Influence of Bulb Size and GA_3 on Bulb and Bulblets Production of Tuberose

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Abstract

The experiment was conducted at horticulture farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh to study the influence of bulb size and different levels of GA_3 on bulb and bulblets production of tuberose during the period of April 2006 to January 2007. The two factors experiment was laid out with Randomized Complete Block Design (RCBD) with 3 replications. Factor A: Three sizes of bulb, i.e. small (1-1.5 cm), medium (>1.5-2.0 cm) and large (>2.0-2.5 cm) and Factor B: Six levels of GA_3 (0, 100,150, 200, 250 and 300 ppm). In case of bulb size, maximum weight of individual bulb (45.48 g), maximum number of bulblets plant^{-1} (14), and maximum yield of bulb (9.10 t ha^{-1}) and bulblets (11.44 t ha^{-1}) was recorded in large size bulb as compared to other sizes of bulb. The highest yield of bulb (8.76 t ha^{-1}) and bulblets (12.14 t ha^{-1}) was found in 300 ppm concentration GA_3.

1. Introduction

Tuberose (*Polyanthus tuberose* L.) is one of the most important bulbous ornamental flowers of tropical and sub-tropical areas. Tuberose has a good demand in market. With the improvement in the standard of living, the demand is increasing by leaps and bounds. To meet this demand, tuberose is cultivated in this country. The size of bulb plays an important role on growth and yield of tuberose. Bulb size influences the sprouting of bulb, and the time required is inversely proportional to its size (Pathak et al., 1980). The bulb yields vary with initial bulb size during planting. The number of daughter bulb production was found to be related to bulb size. Bulblets were smallest on plants from the smallest bulbs and largest on plants raised from large bulbs (Reddy and Singh, 1997). Growth and development behavior of bulbous plants is also regulated by growth hormones. Application of certain growth substances has been found to influence the growth and yield of tuberose.

Many studies have indicated that the application of growth regulators can affect the growth and development of tuberose. There is a very few information about optimum size of mother bulb and proper levels of GA_3 for getting better yield. Therefore, the present study was undertaken to find out the optimum size of mother bulb and levels of GA_3 for maximum bulb and bulblets production of tuberose.

2. Materials and Methods

The experiment was conducted at the horticulture farm of Sher-e-Bangle Agricultural University, Dhaka during the period from April 2006 to January 2007. The experiment consisted of two factors. Factor A: three sizes of bulb, viz. small (1-1.5 cm), medium (>1.5-2.0 cm) and large (>2.0-2.5 cm) in diameter, and Factor B: six levels of GA_3 such as 0, 100, 150, 200, 250 and 300 ppm were considered. The experiment consisting of 18 treatment combinations and were laid out in a Randomized Complete Block Design (RCBD) with 3 replications. The land was prepared by ploughing and laddering properly during the month of April, 2006. The land was fertilized with well decomposed cow dung, urea, TSP and MP at the rate of 50 t, 260 kg, 200 kg and 200 kg ha^{-1}, respectively. The entire amount of cow dung, TSP, MP and ¼ of the total urea was applied during final land preparation. Rest of urea was applied in three installments at 30, 55 and 85 days after planting (Molla et al., 2002). The bulbs of tuberose cv single was used as planting materials. The bulbs were planted on 27th April, 2006. GA_3 and control solution were applied at 40 and 61 days after planting (Singh, 1999). Cultural practices such as weeding, irrigation, mulching, etc. were done as and when necessary. The bulb and bulblets were harvested on 13th January, 2007. Ten representative plants from each plot were selected at harvest for data collection. The recorded data were statistically analyzed using MSTAT program and means were separated by Duncan's multiple range test (DMRT) (Gomez and Gomez, 1984) at 5% level of significance for interpretation of the results.

3. Results and Discussion

3.1. Effect of bulb size

Different sizes of mother bulb of tuberose showed significant effect on the yield contributing characters (Table 1).

