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Efficacy of foliar spray of IAA, GA₃ and daminozide on growth and flowering of gladiolus (*Gladiolus grandiflorus* L.) cv. oscar

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Abstract

The effect of foliar application of IAA, GA₃ and Daminozide on growth and flowering of gladiolus cv. Oscar was investigated. The field experiment was laid out in a randomized block design, replicated thrice, with three levels of each GA₃, IAA and Daminozide. The results revealed that foliar application of 100 ppm GA₃ was found to be the best for plant height (103.16 cm), number of leaves per plant (10.11), length of leaf (67.38 cm), days to first flowering (57.18 DAP), longevity of intact spike (18.44 days), length of the spike (99.67 cm), fresh weight of the spike (71.59 g), number of florets per spike (14.89) and vase life of the cut spike (12.33 days) followed by foliar application of 50 ppm GA₃. While the different levels of Daminozide reduced growth and flowering. However, foliar application of 500 ppm Daminozide increased longevity of intact spike following foliar application of 100 ppm GA₃.

Keywords: Gladiolus, IAA, GA₃, Daminozide, growth, flowering

Introduction

Gladiolus, a member of the family Iridaceae, is known as the queen of bulbous flowers with magnificent flower spikes having dazzling colors and appealing shapes. Gladiolus forms a part of floriculture in the country. The use of growth regulators in horticulture has brought about a revolution in the floriculture industry (Vijaikumar and Singh) [15]. Plant growth regulators are the organic chemical compounds which modify or regulate physiological processes in an appreciable measure in plants. Indole-3-Acetic Acid (IAA) increases the plasticity of cell walls so that the cells stretch easily in response to turgor pressure. Gibberellic acid treatments are known to play important role in promoting diverse processes throughout the development of plant; induced early flowering, increased early flowering, increased length or height of plant, number of leaves, yield and quality of the flower (Tyagi and Singh, and Emami *et al.*) [13, 2]. Foliar application of Daminozide showed maximum flowers per plant and a longer flowering period compared with control in Dahlia (Singh *et al.*) [3]. Therefore, the present investigation was taken under to find out the best concentration of plant growth regulator to be applied to gladiolus for maximizing growth and flowering.

Materials and Methods

The experiment was conducted at Horticulture Research Farm, Andro, College of Agriculture, Central Agricultural University, Imphal during 2017. It is located at latitude of 24°45.89' N with longitude measuring 94°03.46' E at an elevation of 808-940 m above mean sea level. The experiment was laid out in a Randomized Block Design (RBD) with three replications and 10 treatments. Treatments comprised of three plant growth regulators each having three levels viz. IAA @ 50 ppm, 75 ppm, 100 ppm, GA₃ @ 50 ppm, 100 ppm, 150 ppm and Daminozide @ 200 ppm, 300 ppm, 500 ppm along with control (distilled water). Before planting, scale from the corms were removed and dipped in solution of 2.5 g dithane M-45 and 1 g bavistin per liter for 12 hours. The corms were planted at a spacing of 40cm x 20 cm in raised beds of 2m x 1.2m dimension. The foliar application of the growth regulators were done twice at 3 leaf stage and 6 leaf stage. The intercultural operations were followed. The vegetative growth, flowering and yield parameters were recorded from five plants of each replication of every treatment by random sampling method. The data collected for various parameters were subjected to a statistical analysis by Fisher's method of analysis of variance for testing the significance of the treatments effect and their interpretation of data as given by Gomez and Gomez [3].

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Results and Discussion

The data presented in Table 1 showed that the vegetative growth parameters significantly increased by the foliar application of GA₃. The foliar application of 100 ppm GA₃ recorded maximum height (103.16 cm) followed by foliar application of 50 ppm GA₃ (96.54 cm). Foliar application of 100 ppm GA₃ increased the number of leaves (10.11) which was followed by 50 ppm GA₃ (9.34). The maximum length of leaf (67.38 cm) was recorded in foliar application of 100 ppm GA₃ which was followed by 50 ppm GA₃ (63.90 cm) and 150

ppm GA₃ (62.18 cm). The minimum vegetative growth parameters were recorded in foliar application of 500 ppm Daminozide. The vegetative growth parameters enhanced by application of GA₃ is due to increase in the endogenous level of gibberellins in different phases of growth and development of plant which promotes vegetative growth by inducing active cell division and cell elongation of the apical meristem which ultimately affects plant growth and length of leaves (Sharma *et al.*,^[7]. The similar findings were reported by Rana *et al.*^[5].

Table 1: Efficacy of foliar spray of IAA, GA₃ and Daminozide on vegetative growth parameters of Gladiolus

| Treatment | Plant height (cm) 60 DAP | Number of leaves per plant 60 DAP | Length of leaf (cm) 60 DAP |
|---|--------------------------|-----------------------------------|----------------------------|
| T ₁ (Control) | 81.58 | 7.67 | 54.35 |
| T ₂ (50 ppm IAA) | 88.93 | 8.56 | 57.09 |
| T ₃ (75 ppm IAA) | 91.58 | 8.33 | 58.96 |
| T ₄ (100 ppm IAA) | 94.30 | 8.66 | 61.48 |
| T ₅ (50 ppm GA ₃) | 96.54 | 9.34 | 63.90 |
| T ₆ (100 ppm GA ₃) | 103.16 | 10.11 | 67.38 |
| T ₇ (150 ppm GA ₃) | 95.92 | 9.22 | 62.18 |
| T ₈ (200 ppm Daminozide) | 86.10 | 9.00 | 55.64 |
| T ₉ (300 ppm Daminozide) | 77.63 | 9.11 | 54.33 |
| T ₁₀ (500 ppm Daminozide) | 71.82 | 8.44 | 50.62 |
| CD (P = 0.05) | 7.03 | 0.86 | 5.78 |

