Plant Archives Vol. 26, Supplement 2, 2026 pp. 1079-1082 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-2.125

EFFECT OF PLANT GROWTH REGULATORS ON FLOWER LONGEVITY, VASE LIFE AND BULB PRODUCTION OF LILIUM (*Lilium longiflorum cv.* Pavia)

Shubham Rai*, Bhanu Pratap, Sunil Kumar, Sanket Kumar Maurya and Santosh Kumar Verma
Acharya Narendra Dev University of Agriculture and Technology, Kumarganj, Ayodhya, U.P., India
*Corresponding author E-mail: 14srai@gmail.com
(Date of Receiving : 20-03-2026; Date of Revision : 24-04-2026; Date of Acceptance : 27-05-2026)

ABSTRACT

A field experiment was conducted during 2024-25 at Technology Park, Horticulture Block, Floriculture and Landscaping Unit, ANDUAT, Kumarganj, Ayodhya (Uttar Pradesh) to evaluate the effect of plant growth regulators on flower longevity, vase life and bulb production of Lilium (*Lilium longiflorum*) *cv*. Pavia. The experiment was laid out in a Completely Randomized Design with ten treatments and three replications, comprising foliar application of GA_3 (100, 200 and 300 ppm), BA (100, 200 and 300 ppm), SA (50, 100 and 150 ppm) and control. GA_3 at 300 ppm recorded maximum flowering duration 18.42 days, maximum bulb circumference, 14.06 maximum weight of bulbs. 89.89 and SA 100 ppm record maximum vase life 10.12 days and the maximum number of bulbs (3.65) were obtained in the treatment BA 300 ppm.

Keywords **:** Plant growth regulator, Lilium, Gibberellic acid, Benzyl adenine, Salicylic acid.

Introduction

Lilium longiflorum is the most beautiful ornamental bulbous plants which is valued for its attractive flowers, pleasant fragrance, wide range of colours and long vase life. Because of these desirable characteristics, lilies are widely used as cut flowers, pot plants and landscape ornamentals in the floriculture industry. The crop has been grown for frequently utilized in religious rituals, weddings, bouquets, and other social events (Jayashree *et al*., 2020). The genus Lilium belongs to the family Liliaceae and comprises more than 80 species distributed mainly in temperate regions of the Northern Hemisphere (Lim *et al*., 2006). About 76 percent of the world's lily bulb production occurs in the Netherlands, which is considered the leading centre for commercial lily bulb production (Gheware *et al*., 2022). The bulbs contain compounds such as lilaline (Ragini *et al*., 2019).

Lilies are typically grown in both protected and open fields. Sandy loam soil with a pH of 6.5 to 7.5 is ideal for their growth. Lily cultivation requires temperatures between 15 and 20 °C during the day and 8 to 10 °C at night. In India, Asiatic lilies are commercially cultivated in several regions such as the Nilgiris (Coonoor, Ooty and Kothagiri), Kalvarayan Hills, Kodaikanal, Yercaud, and parts of Himachal Pradesh including Shimla and Kullu valleys (Pillai *et al*., 2022).

Plant growth regulators (PGRs) play a significant role in modifying plant growth and development. In floricultural crops, PGRs are widely used to manipulate Bulb parameter and post-harvest performance of flowers (Kadam *et al*., 2020 and Sajid *et al*., 2009)

Among various growth regulators, Gibberellic acid plays an important role in plant growth and development. Gibberellins are known to stimulate cell division and elongation, thereby increasing plant height, flower stalk length and overall vegetative growth. The application of GA_3 has been widely reported to enhance flowering and bulb productivity in many ornamental bulbous crops (Gul *et al*., 2006). Benzyl adenine a cytokinin that promotes cell division and delays senescence. Application of benzyl adenine has been reported to improve post-harvest quality attributes such as vase life and flower diameter. It also plays a role in bulb formation and elongation in bulbous ornamental crops (Sisodia *et al*., 2018). The combined use of benzyl adenine and gibberellic acid has been found beneficial in improving bulb production in several ornamental species (Jayashree *et al*., 2020). Another important compound Salicylic acid regulates several plant functions including nutrient uptake, photosynthesis, protein synthesis and stomatal movement. It also plays a crucial role in enhancing plant tolerance to various environmental stresses (Kumari *et al*., 2017 and Luo *et al*., 2022).

Although Lilium is naturally adapted to temperate regions, the agro-climatic conditions of Ayodhya are suitable for its cultivation under protected conditions. Keeping these aspects in view, this investigation was undertaken to study the influence of different plant growth regulators on post-harvest life and bulb production under Ayodhya agro-climatic conditions.

