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Growth and flowering of Asiatic lily (*Lilium × asiatica*) cv. Litouwen as affected by GA₃ and NAA under naturally ventilated polyhouse conditions of Prayagraj

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Abstract

The present investigation was carried out under naturally ventilated polyhouse, Department of Horticulture, SHUATS, Prayagraj, Uttar Pradesh. In the month of December 2020 and the observations recorded up to February and March 2021. There were nine treatments comprising of two growth regulators viz., GA₃ (200, 250, 300 and 350 ppm), and NAA (50,100,150 and 200 ppm) along with control. The whole experiment was laid out following in a Randomized Block Design (RBD) with three replications. The results revealed that among the *Lilium* cv. LITOUWEN foliar application of 250 ppm GA₃ significantly increased plant height (28.0 cm), as recorded data GA₃ @ 250 ppm has enhanced bud length (5.9 cm), bud diameter (18.2 mm) GA₃ @ 250 ppm, flower diameter (17.7 mm) GA₃ @ 250 ppm, stalk length (43.4 cm). Whereas application of GA₃ 350 ppm enhanced significantly maximum stalk diameter (5.83 mm).

Keywords: Growth, Asiatic, Litouwen, NAA, Prayagraj

Introduction

Lilium sp. is cultivated worldwide and is one of the most important generator cut flower, pot plant and garden plant. The genus *Lilium* belongs to the family Liliaceae comprising of around 100 species and more than 9,400 cultivars, which are divided into seven sections (Comber, 1949) [4]. Lily is the common English name for flowering plants of the *Lilium* genus and they are extensively being grown in polyhouse as cut flower in global flower trade due to wider choice of growing periods, array of colours and everlasting quality. The cultivars of genus *Lilium* are highly appreciated by the horticulturists for their outstanding range of colour, fragrance and adaptability to several environmental conditions. *Lilium* can be used for informal planting in grassland or among orchard trees, along crocuses, bluebells and tulip to create flower meadows.

Large and attractive flowers with the capacity to rehydrate after a long distance transportation, have made *Lilium* gain popularity fast in our country. The cultivars are highly appreciated for their outstanding range of colours, fragrance and adaptability to several environmental conditions (Bahr and Compton, 2004) [3]. However, nearly all the cut flowers of *Lilium* available in the florists' shop are being acquired from Bengaluru, Pune and hilly areas of the country like Himachal Pradesh, Uttarakhand and North Eastern regions. However, Asiatic lily varieties / hybrids grown by amateurs in the state of Uttar Pradesh are coming up well and blooming in wide range of colour, size and shape. Although agro-climatic conditions of the State are suitable for this flower crop, yet its commercial cultivation has not attracted the flower growers due to lack of awareness about the crop, quality planting material and knowledge about its production technology.

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Although agro-climatic conditions of the State are suitable for this flower crop, yet its commercial cultivation has not attracted the flower growers due to lack of awareness about the crop, quality planting material and knowledge about its production technology.

Materials and Methods

The experiment was conducted in the naturally ventilated polyhouse at Department of Horticulture, SHUATS, Prayagraj. An experiment was performed by using randomized block design (RBD) with three replication. The bulbs of Asiatic lily were planted on Dec 2020. Also, In this experiment plant sprayed with GA₃ (200, 250, 300, 350 ppm), NAA (50, 100, 150, 200 ppm) with control after planting of liliun bulbs. The observations were recorded with respect at 30 days after planting to know the response of Asiatic lily to different regulators at different concentration.

Result and Discussion

Growth Parameters

(a) Plant height (cm)

In plant height the treatment differed significantly with respect to height of the plant at 30 days after transplanting. It was found that maximum plant height (28.0 cm) was reached in the T₁ GA₃ 200 ppm. In the year 1974, Dicks *et al.*, [5] also reported that GA₃ promoted plant height in mid-century hybrid lily. Increased vegetative growth might have been due to increased photosynthesis and respiration which enhanced CO₂ fixation in the treated plant (Broughton *et al.*, 1970) [2].

Flower Parameters

(a) Bud length (cm)

Response of GA₃ and NAA at different concentrations was recorded to find out the maximum bud length (Table 1). Application GA₃ 250 ppm resulted in longest bud length (5.9 cm), whereas smallest bud length was found in NAA 200 ppm (2.1 cm). The present investigation similar findings are also reported by Kumar and Gupta (2014) [7] recorded significant increase in bud length at 100 ppm GA₃ application whereas, increase in dose to 200 ppm reduced the length of floret in gladiolus. The increase in the length of the flower bud in GA₃ treated plants is due to rapid cell elongation, increased cell divisions and cell enlargement (Sable *et al.*, 2015) [9].

