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EFFECT OF PRE-HARVEST SPRAYS OF BIOSTIMULANTS ON POST-HARVEST VASE LIFE OF CUT GLADIOLUS CV. ARKA AMAR

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ABSTRACT

Gladiolus is one of the popular cut flowers that usually encounter postharvest problems resulting in shorter vase life and loss of quality. The present investigation was carried out at Floricultural Research Station, Rajendranagar, Hyderabad, during Rabi, 2017-18. The experiment was laid out in Completely Randomized Block Design replicated thrice, 5 biostimulant treatments were tried at two different concentrations. Significantly Humic acid at 4ml/L treatment *i.e* T_8 recorded longer vase life (10.43 days), the lowest was recorded in control. Highest number of days taken for 50 and 100 per cent floret opening (4.63, 9.10 respectively), and also higher water uptake (18.20 g.spike^{-1}) was recorded in HA treatment. The highest Transpirational loss of water was recorded in Fulvic acid at 4ml/L (18.45 g spike^{-1}) and it was lowest in control. While, minimum percent of spoilage of floret (39.08 %) was recorded in humic acid at 4ml/L treatment. The results showed that pre soaking and foliar sprays with Humic acid at 4ml/L recorded significantly best results for almost all the postharvest and physiological parameters studied except for water balance. Hence, the same treatment was used to extending vase life, delay spike senescence and enhance post-harvest quality of cut gladiolus spikes.

INTRODUCTION

Gladiolus (*Gladiolus grandiflorus* L.) generally called as "sword lily" due to its sword shaped leaves. A member of family Iridaceae, originated from South Africa, commercially propagated by corms. It is one of the top ranking cut flower crops. It has great economic value and social appeal for cut flower trade and much valued by the aesthetic world for beauty (Ahmad *et al.*, 2008). The total area of gladiolus in India is 11,160 ha with production of 48,320 MT loose flowers and 54.59 lakh number of cut spikes (Anon, 2014-15). Intensive cut flower production demands high levels of fertilization. Improper fertilization in combination with excessive irrigation may contribute soil, water and environmental pollution (Zafar, 2007). With the rapid increase in population and limited area of cultivation, there is need to improve crop productivity with less effect on the environment. One among these approaches is the use of Biostimulants.

Biostimulants have been emerged as a supplement to mineral fertilizers and hold a promise to improve the yield as well as quality of the crop under protected condition and also in open field cultivation (Harshavardhan *et al.*, 2016). As the postharvest life of the flowers depends upon the pre-harvest factors also, nutrition is one of the important aspects in increasing the flower yield and quality of gladiolus spikes. Excessive use of chemical fertilizers and pesticides impose threat to the ecology and environment. It is impossible to meet the nutrient requirement of the crops, exclusively through the organic farming (Yathindra *et al.*, 2016) Therefore, One of the approaches to reduce soil pollution is the use of biostimulants. Biostimulants are physiologically active substances, when applied in low concentrations, promote the growth and development of plants. It plays a significant role in providing resistance to pests, diseases and increasing overall quality in flower crops (Nakamura, 1996; Pruthvi *et al.* 2017). Keeping in view, the need and importance of biostimulants the present investigation was undertaken with an objective to study the effect of biostimulants on post-harvest vase life of gladiolus.

MATERIALS AND METHODS

An investigation entitled "Effect of pre-harvest sprays of biostimulants on post-harvest vase life of cut gladiolus Cv. Arka amar" was carried out at Floricultural Research Station, Rajendranagar, Hyderabad, during Rabi, 2017-18. The experimental site falls under subtropical climate zone with an average rainfall of 800 mm per annum. The soil of experimental site was red sandy loam with good drainage facility and low water holding capacity. Located at an altitude of 542.3 m above mean sea level with geographical bearing of 17.19° N latitude and 78.23° E longitude. The experiment was laid out in Complete randomized block design with 11 treatments and three replications. Treatments included T_1-Triacontanol @ 2ml/L, T_2-Triacontanol @ 4ml/L, T_3-Cytozyme @ 2ml/L, T_4-Cytozyme @ 4ml /L, T_5-Biozyme @ 2ml/L, T_6-Biozyme @ 4ml/L, T_7-Humic acid @ 2ml/L, T_8-Humic acid @

4ml/L, T_9-Fulvic acid @ 2ml/L, T_{10}-Fulvic acid @ 4ml/L, T_{11}-Control. Presented in Plate 1 and 2.

Solutions of 2ml and 4ml of biostimulants were prepared in 1 lit volumetric flask by dissolving calculated quantity of solution in 0.998 and 0.996 liter distilled water respectively (Harshavardhan, *et al.*, 2017). The treatments were applied as a pre-soaking and foliar spray at 30 and 45 days after corm sowing and the harvested spikes were kept in distilled water for the observations like vase life, number of days taken to 50 and 100 per cent floret opening, change in fresh weight of floret, water uptake, transpiration loss of water, water balance and spoilage per cent of florets (Plate 3).

$$\text{Water uptake (WU)} = \frac{\text{Initial wt. of container without spike} - \text{Final wt. of container without spike}}{\text{Number of spikes in bottle}}$$

(Venkatarayappa *et al.* 1981).

$$\text{Transpiration loss of water (TLW)} = \frac{\text{Initial wt. of container without spike} - \text{Final wt. of container without spike}}{\text{Number of spikes in bottle}}$$

(Venkatarayappa *et al.* 1981).

