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EFFECT OF STORAGE PERIOD AND GA_3 SOAKING OF BULBS ON GROWTH AND FLOWERING OF TUBEROSE (*Polianthes tuberosa* L.) CV. DOUBLE

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ABSTRACT : The experiment on effect of storage period and GA_3 soaking of tuberose bulbs on growth, flowering, flower yield and quality was conducted at Junagadh Agriculture University, Junagadh during 2010-11. The experiment was laid out in factorial randomized block design (FRBD) with three replications and four treatment combinations of storage comprising : S_0 - Fresh uplifted, S_1 - One month storage (uplifted during 2nd week of January, 2010), S_2 - Two months storage (uplifted during 2nd week of December, 2009), and S_3 - Three months storage (uplifted during 2nd week of November, 2009). These tuberose bulbs were planted in 3rd week of February, 2010 with four GA_3 soaking treatments for 12 hours *viz.* G_0 - Control (soaking in distilled water), G_1 - 100 mg/l, G_2 - 200 mg/l and G_3 - 300 mg/l. The bulbs soaked with different concentration of GA_3 were kept in shade for half an hour before planting. The results revealed that one month storage period after uplift of bulbs and GA_3 200 ppm soaking before planting treatments significantly improved growth parameters (days to sprouting, sprouting percentage and plant height), and floral characters (days to spike emergence, days to first spike harvested and length of spike, number of florets per spike and diameter of floret) over a control treatment.

Keywords : *Tuberose bulbs, GA_3 soaking, storage, spike quality, yield.*

The tuberose (*Polianthes tuberosa* L.) is a very important bulbous flower crop both for cut flower and loose flower production through out country. Flowering in tuberose is affected by several factors, out of which, the resting period of the bulb before planting and level of growth hormones present in the bulbs has an important role to play. It is one of the important cut flowers used for vase decoration and bouquets. The flowers stalk is 75 to 100 cm long bearing 10-20 flowers (florets) of white colour. The spikes of tuberose are used as a cut flower due to its delightful appearance, sweet fragrance and good keeping quality. The individual florets are used for making *veni* and garlands. Besides the floral decoration it is suitable for pots, beds and for extraction of oil. Bulb planting with appropriate indigenous level of growth hormones can help to obtain increased production. However, there are no comprehensive reports available on this aspect. Therefore, an effort was made to find out the most suitable storage period and optimum level of GA_3 treatment to the bulbs for higher flower production of tuberose cv. Double.

MATERIALS AND METHODS

An experiment was conducted at Horticultural Instructional Farm, Department of Horticulture, College of Agriculture, Junagadh Agriculture University, Junagadh (Gujarat) during February 2010 to January 2011. The experiment was laid out in factorial randomized block design. Four treatment combinations of storage comprising : S_0-Fresh uplifted, S_1-One month storage (uplifted during 2nd week of January, 2010), S_2 -Two months storage (uplifted during 2nd week of December, 2009), and S_3-Three months storage (uplifted during 2nd week of November, 2009). These tuberose bulbs were planted in 3rd week of February, 2010 with four GA_3 soaking treatments for 12 hours *i.e.* G_0- Control (soaking in distilled water), G_1-100 mg/l, G_2-200 mg/l and G_3-300 mg/l. The bulbs soaked with different concentration of GA_3 were kept in shade for half an hour before planting, then they were treated with Bavistin powder @ 0.5% to prevent them from fungal diseases. The experimental land was fertilized with 180 kg nitrogen, 60 kg phosphorus and potash each per hectare as per recommendation made by Junagadh Agriculture University for this crop. Full dose of phosphorus and potash, and one third dose of nitrogen were applied as a basal dose uniformly to all the plots before planting and the remaining two-third dose of nitrogen was applied in two spilts at an interval of 45 days after planting. Irrigation was given before fertilization to the crop for maintaining soil moisture. The treated bulbs were planted in each plot at the spacing of 30 cm x 30 cm on third week of February. The gap filling was carried out within one month. First

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light irrigation was given immediately after planting and then the irrigation was done once a week in summer and after 10 to 12 days in winter. Weeding was carried out as and when required. However, no any serious incidence of insect pest and disease infestation was observed during the period of experiment. Harvesting was done at opening of two to three basal pair of florets during early in the morning with the help of secateur. Immediately after harvesting, the bottom end of spike was put in water.