Materials and Methods

The present investigation was conducted during 2024-25 at the Technology Park, Horticulture Block, Floriculture and Landscaping Unit, Acharya Narendra Deva University of Agriculture and Technology (ANDUAT), Kumarganj, Ayodhya, Uttar Pradesh, India. The region falls under a semi-arid climate with an average annual rainfall of about 1100 mm, and the experiment was carried out under shade-net conditions from September 2024 to April 2025. Healthy and uniform bulbs of *Lilium longiflorum cv*. Pavia were procured from a commercial supplier and treated with Bavistin (2 g L^{-1}) before planting to prevent fungal infection. The bulbs were planted at a depth of 10-12 cm in grow bags (1.25 ft × 1.25 ft) filled with a well-aerated growing medium consisting of cocopeat, perlite, vermicompost and garden soil in the ratio of 4:3:2:1.

The experiment was laid out in a Completely Randomized Design (CRD) with ten treatments and three replications. The treatments consisted of foliar application of plant growth regulators, namely

1. Gibberellic acid (GA_3) at 100, 200 and 300 ppm
2. Benzyl adenine (BA) at 100, 200 and 300 ppm
3. Salicylic acid (SA) at 50, 100 and 150 ppm

along with a control (water spray). The required concentrations of plant growth regulators were prepared by dissolving the chemicals in suitable solvents and making the final volume with distilled water

Observations were recorded on parameters including duration of flowering, measured from first flower opening to fading of the last flower, and vase life, recorded as the number of days from harvest at colour-show stage until petal fall (senescence) under tap water conditions. Observations were recorded on bulb characters including number of bulbs per plant, counted after harvest from randomly selected and labelled plants, bulb weight measured in grams by weighing bulbs of selected plants individually after harvest; and number of bulblets per plant, recorded by counting bulblets produced below ground and calculating the average per plant.

The recorded data were subjected to statistical analysis using analysis of variance (ANOVA) appropriate for a Completely Randomized Design, and the significance of treatment effects was tested at the 5% level of probability.

Results and Discussion

Duration of flowering (days)

The data represented in Table 1. indicate that the application of growth regulators (GA_3, BA and SA) had significant effect on flowering duration as compared to control. In case of maximum flowering duration was (18.42 days) which was recorded with (GA_3 300 ppm). Which was statistically at par with (18.25 days) with (GA_3 200 ppm). While the minimum duration of flowering (14.30) was recorded with (SA 50 ppm). Gibberellic acid direct nutrients to growing tissues, antioxidant defence, and membrane stability, delaying petal cell folding (Singh *et al.,* 2008). The findings of present investigation are also substantiated Emami *et al*. (2011) in lily and Sajid *et al*. (2015) in gladiolus.

Vase life (days)

The results revealed that the application of plant growth regulator had significant effect on vase life (days) as compared to control. The maximum vase life (10.12 days) was obtained in the treatment SA 100 ppm which was statistically at par with (9.99) by SA 150 ppm while minimum (7.48 days) recorded in GA3300 ppm. The maximum vase life is recorded in SA may be due to the it plays a role in regulating the response of plants to environmental stress condition and provides protection Results and Discussion48against them, such as abiotic stress (salt, heat, drought, chilling) and stress resulting from minerals, SA affects the biosynthesis of ethylene and has an opposite role to the growth inhibitor (Lingakumar *et al*. 2017). These results are similar to the reports of Kumari *et al* (2018) recorded maximum vase life (16.00) in salicylic acid @ 100 ppm.

Bulb parameters

Number of bulbs per plant

The data represented in Table 1. indicate that the number of bulbs per plant are significantly incress as compared to control at different levels of PGR spray on lilium. The treatments varied significantly on the number of bulbs per plant. The maximum number of bulbs (3.65) were obtained in the treatment BA 300 ppm, which was statistically at par with (3.43) BA 200 ppm, while the minimum number of bulbs (1.28) are obtained in SA 100 ppm. This might be due to benzyl adenine, which is like other cytokinin causes more splitting and cell division and increases the number of bulbs. It indirectly affects tuberization by enhancing the activation of starch synthetic enzymes to support continuing starch deposition. The findings of present investigation are also substantiated Shanker *et al.* (2011) in *Polianthes tuberosa cv.* Double.

Weight of bulb (g)

The data represented in Table 1. indicates that the weight of bulbs is significantly increasing as compared to control at different levels of PGR spray on lilium. The treatments varied significantly on the weight of bulbs. The maximum weight of bulbs (89.89) was obtained in treatment GA_3 300 ppm, which was followed by (75.21) GA_3 200 ppm, while the minimum weight of bulbs (42.74) is obtained in BA 100 ppm. This could be attributed to the substantial storage of nutrients in the bulbs, facilitated by gibberellic acid's enhancement of growth parameters. These results are similar to the reports of Singh *et al.* (2018) recorded maximum weight of bulb (16.30) in GA_3 @ 150 ppm.

