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Floral and Yield Attributes of Tuberose as Influenced by Gibberellic Acid

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Abstract

The present work was studied to modify the floral and yield contributing characters of tuberose by the influence of gibberellic acid. During the experiment four treatments were tested: control, 100 ppm, 200 ppm and 300 ppm with three replications. The experiment was conducted over two growing periods during April 2013 to March 2015 at Horticulture Farm of Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh. Gibberellic acid regulated the development of spike, bulb and bulblet. GA_3 @ 200 ppm was more effectiveon floral initiation, floret iflorescence^{-1}, bulb and bulblet production compared to control. Maximum flowering plants about 92.56%, bulb yield about 15.86 t ha^{-1} and bulblet yield about 13.60 t ha^{-1} were found from the plants treated with GA_3 @ 200 ppm. Therefore, GA_3 @ 200 ppm were found to be effective for the tuberose production rather than other treatments.

Keywords: Cut-flower, floral attributes, yield traits, PGRs and tuberose

1. Introduction

Tuberose (*Polianthes tuberosa* L.) is one of the most popular cut flower belongs to the family Amaryllidaceae. For the last few years, tuberose has become a popular cut flower in Bangladesh for its attractive fragrance and beautiful display in the vase. It has high demand in the market but production in Bangladesh is not sufficient to meet up market demand. Plant growth and development are regulated by naturally produced phytohormones. Growth and development also can be promoted by the exogenous application of plant growth regulator. The potential use of plant growth regulator like GA_3 in flower production has created considerable scientific interest in recent years (Padaganur et al., 2005; Singh et al., 2003). In Bangladesh, a few studies were done regarding GA_3 on tuberose. Considering the above facts, this research was aimed to find out the effect of GA_3 on floral and yield contributing characters of tuberose.

2. Materials and Methods

The experiment was conducted for two years during April 2013 to March 2015 at Horticulture Farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh. Geographically the experimental area is located at 23°41 N latitude and 90°22 E longitudes at the elevation of 8.6 m above the sea levelbelong to the Modhupur Tract under AEZ No. 28. This area characterized by three distinct seasons, winter season: November to February, pre-monsoon: March to April and monsoon: May to October. Four levels of GA_3 @ 0, 100, 200 and 300 ppm as represented by G_0, G_1, G_2 and G_3 respectively, were tested on the single cultivar of tuberose in a randomized complete block design with three replications. Bulbs were planted on 21st April in each year maintaining the spacing of 30×20 cm^2. GA_3 Spraying was done 40, 50 and 60 days after sowing. The spikes of tuberose were harvested when the first floret opened in the rachis during 5th August to 10th September and bulbs were harvested on 20th March in each year. The experimental data were statistically analyzed by analysis of variance and significance of the difference among the treatments was estimated by the Duncan's Multiple Range Test (DMRT) at $p<0.05$.

3. Results and Discussion

3.1. Flowering plant %

GA_3 @ 200 ppm significantly promoted the plant for flowering. It was more effective than others concentration of GA_3 and increased about 92.56% flowering plant. Tuberose plants treated with GA_3 @ 200 ppm were found maximum flowering (Table 1). This is might be due to exogenous application of GA_3 influence the vegetative growth in an early phase that helps to floral initiation in the plant. Yang et al. (2002) reported that, GA_3 significantly regulate the growth and flowering of tuberose. Sarkar et al. (2014) also found the significant and regulating effect of GA_3 on flowering of Gladiolus.

3.2. Length and diameter of spike

Different concentrations of GA_3 showed no statistical variation on spike length and diameter of the spike (Table 1).

3.3. Length of rachis

The length of rachis varied significantly for different concentration of GA_3 (Table 1). The highest rachis length was found by applying GA_3 up to the concentration of 200 ppm while lower and higher concentrations decreased the rachis length. This might be due to the optimum doses of GA_3 which influence the vegetative growth, enhances the photosynthetic and metabolic activities, causing at all per plant that provides taller rachis (Table 1). This finding is agreement with Manisha et al. (2002) where they stated that, GA_3 @ 150 ppm significantly increased the rachis length of tuberose. This result is also similar to the findings of Sarkar et al. (2014) where they reported as GA_3 promotes the vegetative and reproductive growth of gladiolus.