Water balance = Water uptake - Transpiration loss of water

(Venkatarayappa *et al.* 1981).

Plate 1: Planting of corms

Plate 2: Soaking of corms into different biostimulant solutions

Plate 3: Overall laboratory view

RESULTS AND DISCUSSION

The data on the postharvest vase life of Gladiolus var. Arka amar was recorded during the course of investigation and subjected to statistical scrutiny by the method given by Panse and Sukhatme (1967) and presented in table1. The results revealed that all the postharvest parameters were significantly differed by application of biostimulants. Among the different biostimulants studied Humic acid 4ml/L-T_8 recorded longer vase life (10.43days) which was followed by T_7 (8.83days) and minimum was recorded in control (7.10 days) represented in fig.1. It might be due to the presence of humic substances in plant tissues might have changed the metabolic process of plants, imparting resistance to certain phytopathogens. The humic acid complex retained with in the tissues might have prevented bacterial accumulation in the tissues during postharvest period. Similar results were also explained by Vaughan *et al.* (1985), Rauthan and schnitzer (1981) and Baldotto and Baldotto (2013) in gladiolus bulb treatment with humic acid. The result in the present study was parallel with the findings of mechanisms proposed to account for Fan *et al.* (2015) found that foliar application of humic acid on chrysanthemum.

Significantly highest number of days taken for 50 per cent floret opening during vase life period was recorded in T_8 (5.40 days) and found significantly superior compared to all other treatments followed by Humic acid 2ml/L (4.63 days), which was on par with T_2 (3.96) and T_6 (3.90 days) whereas, least number of days to 50 per cent floret opening during vase life period was recorded in T_{11} (3.10 days) which was on par with Triacontanol (3.40), Cytozyme 2ml/L (3.30), T_4 (3.50) and T_9 (3.53). Maximum number of days taken to 100 per cent floret opening during vase life period (9.10days) was significantly recorded in T_8 which was followed by Humic acid 2ml/L (8.06days), Fulvic acid 4ml/L (7.16days) whereas, the treatment control (5.73 days). This could be attributed due to Humic acid might have placed preservative role in the vase life extension by a reduction in ethylene synthesis rate. The results are supported by the findings of Khenizy *et al.* (2013) and Ali *et al.* (2008) in gerbera cut flower.

Change in fresh weight of the spike (89.45 %) maximum in Humic acid at 4ml/L which was followed by Humic acid 2ml/L (86.30 %). The control plants recorded the minimum change in fresh weight of the spike (81.53 %) compared to all other treatments. highest water uptake (WU) was recorded in T_8 (18.20 g.spike^{-1}) significantly superior to other treatments, followed by Fulvic acid 4ml/L (17.17g.spike^{-1}) which was on par with Humic acid 2ml/L (16.50 g.spike^{-1}) while T_{11} recorded significantly lowest WU (10.33g.spike^{-1}). The highest water uptake in Humic acid 4ml/L treatment was might be due to the humic substances played a major role in plant physiological process and possess auxin like hormonal activity being an integral part of reproductive growth. The present findings are in close agreement with the findings of Ali *et al.* (2014) who reported that application of HA in combination with NPK nutrients improved the postharvest life of cut tulip flowers. The results are supported by the findings of Chamani *et al.* (2012) in cut Alstroemeria.

The results indicating that significant differences among

Table 1: Effect of bio stimulants on vase life, days to 50% floret opening, days to 100% floret opening, water uptake, transpirational loss of water, water balance and spoilage percentage of florets during vase life period of cut gladiolus cv. Arka Amar