(b) Bud diameter (mm)

The results presented in Table 1 revealed that growth

regulators treatments had significantly with respect to bud diameter. Diameter of bud was studied among the different treatment in T₂ GA₃ 250 ppm had maximum bud diameter (18.2 mm), which were found minimum bud diameter (5.2 mm) in T₈ NAA 200 ppm. The results are in conformity with the findings of Justo *et al.*, (2017) [6] reported that foliar application of GA₃ at 200 ppm significantly increased flower bud diameter followed by 100 ppm GA₃. Effect of GA₃ in treated plants results in active cell elongation, increased cell divisions and cell enlargement may be the reason for increase in the diameter of the flower buds.

(c) Flower diameter (mm)

The effect of different growth regulators showed significant influence on flower diameter. It was spotted that diameter of flower was maximum (17.5 mm) in T₃ GA₃ 300 ppm. Which had the plant sprayed with NAA 200 ppm T₈ has least diameter (6.9 mm). The current findings are in concurrence with Nowak and Mynett (1985) [8] who studied the effect of growth regulators on post-harvest characters of cut *Lilium* 'Prima' inflorescences and found that of several growth regulators, treatment with GA₃ (200-300 mg/l) resulted in increased floret size. Increased cell elongation, rapid cell division and active cell enlargement due to the application of GA₃ might be the reason for increased diameter of the flower.

(d) Stalk length

The data pertaining to stalk length exhibited significant difference among the treatments. Maximum stalk length was observed in T₂ GA₃ 250 ppm (43.4 cm) and Shortest stalk length were seen in T₇ NAA 150 ppm (15.7 cm). The results is in agreement with the report of Aier *et al.*, (2015) [1] recorded maximum spike length at GA₃ 200 ppm whereas, GA₃ at 50, 100 and 150 ppm also exhibited significantly higher spike length when compared with control in gladiolus cv. Red Candyman.

(e) Stalk diameter

As mentioned in Table 1 plants treated with GA₃ @ 350 ppm T₄ had maximum stalk diameter (5.8 mm) whereas, the minimum stalk diameter (4.7mm) was recorded in T₀ (Control) among all the treatments. The findings are in agreement with those of Sable *et al.*, (2015) [9] reported that the diameter of the spike was recorded maximum with foliar spray of GA₃ 200 ppm followed by treatment with lower doses of GA₃ viz., 150 ppm and 100 ppm.

Table 1: The influence of GA₃ and NAA on Plant height (cm), Bud length (cm), Bud diameter (mm), Flower diameter (cm), Stalk length (cm), Stalk diameter (mm)

Treatment No.	Treatment	Plant height (cm)	Bud length (cm)	Bud diameter (mm)	Flower diameter (cm)	Stalk length (cm)	Stalk diameter (mm)
		30 days after transplanting					
T ₀	Control	22.3	4.6	15.1	13.5	37.7	4.6
T ₁	GA ₃ @ 200 ppm	23.7	5.6	17.2	17	40.5	5.4
T ₂	GA ₃ @ 250 ppm	28.0	5.9	18.2	17.7	43.4	5.5
T ₃	GA ₃ @ 300 ppm	25.8	5.2	16.5	17.1	41.2	5.1
T ₄	GA ₃ @ 350 ppm	25.6	5.5	17.7	16.6	38.6	5.8
T ₅	NAA @ 50 ppm	24.9	4.2	13.3	11.9	30.2	5.0
T ₆	NAA @ 100 ppm	25.8	3.4	10.2	6.8	16.5	5.0
T ₇	NAA @ 150 ppm	22.6	2.5	8.9	7.5	15.7	5.3
T ₈	NAA @ 200 ppm	18.6	2.1	5.2	6.9	16.3	5.1
S.Ed.±		2.59	0.73	1.89	1.54	3.06	0.24
C.D. at 5%		-	1.57	4.05	3.3	6.50	0.51

Conclusion

From the present investigation It is concluded that among the different growth regulators treatments GA₃ @ 250 ppm gave significant results for plant height, bud length, bud diameter, stalk length and flower diameter, while GA₃ @350ppm gave better stalk diameter in Asiatic lily cultivar Litouwen. Hence, GA₃ @ 250 ppm can be recommended for plant growth and flowering of Asiatic lily cv. Litouwen.

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