Number of bulblets per plant

The results revealed that the application of plant growth regulator had significant effect on the number of bulblets per plant as compared to control. Data represent in table 1. that the maximum number of bulblets per plant (4.96) was obtained in treatment BA 200 ppm which was statistically at par with (4.80) by BA 300 ppm, while minimum (2.93) recorded in SA 150 ppm. Benzyl adenine helps bulbs produce more offshoots by encouraging cell division and splitting. Instead of just growing larger corms, it speeds up the formation of multiple shoots and increases the number of new bulblets. The results are similar to the reports of Singh *et al*. (2018) recorded maximum bulb diameter (37.76 mm) in GA_3 @ 100 ppm.

Table 1 : Effect of Plant Growth regulators on Flower Longevity, Vase Life and Bulb Production

Treatment No.	Treatment details	Vase life (days)	Duration of flowering (days)	Number of bulbs per plant	Weight of bulb (g)	Number of bulblet per plant
T_1	Control (water spray)	6.65	13.72	1.10	32.92	1.89
T_2	Gibberellic Acid (GA_3) @ 100 ppm	7.82	17.26	1.36	55.63	3.42
T_3	Gibberellic Acid (GA_3) @ 200 ppm	7.71	18.25	1.68	75.21	3.32
T_4	Gibberellic Acid (GA_3) @ 300 ppm	7.48	18.42	1.86	89.89	3.69
T_5	Benzyl Adenine (BA) @ 100 ppm	8.77	15.03	2.32	42.74	4.79
T_6	Benzyl Adenine (BA) @ 200 ppm	8.90	15.41	3.43	50.92	4.96
T_7	Benzyl Adenine (BA) @ 300 ppm	9.04	15.84	3.65	54.98	4.80
T_8	Salicylic Acid (SA) @ 50 ppm	9.77	14.30	2.36	43.00	3.29
T_9	Salicylic Acid (SA) @ 100 ppm	10.12	14.46	1.28	45.41	3.21
T_{10}	Salicylic Acid (SA) @ 150 ppm	9.99	14.30	1.46	49.89	2.93
	C.D.@5%	0.64	1.39	0.31	1.72	0.86
	SEm±	0.21	0.46	0.11	0.58	0.29

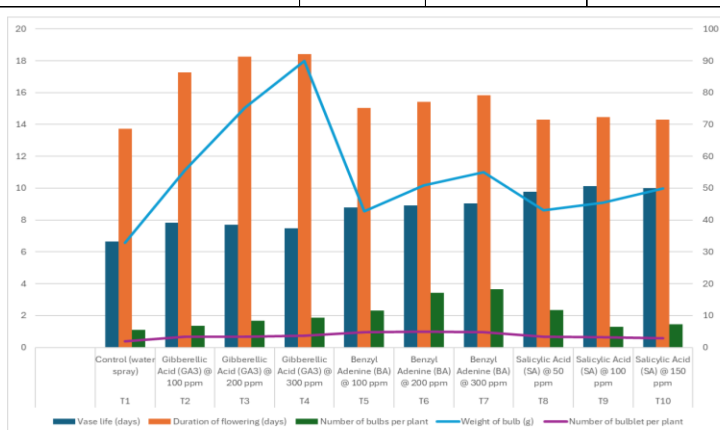

Fig. 1: Effect of Plant Growth regulators on Flower Longevity, Vase Life and Bulb Production

References

Akshitha, S., Prasanth, P., Laxminarayana, D., Salma, Z., & Kumar, P. P. (2024). Effect of preconditioning with benzyl adenine (BA) and gibberellic acid (GA_3) on post-harvest life of calla lily (*Zantedeschia* spp.) flower spikes and leaves. *Plant Archives*, ***24***(2), 1631.

Al-Ajlouni, M. G., Othman, Y. A., Tala, S., & Ayad, J. Y. (2023). Lilium morphology, physiology, anatomy and postharvest flower quality in response to plant growth regulators. *South African Journal of Botany*, ***156***, 43–53.

Anwar, M., Sahito, H. A., Hassan, I., Abbasi, N. A., Ahmed, H. A., Bhatti, M. A., Iqbal, Z., & Hussain, A. (2014). Effect of pre harvest treatment of salicylic acid on growth and vase life of tuberose with aroma environment. *Journal of Agricultural Research*, ***3***(2), 50–57.

Baskaran, V., Abirami, K., & Roy, D. S. (2014). Effect of plant growth regulators on yield and quality in gladiolus under Bay Island conditions. *Journal of Horticultural Science*, ***9***(2), 213–216.