The maximum weight (45.48 g) of mother bulb was produced

Table 1: Effect of bulb size on bulb and bulblets production of tuberose

Bulb size	Weight of individual bulb (g)	Diameter of individual bulb (cm)	Weight of single bulblet (g)	Number of bulblets plant^{-1}	Weight of bulblets plant^{-1} (g)	Diameter of bulblet (cm)
Small	37.52 c	3.29 c	3.45 b	13.16c	45.67 c	1.195 c
Medium	41.64 b	3.62 b	3.82 a	13.80b	53.08 b	1.450 c
Large	45.48 a	3.82 a	3.92 a	14.57a	57.20 a	1.655 a
LSD (p=0.05)	1.141	0.053	0.148	0.539	2.776	0.103
Significance level	**	**	**	**	**	**

by large bulb which was statistically higher than small and medium sized bulb and the minimum weight (37.52 g) of individual bulb was recorded for small sized bulb. Bulb diameter increased with the increase of mother bulb size. The maximum bulb diameter (3.82 cm) was obtained from large mother bulb and the minimum diameter (3.29 cm) of individual bulb was found for small sized bulb.

Maximum number of bulblets (14) plant^{-1} was observed in large sized and minimum (13) number was recorded for small sized bulb. The maximum (3.92 g) weight of single bulblet was obtained from large sized bulb which was statistically similar (3.82 g) with medium bulb size and the minimum (3.45 g) weight of single bulblet was recorded for small sized bulb. The highest weight of bulblets (57.20 g) plant^{-1} was obtained from large sized bulb and the minimum (45.67 g) weight was recorded for small sized bulb. The maximum diameter (1.65 cm) of bulblet was obtained from large sized bulb and the minimum (1.195 cm) diameter was recorded for small sized bulb. The highest bulb yield (9.10 t ha^{-1}) was observed in large sized bulb which was statistically higher than other two sizes of mother bulb and the lowest yield (7.50 t ha^{-1}) was recorded in small mother bulb (Figure1). The maximum yield of bulblets (11.44 t ha^{-1}) was recorded from large sized bulb. Bulblets yield was decreased with the decrease of bulb size. The minimum

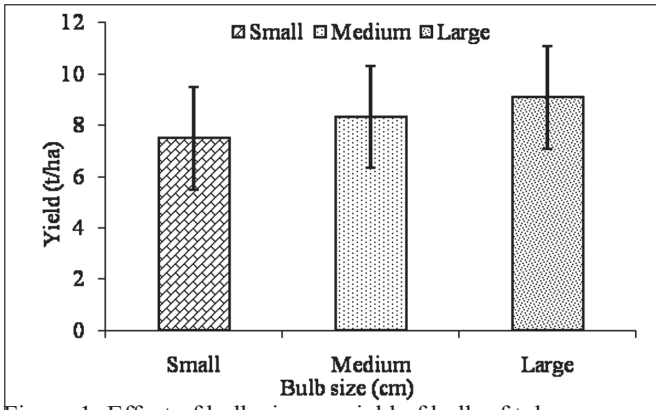

Figure 1: Effect of bulb size on yield of bulb of tuberose

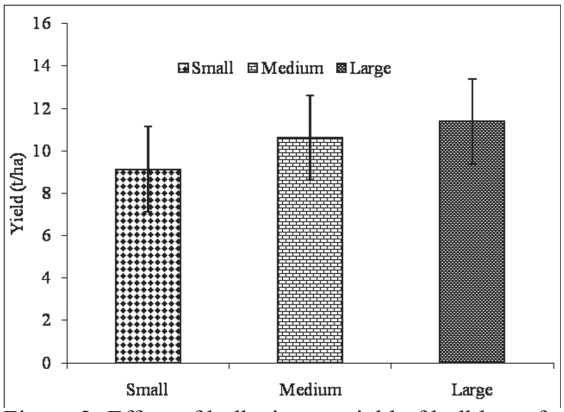

Figure 2: Effect of bulb size on yield of bulblets of tuberose

yield (9.13 t ha^{-1}) of bulblets was recorded from small sized bulb (Figure 2).

1.1. Effect of GA_3

Yield and yield contributing characters of tuberose was significantly affected by different levels of GA_3 (Table 2).

