"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"

ABSTRACT

This investigation was conducted under a naturally ventilated polyhouse, in the Department of Horticulture, SHUATS, Prayagraj, Uttar Pradesh. In December 2020 with records taken from the month of February to month of March 2021. There were nine treatments comprising two growth regulators Gibberellic acid (GA_3) (at 200, 250, 300, and 350 ppm), and Naphthalic Acetic Acid (NAA) (at 50,100,150, and 200 ppm) along with control. The whole experiment was laid out as a Randomized Block Design (RBD) with three replications. The results revealed that among the *Lilium* cv. LITOUWEN, the foliar application of 250 ppm GA_3 significantly increased the number of leaves per plant (66) with enhanced days to bud initiation (25.7 days). The number of bud per plant was 2.8 and stem length was 43.4cm respectively., GA_3 at a concentration of 350 ppm enhanced vase life (7.9 days). and NAA at a concentration of 100 ppm enhanced the number of bulblets (3.3).

Keywords: Asiatic Lily, Polyhouse, GA_3, NAA

INTRODUCTION

"*Lilium* sp. is cultivated worldwide and is one of the most important generators of cut flowers, pot plants, and garden plants. The Asiatic hybrids are derived from interspecific crosses among at least 12 species of the Sinomartagon section" **(Leslie 1982-2005).** Lilies (*Lilium species*) are significant ornamental bulbous plants belonging to the family Liliaceae. The genus *Lilium* comprises nearly 100 species and more than 9,400 cultivars **(Fatmi *et al.*, 2018)**, an essential geophyte with showy flowers, appealing colour, sturdy growth, and robust flowers. which are divided into seven sections. Lily is the common English name for flowering plants of the *Lilium* genus and they are extensively grown in polyhouse as a cut flower in the global flower trade due to a wider choice of growing periods, adorn of colors, and everlasting quality. *Lilium* with showy captivating flowers of different color patterns. It is one of the important genera of flower bulbs produced worldwide. *Lilium* is a Latin name derived from the Greek word "leiron" used by the Theophrastus for the Madonna lily (*Lilium candidium*). In Christianity, the lily flower symbolizes the virgin mother in the semantic world, the symbol of mother wood. It can be grown both as a cut flower and a pot plant. Lily ranks fourth among the top ten cut flowers of the world, next to rose, chrysanthemum, and tulip **(Chaudhary *et al.*, 2018).** The global production of lily bulbs occurs in ten countries **(Buschman, J.C.M. 2005),** with the Netherlands having the maximum

production area (4280 hectares, 77%), followed by France (401 hectares, 0.8%), Chile (205 hectares, 0.4%), Japan (189 hectares, 0.3%) and New Zealand (110 hectares, 0.2%). In India, lilies are famous among farmers of Haryana, Himachal Pradesh, Jammu Kashmir, Uttarakhand, and Tamil Nadu because of their high profitability within a short growing period of four months. "The cultivars of the genus *Lilium* are highly appreciated by horticulturists for their outstanding range of color, fragrance and adaptability to several environmental conditions. *Lilium* can be used for informal planting in grassland or among orchard trees, along crocuses, bluebells and tulips to create flower meadows.

Large and attractive flowers with the capacity to rehydrate after long distance transportation, have made *Lilium* gain popularity fast in our country. The cultivars are highly appreciated for their outstanding range of colours, fragrances, and adaptability to several environmental conditions" **(Bahr and Compton, 2004).** "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 a wide range of colors, sizes, and shapes. Although agro-climatic conditions of the State are suitable for this flower crop, its commercial cultivation has not attracted the flower growers due to a lack of awareness about the crop, quality planting material and knowledge about its production technology.

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Research work on the use of traditional plant growth promoters like gibberellins, improving bulb and corm multiplication rate as well as bulb and corm enlargement was carried out in different parts of the country but artificial application of plant growth regulators can also enhance, hasten, or delay the flowering time in some plant species. According to some other reports, gibberellins induced early flowering and prolonged flower life. Growth and yield were enhanced by application of Gibberellic Acid (GA_3)**(Umrao *et al.*, 2007 and Rana *et al.*, 2005)**, and Naphthalic Acetic Acid (NAA) **(Kumar *et al.*, 2008).**

MATERIALS AND METHODS

The present investigation was conducted at Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj from December 2020 to March 2021.