Chaudhari, V., Badge, S., Kuchanwar, O., Thakre, S., & Gadekar, A. (2024). Effect of gibberellic acid and salicylic acid on growth and yield of statice (*Limonium sinuatum*). *International Journal of Innovative Horticulture*, ***13***(1), 93–95.

Emami, H., Saeidnia, M., Hatamzadeh, A., Bakhshi, D., & Ghorbani, E. (2011). The effect of gibberellic acid and benzyl adenine in growth and flowering of lily (*Lilium longiflorum*). *Advances in Environmental Biology*, ***5***(7), 1606–1611.

Gheware, K. M., Kaushik, K., Gangwar, R., Wamiq, M., & Fatmi, U. (2022). The effect of different concentrations of GA_3 and NAA on growth and flowering of Asiatic lily (*Lilium* × *asiatica*) cv. Litouwen under naturally ventilated polyhouse conditions of Prayagraj. *International Journal of Environment and Climate Change*, ***12***(12), 1196–1201.

Gul, H., Khattak, M. A., & Amin, N. (2006). Accelerating the growth of *Araucaria heterophylla* seedlings through different gibberellic acid concentrations and nitrogen levels. *Journal of Agricultural and Biological Science*, ***1***(1), 25–29.

Jayashree, N., Chandrashekar, S. Y., Hemla, N. B., Hanumantharaya, L., & Ganapathi, M. (2020). Influence of benzyl adenine and gibberellic acid on morphological behaviour of Asiatic lily. *International Journal of Chemical Studies*, ***8***(5), 2028–2031.

Kirad, K. S., Banafar, R. N. S., Barche, S., Billore, M., & Dalal, M. (2001). Effect of growth regulators on gladiolus. *Annual Agricultural Research*, ***22***(2), 278–281.

Kumar, M., Malik, S., Singh, M. K., & Pal, V. (2012). Impact of spacing, doses of vermicompost and foliar application of salicylic acid on growth and flowering of gladiolus (*Gladiolus grandiflorus* L.) cv. White Prosperity. *Annals of Horticulture*, ***5***(2), 272–279.

Kumar, P., Raghava, S. P. S., Misra, R. L., & Singh, K. P. (2003). Effect of GA_3 on growth and yield of China aster. *Journal of Ornamental Horticulture*, ***6***(2), 110–112.

Maurya, R. P., & Nagda, C. L. (2002). Effect of growth substances on growth and flowering of gladiolus (*Gladiolus grandiflorus* L.) cv. Friendship. *Haryana Journal of Horticulture Science*, ***31***(3), 203–204.

Misra, A., Chaturvedi, O. P., & Bhala, R. (2000). Effect of gibberellic acid and indole acetic acid on growth and flowering of football lily. *Journal of Ornamental Horticulture*, ***3***(1), 56–57.

Prajapati, D., Joshi, N. S., Patel, D., & Solanki, K. S. (2023). Response of plant growth regulators on growth and flowering of spider lily (*Hymenocallis littoralis* L.). *The Pharma Innovation Journal*, ***12***(10), 461–465.

Rani, P., & Singh, N. (2003). Impact of gibberellic acid pretreatment on growth and flowering of tuberose (*Polianthes tuberosa* L.) cv. Prajwal. *Journal of Tropical Plant Physiology*, ***5***(2013), 33–42.

Roy, S., Fatmi, U., Mishra, S. K., & Singh, R. (2017). Effect of pre plant soaking of corms in growth regulators on sprouting, vegetative growth and corm formation in gladiolus (*Gladiolus grandiflorus* L.). *Journal of Pharmacognosy and Phytochemistry*, ***6***(5), 1135–1138.

Saeed, T., Hassan, I., & Abbasi, N. A. (2014). Effect of gibberellic acid on the vase life and oxidative activities in senescing cut gladiolus flowers. *Plant Growth Regulation*, ***72***, 89–95.

Sajid, G. M., Kaukab, M., & Ahmed, Z. (2009). Foliar application of plant growth regulators (PGRs) and nutrients for improvement of lily flowers. *Pakistan Journal of Botany*, ***41***(1), 233–237.

Sajjad, Y., Jaskani, M. J., Qasim, M., Mehmood, A., Ahmad, N., & Akhtar, G. (2015). Pre-plant soaking of corms in growth regulators influences the multiple sprouting, floral and corm associated traits in *Gladiolus grandiflorus* L. *Journal of Agricultural Science*, ***7***(9), 173–181.

Sharma, A., Dogra, S., Pandey, R. K., Sinha, B. K., Singh, A., & Laishram, L. (2024). Effect of gibberellic acid (GA_3) and benzyl adenine (BA) on vegetative growth and flower induction in gladiolus (*Gladiolus grandiflorus*). *International Journal of Plant & Soil Science*, ***36***(3), 362–368.