Data on days to sprout emergence, sprouting percentage, plant height at full bloom stage (cm), days to spike emergence, days to first spike harvested, length of spike (cm) and diameter of floret (mm) were recorded. The data of all the characters studied were subjected to statistical analysis of variance technique as described by Panse and Sukhatme (4).

RESULTS AND DISCUSSION

Sprouting and growth parameters

Days taken to sprouting, sprouting percentage and plant height (Table 1) was significantly affected by storage of bulbs before planting. Minimum days for sprouting were recorded in one month storage (46.05 days) being at par with two months storage (46.90 days). Significantly, one month storage also recorded maximum sprouting percentage (72.48 %) being at par with S_2 (69.10 %) and S_3 (68.24 %). The S_0 treatment delayed the sprouting with least sprouting percentage which may be due to presence of slight dormancy in fresh uplifted bulbs (Aoba and Shibuya, 1). Significantly highest plant height (92.36 cm) was noted in S_1 treatment being at par with S_2 (87.86 cm) and S_3 (88.24 cm) treatments. This increase in plant height might be due to overcome of dormancy during storage, but when storage was extended more than one month the sprouting and growth vigour were slightly decreased because of depletion of storage food in the bulbs. Increase in plant height as a consequence of GA_3 treatments has also been reported by Borse (2) and Pavaghadhi (5) in *Salidago* and Kumar and Singh (3) in gladiolus.

Significantly early sprouting, higher sprouting percentage and higher plant height were observed in GA_3 treated bulbs confirming to the reports of Umrao *et al.* (8). Least days to sprouting was noted in G_2 (47.66 days) followed by G_3 (49.03 days), but highest sprouting percentage was observed in G_3 (72.57 %) followed by G_2 (71.27%). Similarly, G_2 (200 mg GA_3/l) treatment gave tallest plant (91.57 cm) followed by 300 mg GA_3/l (90.93 cm) and G_1 (87.48 cm). This

Table 1: Effect of storage period and GA_3 soaking of bulbs on sprouting, growth and spike characters and yield in tuberose cv. Double.

Treatments*	Days to sprouting	Sprouting percentage	Length of spike (cm)	Plant height at full bloom stage (cm)	No. of florets per spike	Diameter of floret (mm)	No. of spikes/plant	Number of spikes/ha (lacs)
Storage period of bulb								
S_0	54.54	66.12	76.12	86.12	17.51	28.22	2.31	2.75
S_1	46.05	72.48	82.49	92.36	22.99	30.12	3.23	3.69
S_2	46.90	69.10	77.88	87.86	18.41	29.30	2.65	2.44
S_3	56.90	68.24	78.24	88.24	19.72	29.45	2.64	2.43
C.D. (P = 0.05)	6.00	4.25	4.28	4.23	4.26	1.00	0.42	0.46
GA_3 treatments								
G_0	55.65	64.62	74.62	84.62	17.27	29.27	2.29	2.63
G_1	52.11	67.48	77.48	87.48	19.07	29.18	2.71	3.11
G_2	47.66	71.27	81.70	91.57	21.37	29.58	2.95	3.27
G_3	49.03	72.57	80.93	90.93	20.93	29.07	2.88	3.20
C.D. (P = 0.05)	6.00	4.26	4.28	4.23	4.26	NS	0.42	0.46
CV%	**14.07**	**7.4**	**6.52**	**5.73**	**15.89**	**4.1**	**18.75**	**18.42**

