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ECONOMIC ASSESSMENT OF SPIDER LILY CULTIVATION WITH PLANT GROWTH REGULATORS: YIELD, COST AND PROFITABILITY ANALYSIS

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ABSTRACT

Spider lily is very important loose flower crop grown for beautiful white flowers. It is perennial bulbous plant. Application of plant growth regulators help to increase the yield and economic value of spider lily flowers. An investigation was conducted in the Department of Floriculture and Landscape Architecture, College of Horticulture, Junagadh Agricultural University during the academic year 2022-2023 to determine the optimal dosage and timing of plant growth regulators for spider lily (*Hymenocallis littoralis* L.). The experiment designed in a Randomized Block Design (RBD) with four replications aimed to assess the effects of various foliar applications of Gibberellic Acid (GA*f*), Naphthalene Acetic Acid (NAA) and Brassinosteroid (BRs). The experiment consists of 7 treatments *viz*., T_1: 200 ppm GA_3, T_2: 250 ppm GA_3, T_3: 150 ppm NAA, T_4: 250 ppm NAA, T_5: 3 ppm BR, T_6: 5 ppm BR and T_7: Control. The plants received two sprays of the growth regulators at 45 and 60 days after de-leafing. Among different treatments, application of 250 ppm Gibberellic Acid (GA_3)recorded maximum number of flowers harvested per net plot (28.52 bundle per net plot) and yield of flowers (88,032.41 bundle per hectare). Economic point of view, this treatment also resulted in the highest net return (1,95,760.64 ha^{-1}) and benefit cost ratio (2.25). This study sought to optimize growth, flowering, quality and yield outcomes addressing the challenges of uniform coverage and absorption in large-scale cultivation.

***Key words*:** Economic, yield, net returns, PGRs, spider lily

Introduction

Spider lily (*Hymenocallis littoralis*) is a major loose flower crop of south Gujarat as well as south Indian conditions. It is famous for its white, vanilla scented and long flower bud. Flowers look like claws of spider therefore it is popularly known as spider lily. Flowers are associated with mankind from the down of civilization. India is the largest producer of loose flower and this spider lily is one of the major loose flowers cultivated in India. It belongs to Amaryllidaceae family and native to armer coastal regions of Latin America and widely cultivated and naturalized in many tropical countries. Plant is 60-70 cm tall perennial. Propagating material of spider lily is bulb with ideal size of 7-10 cm in diameter. The total area under commercial production of spider lily is 3715 ha with 36,986 MT production and 9.96 MT/ha productivity in Gujarat (Anon., 2021-22). It is used as loose flower as offered to the God, garland making, veni, gajra and to bridal car decoration, pergolas stages in various social functions. The flowers of spider lily are largely used in garland and Gajra making, mandap and various flower decorations. The flowers are in great demand during marriages and social ceremonies. Bundles of 50 buds are prepared by tying with fibers or rubber band and kept in wet jute bags for transportation. The spider lily is perennial bulbous flower crop and gives economic production up to 7-10 years. Plant growth regulator improve the physiological efficiency of the plants by regulating the rate of photosynthesis, transpiration, photorespiration, water and nutrient uptake and leaf

Table 1: Effect of plant growth regulators on number of flowers harvested per net plot (bundles) and Yield of flowers (bundles/ha) spider lily.

Sr. no.	Treatment	Number of flowers harvested per net plot (bundles)	Yield of flowers (bundles /ha)
T_1	GA_3 @ 200 ppm	24.88	76797.86
T_2	GA_3 @ 250 ppm	28.52	88032.41
T_3	NAA @ 150 ppm	21.28	65611.73
T_4	NAA @ 250 ppm	23.12	71358.03
T_5	Brassinosteroid @ 3 ppm	23.31	71936.72
T_6	Brassinosteroid @ 5 ppm	18.83	58125.00
T_7	Control	15.43	47608.02
S.Em. ±		0.85	2603.18
C.D. at 5 %		2.52	7734.44
C.V.%		7.64	7.60

senescence by imparting resistance of environmental stresses and ultimately increasing the harvest index. It is generally accepted that exogenously applied growth regulators produce their effects through the alteration in the levels of naturally occurring hormones, thus modifying the growth and development of plants.

