Int.J.Curr.Microbiol.App.Sci (2018) *7*(6): 1236-1240

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 06 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.706.145

Effect of GA_3 and Benzyladenine (BA) on Growth and Bulb Production in Lily (*Lilium longiflorum*)

Anil K. Singh, Mithilesh Kapri, Anjana Sisodia*, Minakshi Padhi and Sumit Pal

Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221 005, U.P., India

**Corresponding author*

Keywords

Lily, GA_3, BA, Growth, Bulb, Bulblets

Article Info

Accepted:
06 May 2018
Available Online:
10 June 2018

A B S T R A C T

In the present study, effect of GA_3 and BA on plant growth and flowering attributes of lily was evaluated. Experiment was conducted during 2014-2015 in Horticulture Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi under polyhouse condition. Treatments consisted of Single and Double dose of GA_3 100 ppm, GA_3 150 ppm, GA_3 200 ppm, BA 100 ppm, BA 150 ppm, BA 200 ppm and control. The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments and replicated three times. Observations were recorded on growth and bulb production lily crop. All the growth and bulb parameters were significantly influenced due to various concentrations of GA_3 and BA. Results revealed that application of Double dose of BA 150 ppm resulted in maximum number of leaves and scales per plant. However, plants treated with Single dose of BA 100 ppm had maximum dry weight of leaves per plant and plant height as compared to other treatments. Maximum diameter, weight of bulb and fresh weight of leaves/plant were noted with the application of Double dose of GA_3 at concentration 100 ppm, 150 ppm and 200 ppm respectively. Maximum number and weight of bulblets and diameter of bulbs were recorded with Single dose of GA_3 150 ppm and GA_3 100 ppm which were statistically at par with treatments BA 100 ppm (Single dose) and BA 150 ppm (Double dose).

Introduction

Lily is one of the most important bulbous flowers and commercially cultivated for cut flower production (Singh and Sisodia, 2017). A trending demand of lily (*Lilium longiflorum* L.) as cut flower is increasing day by day because of their showy nature of colourful spathe which has attracted medium scale cultivation. It adds instant elegance in decorations, floral arrangements, wedding bouquets and festive occasions. Being a stem rooted bulbous high value crop, it possesses a great potential for market export especially during winter. Presently, availability of quality planting materials that produces massive sized bulbs in huge number is bottleneck due to the adverse climatic condition and also affected by non-availability of micronutrients in soils of India. Growth promoting chemicals like GA_3 and BA found beneficial in different flower crops (Singh, 2003 a & b, Singh, 2005, Yadav *et al.*, 2014, Singh *et al.*, 2017) Application of PGR is an effortless way to

produce more number of quality bulbs and healthy planting materials. GA_3 treatment boosts the bulb and bulblet characters, cell division process, Stem and internodal elongation and vigour of various bulbous crops which was well documented by (Gu *et al.,* 2006; Metivier and Viana, 1979). Earlier workers demonstrated that the growth of flower buds, daughter bulbs, number of leaves, fresh weight and dry weight could be induced by application of BA in low concentration (Naji *et al.,* 2015). Hence, an attempt was made to carry out a research on application of GA_3 and BA in lily cv. Novana to find out its influence on growth and bulb size.

Materials and Methods

The experiment was conducted during the year of 2014-2015 at Horticulture Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, India. Experiment consisted of thirteen treatments, *viz.,* control, Single and Double dose of GA_3 100 ppm, GA_3 150 ppm, GA_3 200 ppm, BA 100 ppm, BA 150 ppm, and BA 200 ppm in a randomized block design (RBD) with three replications. Varanasi is situated in the Agroclimatic Zone-4 (Northern transitional tract) of Uttar Pradesh State and is stretched between 82° 56'E-83° 03'E longitude and 25° 14'N- 25° 23.5'N latitude and at altitude of 76 m above mean sea level.