EXPERIMENTAL DESIGN AND TREATMENTS

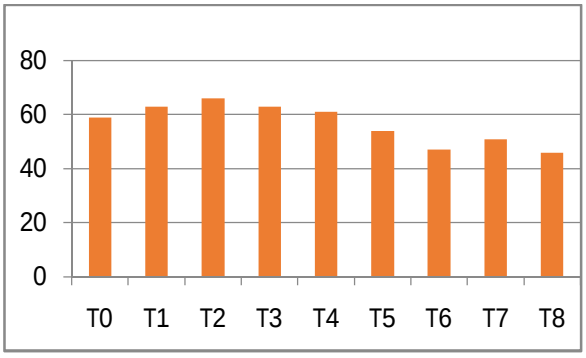
An experiment was performed by using randomized block design (RBD) with three replications. Also, in this experiment plant was sprayed with Gibberellic Acid (GA_3) (at

200, 250, 300, 350 ppm), and Naphthalic Acetic Acid (NAA) (at 50, 100, 150, and 200 ppm) with control after planting of Lilium bulbs. The observations were recorded with respect to 15 days after planting to know the response of Asiatic lily to different regulators at different concentrations.

RESULT AND DISCUSSION

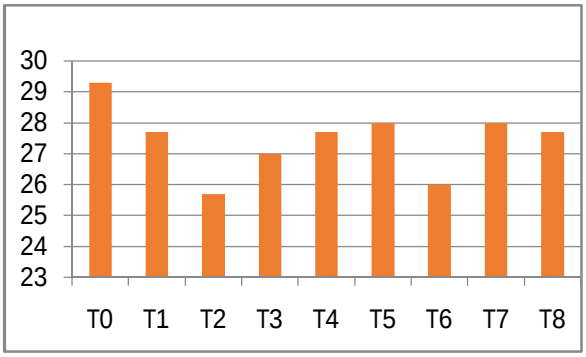
No. of leaves per plant :- In no. of leaves per plant treatment differed significantly with respect. It was found that the maximum no. of leaves per plant (66) was reached in the T_2 GA_3 at 250 ppm. Gibberellic Acid (GA_3) influencing the increased vegetative growth by increasing cell division and cell elongation may be the reason behind the production of more number of leaves per plant. Similar findings were also reported by **Pal and Das (1990)** where GA_3 application increased the number of leaves per plant in Asiatic lily which in consonance with the present findings.

Fig 1: No. of Leaves Per Plant



Days to bud initiation(days):- The results presented in Table 1 revealed that the growth regulator's treatments had significantly for days to bud initiation. It was studied among the different treatments in T_2 GA_3 at 250 ppm that took lesser days (25.7 days), which were found maximum days (29.3 days) for bud initiation in T_0 Control. The result revealed that foliar application of 250 ppm GA_3 significantly advanced days to bud initiation in the Asiatic lily cultivar Litouwen. The reason behind this effect may be due to the stimulation and enhancement of vegetative growth. The present findings agree with **Singh *et al.*(2018).**

Fig 2: Days to Bud Initiation



Number of buds per plant:- The effect of different growth regulators showed significant influence on the no. of buds per plant. It was spotted that no. of bud per plant was more (2.8) in T_2 GA_3 at 250 ppm. Which had fewer bud per plant with NAA 200 ppm T_8. In this study, the number of flower buds per plant significantly increased with levels of GA_3 at 250 ppm. However, these parameters were recorded maximum in GA_3 at 250 ppm treatment, by the findings of **Khan and Tiwari (2003)** in dahlia.

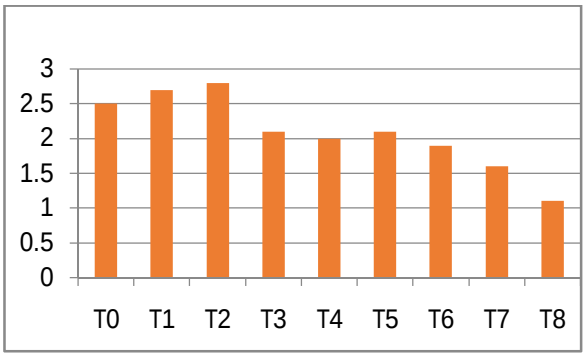


Fig 3: Number of Bud Per Plant

Stem length (cm):-The data on stem length exhibited significant differences among the treatments. The longest stem length was observed in T_2 GA_3 at 250 ppm (43.4 cm) and the Shortest stem length was seen in T_7 NAA at 150 ppm (15.7 cm). The results are in agreement with the report of **Padmalatha *et al.* (2013)** recorded the effect of GA_3 on the growth and flowering of two gladiolus cultivars Darshan and Dhiraj and noted maximum spike length with GA_3.