***Note :** Treatment S_0 - Fresh uplifted, S_1 - One month storage (uplifted during 2nd week of January, 2010), S_2 - Two months storage (uplifted during 2nd week of December, 2009), and S_3 - Three months storage (uplifted during 2nd week of November, 2009). These tuberose bulbs were planted in 3rd week of February, 2010 with four GA_3 soaking treatments for 12 hours *i.e.* G_0 - Control (soaking in distilled water), G_1 - 100 mg/l, G_2 - 200 mg/l and G_3-300 mg/l.

significant effect on sprouting and growth vigour was attributed due to presence of higher level of growth promoting hormones in externally treated bulbs before planting. These results are in conformity with the findings of Preeti *et al.* (6) and Tak and Nagda (7), who reported that dipping of bulbs in 200 mg/l of GA_3 solution broke the dormancy of bulbs.

Flowering and spike characters

Effect of different treatments of storage period significantly influenced to length of spike (Table 1). Plants from one month storage (S_1) produced longest spike (82.49 cm) and it was remained at par (78.24 cm) with three months storage (S_3). Shortest spike (76.12 cm) was obtained from fresh uplifted bulbs (S_0) which was remained at par (77.88 and 78.24 days, respectively) with two months storage (S_2) and three months storage (S_3). Among the growth regulator treatments the highest length of spike (81.70 cm) was resulted from the treatment with GA_3 at 200 mg/l (G_2) but, being at par (80.93 and 77.48 cm, respectively) with GA_3 at 300 mg/l (G_3) and GA_3 100 mg/l (G_1).

Highest number of florets per spike (22.99) was counted from one month storage (S_1) treatment, but it was found at par with three month storage (19.72). whereas, GA_3 200 mg/l (G_2) gave the highest number of florets per spike (21.37) followed by GA_3 300 mg/l (20.93) and GA_3 100 mg/l (19.07) but both the later were found at par to each other. The greatest floret diameter (30.12 mm) was resulted from the one month storage (S_1) followed by three months storage (29.45 mm) and two months storage (29.30 mm), respectively. The beneficial results of GA_3 on improvement of flower characters are in accordance with those of Kumar and Singh (3), Umrao *et al.* (8) and Wankhede *et. al.* (9 and 10) in which they obtained increased spike length, number of florets per spike, floret diameter as well as vase life of spike at GA_3 200 mg/l treatment.

Yield parameters and vase life

Effect of storage period and GA_3 soaking was found significant for number of spikes per plant (Table 1). One month storage (S_1) significantly gave highest number of spikes per plant (3.23). Minimum number of spikes per plant (2.31) was obtained from fresh uplifted bulbs (S_0), which was remained at par (2.65 and 2.64) with two months storage (S_2) and three months storage (S_3), respectively. It is apparent from the data (Table 1) that highest number of spikes per plant (2.95) was obtained in GA_3 at 200 mg/l (G_2) followed by (G_3) and (G_1), but all these three treatments were found to be at par to each other. Whereas, control (G_0) gave minimum spikes per plant (2.29) being at par to GA_3 100 mg/l (G_1). The yield of spikes per hectare was also significantly affected by storage of bulbs before planting. One month storage (S_1) significantly produced highest number of spikes per hectare (3.56 lacs), whereas minimum number of spikes (2.75 lacs) was obtained from fresh uplifted mother bulbs (S_0), but it was remained at par with (2.44 lacs and 2.43 lacs) two months storage (S_2) and three months storage (S_3), respectively. Highest number of spikes (3.27 lacs) was also obtained in GA_3 at 200 mg/l (G_2) followed by G_3 and G_1, whereas, control (G_0) gave minimum spikes per hectare (2.63 lacs). The increased yield of spikes due to treatment of GA_3 at 200 ppm was also noticed by Preeti *et al.* (6) and Wankhede *et al.* (9 and 10).

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