Soil was tested on the basis of availability of essential nutrients and a homogenous piece of land under protected cultivation was selected from the composite block of Horticulture Research Farm, Department of Horticulture with adequate irrigation, tilth and proper drainage facilities. Uniformly sprouted disease free bulbs were selected for study. Bulbs treated with carbendazim were planted in a plot of size 3.0 m × 1.5 m and spacing of 30 cm × 15 cm on 5th January, 2015. Foliar spray of GA_3 and BA was applied after 30 and 45 days after planting. Uniform cultural practices were practised for all the treatments. Observation on growth and bulb parameters of lily plants were taken after harvesting of the crop. Plant heights in all treatments were recorded after 50, 60 and 70 days after planting. Similarly, observations on number of leaves, fresh weight, stem diameter were taken in field condition, whereas, dry weight, number and weight of bulblets, diameter and weight of bulbs were observed after harvesting of the crops. Results thus obtained were subjected to analyzed.

Results and Discussion

Growth parameters

All the growth parameters were significantly influenced due to various concentrations of GA_3 and BA (Table 1). Maximum number of leaves/plant was recorded with BA 150 ppm (Double dose) which was statistically at par with BA 200 ppm (Double dose), BA 100 ppm (Single dose and Double dose) and BA 150 ppm (Single dose) and significant to other treatments.

Maximum fresh weight was recorded with GA_3 200 ppm (Double dose). However, no significant difference was observed with BA 100 ppm (Single dose), whereas these two treatments were significant to other treatments. Application of BA 100 ppm (Single dose) resulted in maximum dry weight of leaves, plant height at 50 days and 60 days. Whereas, maximum diameter was recorded with GA_3 at 100 ppm (Double dose) which was at par with BA 100 ppm (Double dose), GA_3 200 ppm (Double dose) and BA 150 ppm (Double dose). The result could be attributed to the fact that GA_3 increased the plant height and stem diameter due to increase in cell division and cell enlargement.

Table.1 The influence of GA_3 and BA on growth parameters of lily

Treatments	Number of leaves/plant	Fresh weight of leaves/plant (g)	Dry weight of leaves/plant (g)	Stem diameter (mm)	Plant height (DAP)		
					50	60	70
Control	63.00	12.33	1.53	9.45	31.47	41.83	56.73
GA_3 100 ppm (Single dose)	64.00	23.33	2.21	8.81	42.83	55.07	66.90
GA_3 100 ppm (Double dose)	73.00	21.53	2.17	10.21	50.63	65.53	74.20
GA_3 150 ppm (Single dose)	66.33	15.52	1.76	8.44	51.00	58.23	68.80
$GA_3$150 ppm (Double dose)	72.67	25.56	2.61	8.20	50.83	68.53	78.53
GA_3 200 ppm (Single dose)	68.67	18.65	1.94	8.72	49.93	63.57	73.17
GA_3 200 ppm (Double dose)	68.33	29.83	2.88	9.54	46.93	59.90	68.87
BA 100 ppm (Single dose)	78.33	28.42	3.00	8.99	54.17	69.50	75.50
BA 100 ppm (Double dose)	77.00	14.67	1.79	10.06	52.53	65.80	73.80
BA 150 ppm (Single dose)	77.00	19.23	2.11	8.43	43.93	57.40	67.87
BA 150 ppm (Double dose)	83.67	15.42	1.94	9.17	51.13	65.07	75.10
BA 200 ppm (Single dose)	74.00	16.01	2.00	8.22	46.10	57.60	69.77
BA 200 ppm (Double dose)	82.33	14.59	1.75	7.69	43.87	56.63	66.53
C.D. at 5%	9.10	3.45	0.27	1.45	3.31	5.80	7.42