*DAP = Days after planting

The data presented in Table 2 showed that the foliar application of GA₃ hastened flowering as compared to control, Daminozide have delayed flowering. Among all the treatments 100 ppm GA₃ recorded the minimum number of days taken for first flowering (57.18 DAP). The maximum number of days taken to first flowering (66.11 DAP) was recorded in 500 ppm Daminozide. Earliness in flowering in gladiolus by GA₃ application treatments is due to increase in endogenous level of GA₃ as well as increase in respiration and there by enhanced CO₂ fixation in plant, which resulted in early flowering. The findings are in accordance with the findings of Sudhakar and Kumar^[9]. The maximum longevity of spike (18.44 days) was recorded with foliar application of 100 ppm GA₃ which was followed by 500 ppm Daminozide (17.33 days) and 300 ppm Daminozide (16.66 days). The minimum longevity of spike (9.67 days) was recorded in control. Application of Gibberellic acid resulted in continuous supply of photosynthetic assimilate for longer duration. These findings are in line with Umrao *et al.*^[12]. The maximum length of the spike (99.67 cm) was observed with foliar application of 100 ppm GA₃ followed by 50 ppm GA₃ (94.20 cm). The minimum length of the spike (71.33 cm) was recorded with foliar application of 500 ppm Daminozide. Increase in spike length in treatment may be attributed due to the fact that optimum level of GA₃ promoted the efficacy of plants in terms of photosynthetic activity enhanced uptake of nutrients and their translocation, better partitioning of

assimilates into reproductive parts. Similar views have also been expressed by Attia (1). Foliar application of 100 ppm GA₃ gave the highest fresh weight of spike (71.59 g) followed by 50 ppm GA₃ (66.00 g) and 100 ppm IAA (64.60 g), however lowest fresh weight of spike (50.80 g) was observed under 500 ppm Daminozide. The increase in fresh weight was possibly attributed by increased spike length. The similar findings were noted by Tawar *et al.*^[12]. The maximum number of florets per spike (14.89) was recorded with foliar application of 100 ppm GA₃ followed by 50 ppm GA₃ (13.22). The minimum number of florets per spike (9.70) was found in 500 ppm Daminozide. Favorable effect of application of gibberellins on number of florets might be due to improved physiological efficiency, selective ion uptake, sufficient water uptake causing high rate of accumulate deposition. Similar views have been expressed by Sajid *et al.*^[6].

The longest vase life (12.33 days) was observed with foliar application of 100 ppm GA₃ followed by 50 ppm GA₃ (12 days), 150 ppm GA₃ (11.33 days) and 50 ppm IAA (11 days), while the minimum (8.67 days) was recorded in control. The effectiveness of GA₃ might be attributed to higher auxin activity which has been reported to delay senescence and enhance translocation of metabolites. The similar result of increased shelf life with the application of GA₃ was also reported by Sajid *et al.*^[6].

Table 2: Efficacy of foliar spray of IAA, GA₃ and Daminozide on flowering parameters of Gladiolus

| Treatment | Days to first flowering (DAP) | Longevity of intact spikes (days) | Length of the spike (cm) | Fresh weight of the spike (g) | Number of florets | Vase life of the cut spike (days) |
|---|-------------------------------|-----------------------------------|--------------------------|-------------------------------|-------------------|-----------------------------------|
| T ₁ (Control) | 63.37 | 9.67 | 81.40 | 53.58 | 11.55 | 8.67 |
| T ₂ (50 ppm IAA) | 61.47 | 12.38 | 82.57 | 62.68 | 12.22 | 11.00 |
| T ₃ (75 ppm IAA) | 61.92 | 12.68 | 82.10 | 61.77 | 12.00 | 10.67 |
| T ₄ (100 ppm IAA) | 62.34 | 13.89 | 89.40 | 64.60 | 12.86 | 9.67 |
| T ₅ (50 ppm GA ₃) | 60.68 | 15.98 | 94.20 | 66.00 | 13.22 | 12.00 |
| T ₆ (100 ppm GA ₃) | 57.18 | 18.44 | 99.67 | 71.59 | 14.89 | 12.33 |
| T ₇ (150 ppm GA ₃) | 61.38 | 16.20 | 83.43 | 62.60 | 12.44 | 11.33 |

| | | | | | | |
|--------------------------------------|-------|-------|-------|-------|-------|-------|
| T ₈ (200 ppm Daminozide) | 64.52 | 15.22 | 74.60 | 53.87 | 10.02 | 9.67 |
| T ₉ (300 ppm Daminozide) | 64.53 | 16.66 | 74.20 | 51.01 | 10.85 | 9.50 |
| T ₁₀ (500 ppm Daminozide) | 66.11 | 17.33 | 71.33 | 50.80 | 9.70 | 10.67 |
| CD (P = 0.05) | 2.80 | 1.91 | 9.97 | 8.30 | 1.73 | 2.65 |

Conclusion

Foliar application of 100 ppm GA₃ was found to be more effective for better performance of different attributes namely plant height, number of leaves per plant, length of leaf, days to first flowering, longevity of intact spike, length of the spike, fresh weight of the spike, number of florets per spike and vase life of the spikes.

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