Table 1: Influence of gibberellic acid on floral characters of tuberose

Treatment	Flowering plant (%)	Length of spike (cm)	Diameter of spike (cm)	Length of rachis (cm)	No. of florets inflorescene^{-1}
G_0	78.00^c	76.00^a	0.80^a	24.27^c	37.75^d
G_1	89.33^b	76.60^a	0.80^a	29.83^b	43.76^b
G_2	92.56^a	76.70^a	0.80^a	31.11^a	46.19^a
G_3	87.92^b	76.30^a	0.80^a	29.43^b	40.32^c
LSD (p=0.05)	2.78	-	-	1.50	2.12
CV (%)	7.31	9.50	3.13	4.76	7.70

3.4. No. of florets inflorescene^{-1}

Florets no. inflorescene^{-1} was influenced significantly by the application of GA_3. The maximum no. of florets inflorescene^{-1} was in the plant applied with GA_3 @ 200 ppm (Table 1). Cell enhancement, cell division and cell elongation are the basic function of gibberellic acid. So its might have an influencing effect on vegetative growth and floral formation also. This result is in agreement with the findings of (Sudhakar and Kumar, 2012; Neetu et al., 2013; Sarkar et al., 2014) where they reported as GA_3 promotes flowering on gladiolus.

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly as per p<0.05, G_0=control, G_1=GA_3 @ 100 ppm, G_2=GA_3 @ 200 ppm and G_3=GA_3 @ 300 ppm

3.5. Diameter of bulb

Different concentrations of GA_3 differed significantly on bulb diameter (Table 2). It was more effective to increase the diameter of the bulb. The bulb of maximum diameter was in the plant applied with GA_3 @ 200 ppm. Lahiji (2013) stated that, gibberellic acid significantly increased the corm diameter of gladiolus.

3.6. Individual bulb weight

GA_3 showed a significant variation in respect of individual bulb weight. The highest individual bulb weight was found with the application of GA_3 @ 200 ppm increases about 12.83% compared to control (Table 2). Among the doses of GA_3, concentration @ 200 ppm was most effective to produce highest individual bulb weight but it was statistically similar with the application of GA_3 @ 100 ppm.

3.7. Yield of bulb and bulblet ha^{-1}

Bulb and bulblet yield significantly increased with the GA_3 application. Application of GA_3 @ 200 ppm increased the yield of bulb and bulblet significantly about 48.22% and 17.04%, respectively compared with control (Table 2). This might be due to optimum doses of GA_3, that facilitate to grow vigorous and healthy plants which increase the rate of photosynthesis and helps to translocation of assimilates to the storage foodcomponent and ultimately plant produces the highest yield of bulb and bulblet. This result is in agreement with the findings of (Sudhakar and Kumar, 2012; Sarkar et al.,

Table 2: Influence of gibberellic acid on yield contributing characters of tuberose

Treatment	Diameter of bulb (cm)	Individual bulb weight (g)	Yield of bulb (t ha^{-1})	Yield of bulblet (t ha^{-1})
G_0	3.43^d	38.81^d	10.70^d	11.62^c
G_1	3.60^{bc}	42.32^{ab}	11.65^c	13.21^a
G_2	3.68^a	43.79^a	15.86^a	13.60^a
G_3	3.55^{cd}	41.00^{bc}	14.59^b	12.59^b
LSD (p=0.05)	0.80	1.61	0.27	0.78
CV (%)	2.22	4.06	11.52	12.04

2014) where they reported, foliar application of GA_3 was most effective to obtain early flowering, the highest yield of good quality spikes and corm of gladiolus.

In a column means having similar letter (s) are statistically similar and those having dissimilar letter (s) differ significantly as per $p<0.05$, G_0=control, G_1=GA_3 @ 100 ppm, G_2=GA_3 @ 200 ppm and G_3=GA_3 @ 300 ppm

4. Conclusion

GA_3 used in this study had a significant contribution to flower and bulb production of tuberose. Among those treatments, GA_3 @ 200 ppm showed the best potentiality to improve flower quality of tuberose especially for better bulb production.

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