Table.2 The influence of GA_3 and BA on bulb parameters of lily

Treatment	Weight of bulb/plant (g)	Diameter of bulb (mm)	No. of scales/plant	Weight of bulblets/plant (g)	No. of bulblets/plant
Control	9.21	26.39	7.33	0.23	3.00
GA_3 100 ppm (Single dose)	13.37	37.76	12.33	0.32	5.33
GA_3 100 ppm (Double dose)	12.23	24.74	12.67	0.49	8.33
GA_3 150 ppm (Single dose)	12.05	30.64	11.00	0.52	9.33
$GA_3$150 ppm (Double dose)	16.30	36.35	12.67	0.28	5.00
GA_3 200 ppm (Single dose)	11.95	29.96	11.33	0.39	7.00
GA_3 200 ppm (Double dose)	12.04	32.88	11.33	0.34	6.33
BA 100 ppm (Single dose)	9.69	31.86	12.66	0.39	7.00
BA 100 ppm (Double dose)	11.43	30.14	10.00	0.32	6.00
BA 150 ppm (Single dose)	10.39	32.67	10.33	0.21	3.67
BA 150 ppm (Double dose)	11.71	32.68	13.67	0.41	7.33
BA 200 ppm (Single dose)	12.17	32.81	11.00	0.20	3.67
BA 200 ppm (Double dose)	10.53	30.36	10.33	0.25	4.33
C.D. at 5%	3.51	6.90	3.12	0.13	2.78

Similar findings are also experimentally substantiated by Singh (2003b) in calendula, Singh (2005) in California poppy, Kumar *et al.,* (2013) in tulip and Rani *et al.,* (2015) on gladiolus. Similarly, maximum number of leaves in chamomile plant (*Matricaria chamomilla*) which might be due to large size corm reserves more food and supplying more storage nutrients to the leaves and other parts, that initially helps to vigorous growth and enhance to produce maximum number of leaves and maximum fresh weight/plant.

Bulb parameter

Response of GA_3 and BA at different concentration was recorded to find out the optimum bulb yield (Table 2). Application of GA_3 150 ppm (Double dose) resulted in maximum weight of bulb/plant which was statistically at par with GA_3 100 ppm (Single dose) and significant to other treatments. A reverse trend was observed in case of diameter of bulb in which maximum diameter of bulb was recorded with GA_3 100 ppm (Single dose) followed by GA_3 ppm (Double dose). However maximum number of scales/ plant was registered with BA 150 ppm (Double dose) and minimum number of scales/plant was recorded under control. GA_3 at 150 ppm (Single dose) registered significantly higher weight and number of bulblets/plant followed by GA_3 100 ppm (Double dose), BA 150 ppm (Double dose), BA 100 ppm (Single dose), GA_3 200 ppm (Single dose) and GA_3 200 ppm (Double dose). However, minimum weight of bulblets and number of bulblets/plant was recorded under control which was significantly lower than various GA_3 and BA treatments. Bulb size influenced vegetative growth and all other parameters measured in lily at the time of planting. With increase in the size of bulb, parameters measured also increased in proportion to the size of the planted bulb (Addai *et al.,* 2011). Bulbs of maximum diameter generally produced from large sized bulbs as larger ones having higher amount of food reserves that helps to vigorous growth of plant and attributed to larger bulb size with maximum weight of bulbs and bulblets which was lent credence with the observations made by Kumar *et al.,* (2013) on tulip flower and Choudhury *et al.,* (2010) in tuberose plant, Pogroszewska and Sadkowska (2008) on Alba (*Campanula persicifolia* L.) and Jamil *et al.,* (2016) in Hippeastrum (*Hippeastrum hybridum).* Maximum bulblets/plants was recorded with the application of GA_3 which agreed with the findings of Choudhury *et al.,* (2010) in tuberose plant, Taha *et al.,* (2012) on iris plant and Bose *et al.,* (1980) in Hippeastrum.

It may be concluded that application of GA_3 and BA was beneficial in improving plant growth and bulb parameters in lily. Foliar spray of GA_3 significantly influenced the bulb characters while application of BA affects the growth attributes in lily plant.

References

Addai, I.K. and Scott, P. 2011. Plant carbohydrate partitioning and metabolism of lily (*Lilium longiflorum* L.) during bulb production. *Ghana J. Hort.*, 9: 13-23.

Bose, T.K., Jana, B.K. and Mukhopadhyay, T.P. 1980. Effects of growth regulators on growth and flowering in *Hippeastrum hybridum* Hort. *Scientia Horticulturae*, 12(2): 195-200.

Choudhury, S., Amin, M.R., Uddin, A.K.M. and Uddain, J. 2010. Influence of bulb size and GA_3 on bulb and bulblets production of tuberose. *International Journal of Bio-resource and Stress Management*, 1(3): 180-183.

