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## RESEARCH ARTICLE

### EFFECT OF PLANT GROWTH REGULATORS AND NATURAL GROWTH SUBSTANCES ON GROWTH AND FLOWERING OF GLADIOLUS CV. AMERICAN BEAUTY

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#### ABSTRACT

Investigations were conducted to study the effect of different chemicals and natural growth substances as a pre harvest foliar spray on Gladiolus cv. American Beauty. The treatments were comprised of plant growth regulators gibberellic acid (GA<sub>3</sub>, 25 and 50 mg/l) Salicylic acid (SA, 25 and 50 mg/l); and natural growth substances enriched banana pseudostem sap (1 and 2 per cent) and banana pseudostem sap (2 and 4 per cent). All the treatments improved the yield and flowering characters over control. However, among different treatments, foliar spray of GA<sub>3</sub> @ 50 mg/l, followed by GA<sub>3</sub> @ 25 mg/l were found most significant in influencing all yield parameters like number of spikes per plant and per meter square, no. of sprouts per corm, corm and cormel yield. Further, flowering parameters like spike length and vase life were significantly highest in plants sprayed with GA<sub>3</sub> @ 50 mg/l followed by GA<sub>3</sub> @ 25 mg/l. Among natural growth substances, enriched banana pseudostem sap @ 2% significantly improved all the parameters as compared to control.

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#### INTRODUCTION

Gladiolus is known as the queen of bulbous flowers owing to its brilliant colors, varying size, massive form, attractive shapes and excellent shelf life of flower spike and florets. It is grown for its attractive spike as cut flower and also in flower beds in gardens during winter. Plant growth regulators modify or regulate physiological processes in plants when used in small concentrations. It has been known that many plant processes are controlled by interaction of different plant hormones with each other and with other internal factors (Mayak and Halevy, 1980). Growth regulators like GA<sub>3</sub> and salicylic acid promote growth of plants by inducing cell division. The application of growth regulators such GA<sub>3</sub> have been earlier reported to enhance the growth and yield of gladiolus (Umrao, et al., 2007 and Rana, et al., 2005). Banana pseudo stem sap is a novel organic liquid fertilizer. It has a rich source of macro and micro nutrients.

Whereas, Banana pseudo stem enriched sap contains growth regulators like GA<sub>3</sub> and cytokinin apart from essential plant nutrients (Anonymous, 2014).

#### MATERIALS AND METHODS

This experiment was conducted at ASPEE agriculture research and development foundation, Tansa farm, Palghar, India. Total nine treatments comprised of two growth regulators at two levels of each viz., GA<sub>3</sub> @ 25 and 50 mg/l, Salicylic acid @ 25 and 50 mg/l and two natural growth substances at two levels of each viz., enriched banana pseudostem sap 1 and 2% and banana pseudostem sap 2 and 4% with control (only water) were adopted. The experiment was laid in Randomized Block Design (RBD) with three replications. The Gladiolus cv. American Beauty corms of above 5 cm diameter were planted at a spacing 45 x 45 cm in raised beds. The plants were sprayed with aqua's solution of the growth regulators and organic compounds at 15<sup>th</sup> and 45<sup>th</sup> day after planting. Plant height was measured 30 days after second spray using meter tape and expressed in centimeter (cm). No. of sprouts per plant and No. of spikes per plant were recorded at regular interval.

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**Table 1. Effect of plant growth regulators and natural growth substances on growth and flowering of gladiolus cv. American Beauty**

| Treatments                                   | Plant height (cm) | No. of sprouts per plant | No. of Spikes per plant | Spike length (cm) | Vase Life (days) | No of Corms | No of Cormels |
|--|-------------------|--------------------------|-------------------------|-------------------|------------------|-------------|---------------|
| T <sub>1</sub> – GA <sub>3</sub> 25 mg/l     | 73.06             | 2.83                     | 3.47                    | 72.44             | 13.71            | 1.52        | 25.11         |
| T <sub>2</sub> – GA <sub>3</sub> 50 mg/l     | 75.71             | 3.22                     | 3.54                    | 74.77             | 14.42            | 1.63        | 26.50         |
| T <sub>3</sub> – SA 25 mg/l (Salicylic Acid) | 70.14             | 2.24                     | 3.26                    | 69.08             | 11.40            | 1.42        | 22.88         |
| T <sub>4</sub> – SA 50 mg/l (Salicylic Acid) | 73.58             | 2.42                     | 3.25                    | 70.95             | 12.80            | 1.35        | 23.89         |
| T <sub>5</sub> – Enrich sap 1 %              | 68.92             | 1.83                     | 2.67                    | 65.54             | 9.97             | 1.29        | 21.40         |
| T <sub>6</sub> – Enrich sap 2 %              | 70.06             | 2.22                     | 3.41                    | 66.39             | 10.34            | 1.36        | 22.82         |
| T <sub>7</sub> – Banana Pseudostem sap 2 %   | 66.85             | 1.63                     | 2.06                    | 62.13             | 13.48            | 1.23        | 18.83         |
| T <sub>8</sub> – Banana Pseudostem sap 4 %   | 67.43             | 1.61                     | 2.44                    | 62.65             | 8.52             | 1.27        | 19.20         |
| T <sub>9</sub> – Control                     | 61.22             | 1.27                     | 2.06                    | 56.16             | 7.05             | 1.06        | 15.60         |
| LSD @5%                                      | 7.82              | 0.35                     | 0.33                    | 6.74              | 1.24             | 0.22        | 1.77          |

