittacinus Hybrid + IBA 50 ppm	11.87	39.73	2.86	75.40	18.33
Psittacinus Hybrid + IBA 100 ppm	11.67	40.07	2.89	74.47	18.27
Psittacinus Hybrid + IBA 200 ppm	11.27	41.07	2.90	73.27	18.20
CD at 5%	1.07	3.40	0.24	6.42	1.43
SEm±	0.53	1.68	0.12	3.17	0.71

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