Material and Method

This experiment was carried out at Department of Floriculture and Landscape Architecture, College of Horticulture, Junagadh Agricultural university, Junagadh during the academic year of 2022-2023. The experimental design was Randomized Block Design with seven treatments consist of two different concentrations of three different plant growth regulators. *Viz.*, T_1- 200 ppm GA_3, T_2- 250 ppm GA_3, T_3- 150ppm NAA, T_4- 250 ppm NAA, T_5- 3 ppm BRs, T_6- 5 ppm BRs and T_7- Control (Water spray). Foliar application of these PGRs done twice at 45 and 60 Days After Planting. The observation was recorded from five random plants in each replication.

Result and Discussion

Effect of Foliar Application of Plant Growth Regulators on Yield and Economic Aspects of Spider Lily

Number of flowers harvested per net plot (bundles)

The data pertaining in Table 1 is the number of flowers harvested per net plot (bundle) (1 bundle = 50 flower buds) had shown significant differences as influenced by plant growth regulators on spider lily. Significantly maximum number of flowers harvested per net plot (28.52 bundles) was found with treatment T_2- GA_3 @ 250 ppm as compared to control T_7 (15.43 bundles).

This might be due to the availability of desirable food materials and more carbohydrate supply which ultimately effects on flower production. Increase in number of flowers per plant directly increase the number of flowers harvested per net plot (bundle). This result is in accordance with the findings of Khan and Tewari (2003) in dahlia; Maurya and Nagda (2002) in gladiolus; Tak and Nagda (1999) in tuberose.

Yield of flowers (bundles/ha)

The data presented in Table 1 reflected the fact that flower yield per hectare was significantly increased by application of plant growth regulators. The maximum yield of flower (88032.41 bundles/ha) was recorded with treatment GA_3 @ 250 ppm. The minimum yield of flower (47608.02 bundles/ha) was recorded with control.

This might be due to the fact that optimum level of GA_3 promoted the efficacy of plants in terms of photosynthetic activity enhanced the uptake of nutrients and their translocation, better partitioning of assimilates into reproductive parts. This can be attributed to translocation of source to sink. Similar results were recorded by Parmar *et al.*, (2009), Sonone and Rahul (2019) and Chaithra *et al.*, (2020) in spider lily, Sanjay kumar *et al.*, (2019) in amaryllis, Ashwini *et al.*, (2019) in gladiolus, Ganesh *et al.*, (2013) and Amin *et al.*, (2017)

Table 2: Effect of plant growth regulators on economics of spider lily.

Sr. No.	Treatments	Yield (Bundle ha^{-1})	Fixed cost ($Rs.ha^{-1}$)	Variable cost ($Rs.\ ha^{-1}$)	Total cost ($Rs.\ ha^{-1}$)	Gross returns ($Rs.ha^{-1}$)	Net returns ($Rs.ha^{-1}$)	Benefit Cost ratio
1	GA_3 @ 200 ppm	76,797.86	1,42,939	11,454	1,54,393	3,07,191	1,52,798.44	1.99
2	GA_3 @ 250 ppm	88,032.41	1,42,939	13,430	1,56,369	3,52,130	1,95,760.64	2.25
3	NAA @ 150 ppm	65,611.73	1,42,939	8,486	1,51,425	2,62,447	1,11,021.92	1.73
4	NAA @ 250 ppm	71,358.03	1,42,939	11,775	1,54,714	2,85,432	1,30,718.12	1.84
5	Brassinosteroid @ 3 ppm	71,936.72	1,42,939	18,368	1,61,307	2,87,747	1,26,439.88	1.78
6	Brassinosteroid @ 5 ppm	58,125.00	1,42,939	28,244	1,71,183	2,32,500	61,317.00	1.36
7	Control	47,608.02	1,42,939	0	1,42,939	1,90,432	47,493.08	1.33

in tuberose, Kuldip singh *et al*., (2018) in dahlia.

Economics

The cost of cultivation of spider lily per hectare as influenced by the application of plant growth regulators is presented in Table 2.

Among the plant growth regulators, the highest benefit-cost ratio (2.25) was recorded in the treatment GA_3 @ 250 ppm (T_2) with a net return of Rs. 1,95,760.64 per hectare. While the lowest benefit-cost ratio (1.33) and net income Rs. 47,493.08 was recorded in control (T_7).

Conclusion

In the current study, foliar application of plant growth regulator of GA_3 at the rate of 250 ppm at 45 and 60 days after sowing will increase the vegetative growth of plant as well as improves quality and yield of flower as it increases the Number of flowers harvested per net plot (bundles) and Yield of flowers (bundles/ha). Spray of GA_3 ultimately increase the cost-benefit ratio and net return of the crop.

Future scope

The impact of combining several plant growth regulators on spider lily development and flowering will need to be evaluated in future studies with other plant growth regulators.

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