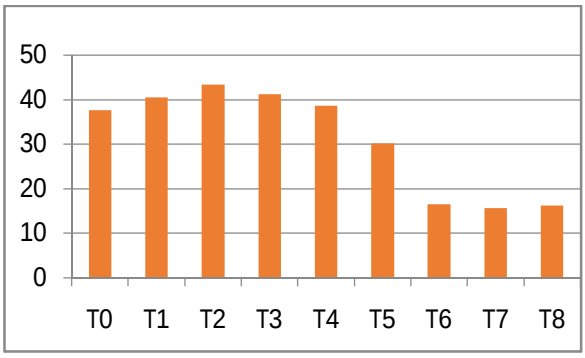


Fig 4: Stem Length (cm)

The vase life of flower:-As mentioned in Table 1 plants treated with GA_3 at 350 ppm T_4 had longer vase life (7.9 days) whereas, the shorter vase life (2.8 days) was recorded in T_6 (NAA at 100 ppm) among all the treatments. The findings are in agreement with similarly, **Kumar and Gupta (2014)** recorded significantly higher vase life with pre-soaking and foliar spray of GA_3 on gladiolus cv. Jessica. And **Jadhav *et al.* (2015)** reported that pre-harvest foliar spray of GA_3 on gladiolus cv. American Beauty was significant in enhancing the vase's life.

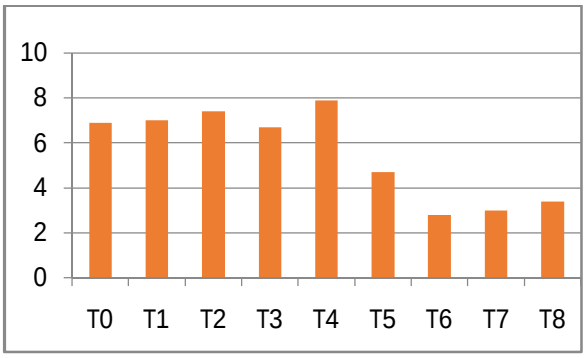


Fig 5: Vase Life

Number of bulblets :-As mentioned in Table 1 among the different growth regulator treatments, the number of bulblets increased significantly with T_6 (NAA at 100 ppm, 3.2) whereas, fewer bulblets were reported in T_0 (Control, 0.9).The findings are in agreement with those of NAA accelerates the growth of the plant, stem cell and manufacturing root cells. Similarly, when NAA was used by **Simmonds and Cumming (1976),** in *Lilium longiflorum* cultivars.

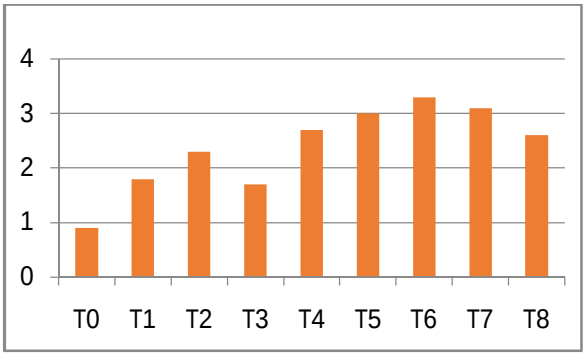


Fig 6: Number of Bulblets

Treatment No.	Treatment	No. leaves per plant	Days to bud initiation (days)	No. of bud per Plant	Stem length (cm)	Vase Life	No. of bulblets
T_0	**Control**	59	29.3	2.5	37.7	6.9	0.9
T_1	**GA_3 at 200 ppm**	63	27.7	2.7	40.5	7	1.8
T_2	**GA_3 at 250 ppm**	66	25.7	2.8	43.4	7.4	2.3
T_3	**GA_3 at 300 ppm**	63	27	2.1	41.2	6.7	1.7
T_4	**GA_3 at 350 ppm**	61	27.7	2.0	38.6	7.9	2.7
T_5	**NAA at 50 ppm**	54	28	2.1	30.2	4.7	3.0
T_6	**NAA at 100ppm**	47	26	1.9	16.5	2.8	3.3
T_7	**NAA at 150ppm**	51	28	1.6	15.7	3	3.1
T_8	**NAA at 200ppm**	46	27.7	1.1	16.3	3.4	2.6
S.Ed. (±)		**2.74**	**0.75**	**0.45**	**3.06**	**0.67**	**0.66**
C.D. at 5%		**5.86**	**1.62**	**0.96**	**6.50**	**1.42**	**1.41**

Table.1 The influence of GA_3 and NAA on No. of leaves per plant, Days to bud initiation(days), No. of bud per plant, Stem length (cm), Vase life, No. of Bulblets.

CONCLUSION

It is determined from the current study that among the different growth regulators and treatment GA_3 at 250 ppm gave significant results for No. of leaves per plant, days to bud initiation, no. of bud per plant, and stem length, while GA_3 at 350ppm gave better vase life of a flower in the Asiatic lily cultivar Litouwen. And NAA at 100 ppm gives significant results in no. of bulblets. Hence, GA_3 at 250 ppm can be recommended for plant growth and flowering of Asiatic lily cv. Litouwen. And NAA at 100ppm for bulblets formation.

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