The maximum weight of bulb (43.79 g) plant^{-1} was recorded with 300 ppm concentration of GA_3 which was statistically similar (43.36 g) with 250 ppm and 42.32 g with 200 ppm concentration of GA_3 and the minimum 38.81 g weight of individual bulb was observed in control condition which was similar (39.99 g) with 100 ppm concentration of GA_3. The maximum diameter (3.68 cm) of individual bulb was recorded in 300 ppm concentration of GA_3 and the minimum (3.43 cm) was obtained in control condition. The maximum number of bulblets (15) plant^{-1} was found with 300 ppm concentration of GA_3 and the lowest (12) in control condition. The maximum weight of single bulblet (3.95 g) was recorded in 300 ppm concentration of GA_3 and the minimum (3.95 g) was obtained in control condition. The maximum weight of bulblets (60.70 g) plant^{-1} and diameter of bulblets (1.6 cm) plant^{-1} were recorded in 300 ppm concentration of GA_3.

Application of GA_3 increased the bulb yield of tuberose significantly. Increasing GA_3 levels from 0 to 300 ppm resulted in progressive increase in bulb and bulblets yield of tuberose. Plants grown without application of GA_3 had the lowest bulb and bulblets yield. The highest bulb yield (8.76 t ha^{-1}) was

Table 2: Effect of different concentration of GA_3 on bulb and bulblets production of tuberose						
Concentration of GA_3 (ppm)	Weight of individual bulb (g)	Diameter of individual bulb (cm)	Weight of single bulblet (g)	Number of bulblets plant-1	Weight of bulblets $plant_{-1}$ (g)	Diameter of bulblet (cm)
0	38.81d	3.43e	3.39d	11.90c	40.49d	1.193e
100	39.99cd	3.51d	3.55cd	12.23c	43.57d	1.303d
150	41.00bc	3.55cd	3.69bc	13.92b	51.50c	1.390c
200	42.32ab	3.60bc	3.88ab	14.38b	55.90b	1.493b
250	43.36a	3.66ab	3.92a	15.24a	59.74ab	1.597a
300	43.79a	3.68a	3.95a	15.37a	60.70a	1.623a
LSD (p=0.05)	1.614	0.074	0.210	0.763	3.925	0.086
Significance level	**	**	**	**	**	**

obtained from large sized bulb which was statistically similar (8.67 t ha^{-1}) with 250 ppm and 8.46 t ha^{-1} with 200 ppm concentration of GA_3 (Figure 3).

The highest yield (12.14 t ha^{-1}) of bulblets was recorded from concentration of GA_3 at 300 ppm which was statistically similar (11.95 t ha^{-1}) with 250 ppm concentration of GA_3. On the other hand, the lowest (8.10 t ha^{-1}) yield of bulblets was obtained from control condition which was statistically similar with 100 ppm concentration of GA_3 (Figure 4).

Interaction effect between bulb size and concentration of GA_3 showed no significant differences in terms of all parameter under the present trial. But the maximum (47.59 g) weight of individual bulb was recorded from large sized bulb with concentration of GA_3 at 300 ppm and the minimum (35.59g) was recorded from small sized bulb with control (Table 3).