Treatments	Vase life (D)	Days to 50% floret opening (D)	Days to 100% floret opening (D)	Change in fresh weight (% initial wt)	Water uptake (g/spike)	Transpirational loss of water (g/spike)	Water balance (g/spike)	Spoilage percentage of florets (%)
T_1 - Triacontanol 2l/l	7.93	3.40	7.00	83.08	14.89	16.38	3.51	59.76
T_2 - Triacontanol 4l/l	8.03	3.96	7.03	84.56	15.46	16.75	3.72	58.29
T_3 - Cytozyme 2l/l	8.16	3.30	6.96	84.86	14.14	15.31	3.83	57.05
T_4 - Cytozyme 4l/l	8.26	3.50	7.10	85.56	16.21	17.13	3.83	58.29
T_5 - Biozyme 2l/l	8.26	3.86	6.56	83.25	15.83	16.90	3.93	58.83
T_6 - Biozyme 4l/l	8.13	3.90	7.06	84.03	15.47	16.20	4.27	54.88
T_7 - Humic acid 2l/l	8.83	4.63	8.06	86.30	16.50	16.91	4.34	45.98
T_8 - Humic acid 4l/l	10.43	5.40	9.10	89.45	18.20	17.97	5.24	39.08
T_9 - Fulvic acid 2l/l	8.43	3.53	7.06	83.49	15.66	17.02	3.65	59.16
T_{10} - Fulvic acid 4l/l	8.53	3.76	7.16	83.72	17.17	18.45	3.69	55.51
T_{11} -Control	7.10	3.10	5.73	81.53	10.33	12.73	2.60	73.79
Mean	8.37	3.85	7.16	84.53	15.44	16.52	3.87	56.42
SEM ±	0.21	0.20	0.22	0.40	0.36	0.44	0.16	0.78
CD (P = 0.05)	0.63	0.61	0.65	1.13	1.02	1.24	0.47	2.21

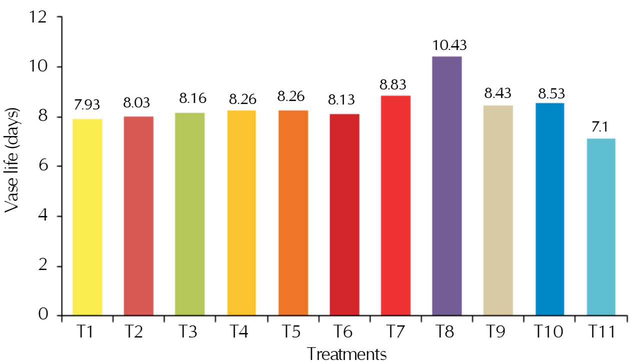

Figure 1: Effect of bio stimulants on Vase life of spike (days) during vase life period of cut gladiolus cv. Arka Amar

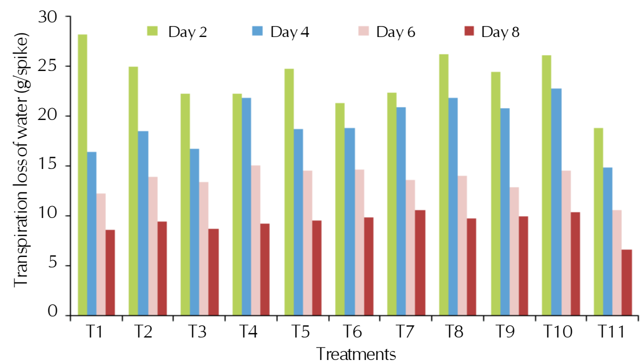

Figure 2: Effect of bio stimulants on Transpiration loss of water (g/spike) during vase life period of cut gladiolus cv. Arka Amar

treatments. A progressive role of HA was determined in the enhancement of TLW. The maximum transpiration loss water was noticed in Fulvic acid 4ml/L-T_{10} recorded highest (18.45 g.spike^{-1}) which was on par with Humic acid 4ml/L(17.97), followed by Cytozyme 4ml/L and Fulvic acid 2ml/L (17.13&17.02 g.spike^{-1}respectively) while T_{11} recorded significantly lowest TLW (12.73 g.spike^{-1}) presented in fig.2; Humic acid 4ml/L recorded highest water balance (WB) (5.24 g.spike^{-1}) and was significantly superior to other treatments, followed by Humic acid 2ml/L (4.34 g.spike^{-1}) which was on par with Biozyme 4ml/L (4.27 g.spike^{-1}) while control recorded significantly lowest WB (2.60 g.spike^{-1}) compared to other treatments. The highest water balance in Humic acid at 4ml/L-T_8 treatment was due to higher uptake of water and controlled transpiration loss of water in response of enhanced water balance. The adequate water uptake might be due to auxin like hormonal activity being an integral part of reproductive growth. The present findings results are supported by Ali *et al.* (2014) in sugar beet and Nardi *et al.*, (2002).

From the data it is clear that, there was significant difference among the treatments on spoilage percentage of floret. Among the treatments, treatment T_8 recorded significantly lowest (39.08 %) and followed by Humic acid 2ml/L (45.98 %), however it was highest in control *i.e* treatment T_{11} (73.79 %). The lowest spoilage percentage of floret might be due to Humic acid contain cytokinin and auxin that increased the antioxidant levels and resistance to senescence. A similar trend was observed by Zhang and Schmidt (2000).

CONCLUSIONS

Among the different biostimulants application longer vase life, highest number of days taken for 50 and 100 per cent floret opening, higher water uptake, minimum percent of spoilage of florets were also recorded in humic acid at 4ml/l treatment and lowest in control. Hence we concluded that the highest transpirational loss of water was recorded in Fulvic acid at 4ml/l which was on par with Humic acid at 4ml/l, for enhancing post-harvest life of cut gladiolus Humic acid at 4ml/L appears to be an optimum treatment.

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