Spike length was measured at time of harvesting of flower with meter tape and expressed in centimeter (cm). To measure vase life, flowers were harvested when first floret started to open and were held in distilled water till 50 per cent florets wilted at ambient room condition. No. of corms and cormels per plant were recorded at time of uplifting of corms from field. The growth and yield parameters for each treatment were recorded in five plants selected by random sampling method in each treatment from each replication. The intercultural operations were followed as and when required. The data were statistically analyzed by using 'waps statistical program' developed by ICAR research complex Goa and critical differences were worked out at five per cent level to draw statistical conclusions

## RESULTS AND DISCUSSION

All growth and flowering parameters of gladiolus were significantly altered due to the application of growth regulators. The maximum plant height (75.71 cm) was observed with GA<sub>3</sub> @ 50 mg/l followed by salicylic acid @ 50 mg/l whereas, the minimum plant height (61.22 cm) was observed in control. Similarly, maximum no. of sprouts per corm (3.22) was recorded in GA<sub>3</sub> @ 50 mg/l followed by GA<sub>3</sub> @ 25 mg/l whereas minimum no. of sprouts per corm (1.27) was found in control. GA<sub>3</sub> promote vegetative growth by increasing both cell division and cell elongation. These findings are in accordance with the reports of Sharma *et al.* (2004), Kumar *et al.* (2008) and Chopde *et al.* (2012) in gladiolus. Further, GA<sub>3</sub> has been reported to activate  $\alpha$ -amylase enzyme that stimulates the hydrolyzation of stored starch into simple sugar and provides energy during sprouting of bulbous crops (Kucera *et al.*, 2005). Further, GA<sub>3</sub> may have suppressed effect of growth inhibitors like ABA in corms as elucidated by Ramzan *et al.*, 2014.

The data showed that application of growth regulators significantly improved flowering parameters as compared to control. Among all treatments, GA<sub>3</sub>@ 50 mg/l recorded maximum no. of spikes per plant (3.54), longest spike (74.77 cm) and maximum vase life (14.42 days) followed by GA<sub>3</sub> @ 25 mg/l. Minimum no. of spikes per plant (2.06), shortest spike (56.16 cm) and minimum vase life (7.05 days) were recorded in control. GA<sub>3</sub> application enhanced vegetative growth in early phase due to increased photo synthesis and CO<sub>2</sub> fixation. Increase in production of spikes with foliar application of GA<sub>3</sub> may be due to enhanced induction of floral bud break. The increase in spike quality in terms of spike length with application of GA<sub>3</sub> can be attributed to active cell elongation

and the increase in the sink strength of the actively growing parts as earlier elucidated by Ramzan *et al.* (2014) in tulip. GA has been known to induce antioxidative enzyme activity in plant cells (Ohlsson and Berglund, 1998) and there by indirectly delay cell senescence process as observed earlier (Mangave *et al.*, 2012, Singh *et al.*, 2008). Similar results of enhanced flower quality with application of GA<sub>3</sub> have also been observed by Baskaran and Misra *et al.* (2007), Sharma *et al.* (2006) in gladiolus and Singh and Shrivastava *et al.* (2009) in tuberose. The yield attributes related to corms and cormels were significantly increased by the application of growth regulators when compared to control. Significantly higher number of corms (1.63) and cormels (26.50) were noticed under GA<sub>3</sub> @ 50 mg/l, followed by GA<sub>3</sub> @ 25 mg/l among all other treatments where minimum no. of corms (1.06) and cormels (15.60) per plant were recorded in control (water only). Gibberelic acid was known to enhance the rate of photosynthesis by increasing chlorophyll content in leaves that further increases the availability of metabolites to the developing corm and cormels. The present results are in conversance with the findings of Sharma *et al.* (2006) in gladiolus, Shankar *et al.* (2011) and Rani and Singh *et al.* (2013) in tuberose. In conclusion, this study has proved that spray of GA<sub>3</sub> @ 50 mg/l at 15 and 45 days after planting of gladiolus cv. American Beauty improves vegetative, flowering and yield parameters significantly.

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