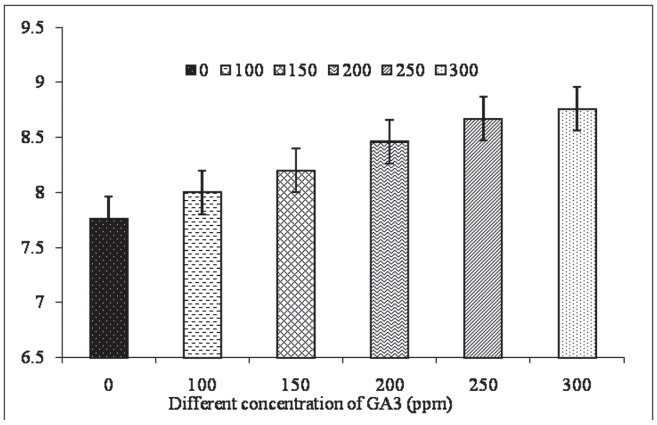

Figure 3: Effect of GA_3 on yield of bulb of tuberrose

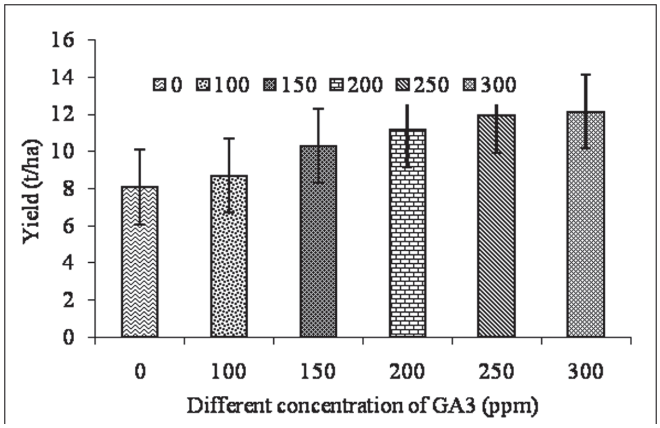

Figure 4: Effect of GA_3 on yield of bulblet of tuberose

The maximum (3.93 cm) diameter of individual bulb was recorded from large sized bulb with concentration of GA_3 at 300 ppm and the minimum (3.11cm) was found from small sized bulb with no GA_3 application. The maximum (16) number of bulblet $plant^{-1}$ was found from large sized bulb with concentration of GA_3 at 300 ppm and the minimum (11) was obtained from small sized bulb with no GA_3 application. The maximum (64.07 g) weight of bulblet $plant^{-1}$ was recorded from large sized bulb with concentration of GA_3 at 300 ppm and the minimum (35.50 g) was recorded from small sized bulb with control. The maximum (9.52 t ha^{-1}) yield of bulb was observed from large sized bulb with concentration of GA_3 at 300 ppm and the lowest (7.12 t ha^{-1}) was recorded from small sized bulb with control. The maximum (12.81 t ha^{-1}) yield of bulblet was observed from large sized bulb with concentration of GA_3 at 300 ppm and the minimum (7.10 t ha^{-1}) was found from small sized bulb with control.

1. Conclusion

The bulb production ability increased gradually with the increase in bulb size. Large bulb (>2-2.5 cm) produced the maximum yield of bulb and bulblets ha^{-1}. The result of the study showed that six levels of GA_3 were significantly different for all the parameters. The highest yield of bulb and bulblets was obtained from the concentration of 300 ppm GA_3 which was statistically similar with 250 ppm concentration of GA_3. However, yield of bulb and bulblets was not significantly affected by the interaction of bulb size and GA_3.

Table 3: Interaction effect of bulb size and different concentration of GA_3 on bulb and bulblet production of tuberose

Bulb size×concentration of GA_3 (ppm)		Weight of individual bulb (g)	Diameter of individual bulb (cm)	Number of bulblets plant^{-1}	Weight of single bulblet (g)	Weight of bulblets plant^{-1} (g)	Diameter of bulblet (cm)	Yield of bulb (t ha^{-1})	Yield of bulblets (t ha^{-1})
Small	0	35.59	3.11	11.14	3.19	35.50	1.14	7.12	7.10
	100	35.95	3.21	11.37	3.20	36.52	1.15	7.19	7.30
	150	36.63	3.23	13.30	3.32	44.15	1.10	7.33	8.83
	200	38.17	3.32	13.75	3.49	48.01	1.09	7.63	9.60
	250	39.08	3.41	14.45	3.72	53.61	1.13	7.82	10.72
	300	39.69	3.43	14.92	3.76	56.22	1.20	7.94	11.24
Medium	0	38.29	3.52	11.48	3.29	37.22	1.59	7.66	7.55
	100	39.65	3.57	12.00	3.69	44.23	1.76	7.93	8.85
	150	41.23	3.61	13.88	3.92	54.45	1.81	8.25	10.89
	200	42.67	3.63	14.45	3.98	57.46	1.73	8.53	11.49
	250	43.93	3.68	15.61	4.02	62.77	1.77	8.79	12.56
	300	44.09	3.69	15.35	4.03	61.80	1.71	8.82	12.36
Large	0	42.56	3.67	13.08	3.69	48.94	1.76	8.51	9.65
	100	44.37	3.75	13.31	3.76	49.94	1.81	8.87	9.99
	150	45.15	3.81	14.57	3.83	55.90	1.81	9.03	11.18
	200	46.12	3.85	14.93	4.01	62.84	1.86	9.22	12.45
	250	47.07	3.90	15.66	4.15	63.23	1.86	9.41	12.57
	300	47.59	3.93	15.82	4.16	64.07	1.88	9.52	12.81
LSD (p=0.05)		-	-	-	-	-	-	-	-
Significance level		NS	NS	NS	NS	NS	NS	NS	NS
NS=Not significant									

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