De Munk, W.J. 1979. Influence of plant growth regulators on the development of bulbous plants with special reference to organ relationships. *Acta Hort.,* 91: 207-220

Dutta, J.P. and Ramadas, S. 1998. Growth and flowering response of chrysanthemum (*Dendranthema grandiflora* Tzelev.) to growth regulator treatments. *Orissa J. Hort*., 26(1): 70-75.

Emongor, V.E., Mutunga, C.M.M. and Chweya, D. 2004. Effect of benzyladenine on growth and flower yield of chamomile plants. *Tropical Agriculture*, 81(1): 1-6.

Gul, H., A.M. Khattak, A.M. and Amin, N. 2006. Accelerating the growth of *Araucaria heterophylla* seedling through different GA_3 concentrations and nitrogen levels. *J. Agric. Biological. Sci*., 1(2): 25-29.

Jamil, M.K., Rahman, M.M., Hossain, M.M., Hossain, M.T., and Karim, A.S. 2016. Effect of plant growth regulators on flower and bulb production of *Hippeastrum hybridum*. *Bangladesh Journal of Agricultural Research*, 40(4): 591-600.

Kumar, R., Ahmed, N., Singh, B.R., Sharma, O.C., Lal, S. and Salmani, M.M. 2013. Enhancing blooming period and propagation coefficient of tulip (*Tulipa gesneriana* L.) using growth regulators. *African Journal of Biotechnology*, 12(2): 168-74.

Naji, D.A., Attiya, H.J. and Askar, H.M. 2015. Effect of plant growth regulators (iba, ba, and ccc) on some vegetative characters of three hybrid lily cultivars of (*Lilium* spp. L.). *Iraqi Journal of Science*, 56(2): *972-982*

Pogroszewska, E. and Sadkowska, P. 2008. The effect of benzyladenine on the flowering of *Campanula persicifolia*. 'Alba' cultivated in an unheated plastic tunnel and in the field. *Acta Sci. Pol. Hortorum Cultus*., 7(3): 57-63.

Rani, P., Yadav, K., Kataria, N., Singh, N., Hussain D.M. and Groach, R. 2015. Assessment of growth, floral and yield attributes of gladiolus in response to gibberellic acid treatment. *Botany Research International*, 8(1): 01-06.

Singh, A.K. 2003a. Effect of plant bioregulators on growth, biomass and flowering in French marigold (*Tagetes patula*). *Indian Perfumer*, 46(3): 279-282.

Singh, A.K. 2003b. Effect of growth regulators on growth and flowering in calendula (*Calendula officinalis*). *Indian Perfumer*, 46(3): 275-278.

Singh, A.K. 2005. Growth and seed yield in California poppy (*Eschsholtzia californica* Chamisso) as influenced by plant growth regulators. *J. Ornamental Horticulture*, 8(2): 159-160.

Singh, A.K. and Bijimol, G. 2001. Influence of growth regulating chemicals on growth, flowering and bulb production in tuberose (*Polianthes tuberosa* L.). *Indian Perfumer*, 45(1): 31-34.

Singh, A.K. and Sisodia, Anjana. 2017. Textbook of Floriculture and Landscaping, New India Publishing Agency, New Delhi. pp. 432.

Singh, A.K., Kumar, P., Sisodia, A., Pal, A.K., Singh, H.V. and Padhi, Minakshi. 2017. Effect of pinching, urea and GA_3 on growth, flowering and seed attributes in African marigold (*Tagetes erecta* L.). *J. Ornamental Horticulture*, 20(1&2): 34-39.

Yadav, K.S., Sisodia, A. and Singh, A.K. 2014. Effect of GA_3 and kinetin on growth and flowering parameters of African marigold (*Tagetes erecta*). *Indian Perfumer*, 58(1): 21-25.

How to cite this article:

Anil K. Singh, Mithilesh Kapri, Anjana Sisodia, Minakshi Padhi and Sumit Pal. 2018. Effect of GA_3 and Benzyladenine (BA) on Growth and Bulb Production in Lily (*Lilium longiflorum*). *Int.J.Curr.Microbiol.App.Sci.* 7(06): 1236-1240. doi: https://doi.org/10.20546/ijcmas.2018.706.145