EFFECT OF BULB SIZE, TEMPERATURE TREATMENT OF BULBS AND CHEMICALS ON GROWTH AND FLOWER PRODUCTION IN TUBEROSE (P O L I A N T H E S T U B E R O S A L.)

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Abstract

Experiments were conducted to study the effect of bulb size, storage and treatment with chemicals on growth and flower production in tuberose. Bulb diameter between 1.5 to 2.0 cm, storage of bulbs at 4°-10°C for 10-30 days and soaking of bulbs in GA_3 (200 mg/l) and thiourea (2000 mg/l) solution for 6 hours were found to improve plant growth and increase yield of spikes and flowers. These treatments also caused early emergence of flower spikes and improved the quality of flowers.

1. Introduction

Tuberose is one of the very important flower crops of India. It is cultivated commercially from bulbs. The yield of flowers depend much on the size of bulbs used at planting (Sadhu and Bose, 1973; Yadav et al., 1984). Treatment of bulbs with growth substances has also been found useful in improving the growth, flowering and quality of flowers (Bose et al., 1980). Bulb storage is another factor playing important role on these aspects. In order to maximise the production, experiments were conducted to study the effect of bulb size, storage and treatment with chemicals on growth and flower production in tuberose.

2. Materials and methods

Investigations were carried out at the Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India. Three separate experiments with cultivar 'Single' were conducted simultaneously in a randomised block design with four replications. The treatments in the experiment on effect of bulb size on growth and flowering included 4 bulb sizes (diameter in cm) i.e. 0.8-1.0 cm, 1.0-1.5 cm, 1.5-2.0 cm and 2.0-2.5 cm while for studying the influence of chemicals, bulbs of 1.5-2.0 cm in diameter were soaked in solution of GA_3 at 100 and 200 mg/l, ethrel at 0.25 and 0.50 ml/l, kinetin at 25 and 50 mg/l, thiourea at 1000 and 2000 mg/l for 6 hours and were properly dried in shade. In case of experiment on effect of temperature, bulbs of the above size were stored at 4°, 10° and 30°C each for 10, 20 and 30 days. Planting of bulbs in all the experiments was done in the first week

of April at a distance of 20 x 20 cm and the recommended cultural practices were adopted regularly. Data on vegetative growth and flowering recorded for two years were pooled and have been presented in tables and figure.

3. Results

3.1. Bulb sprouting and plant growth

The size of bulb at planting influenced its sprouting and subsequent plant growth. Larger bulbs were found to take more time for sprouting. The plant height and number of leaves produced from each bulb, on the other hand, increased with the increase in bulb size upto to 2.0 cm diameter. Larger bulbs measuring 2.0-2.5 cm caused less vegetative growth compared to those having 1.5-2.0 cm diameter (Table 1).

Treatment of bulbs with chemicals except GA_3, also hastened the sprouting and the earliest emergence of shoots were recorded with ethrel at 0.50 ml/l followed by thiourea at 1000 mg/l. Bulbs soaked in solution of GA_3 at 200 mg/l took maximum time to germinate (Table 2). Though all the chemicals used in this investigation improved the plant growth, GA_3 at 200 and thiourea at 2000 mg/l proved very effective in increasing both the plant height and number of leaves per clump. Soaking of bulbs in solutions of these chemicals increased the number of leaves by 116.4 and 146.6 percent respectively compared to the untreated ones.

Similarly, pre-plant storage of bulbs at different temperature and duration significantly influenced their sprouting and subsequent plant growth. Bulbs stored at the lowest temperature of 4°C took more time for sprouting which was further delayed by increase in the duration of storage at 4°C for a period of 30 days (Table 3).

3.2. Flowering

Bulb size also caused marked variation on flowering of tuberose, Increase in size upto 1.5-2.0 cm caused earlier flowering, greater elongation of spike length and flowers. Further increase in bulb size delayed the flowering and resulted in reduced yield of flowers as compared to those having the diameter between 1.5-2.0 cm (Table 1 and Figure 1).

Treatment of bulbs with different chemicals improved the flowering and GA_3 was found to be the most effective followed by thiourea (Table 2 and Figure 1). Though application of GA_3 delayed the sprouting of bulbs, the emergence of flower spikes was found to hasten and there was a remarkable improvement in the production of flowers. Soaking of bulbs in the solution GA_3 at 200 mg/l increased

the spike length and flower yield by 28.4 and 140.3 percent respectively over the control.

As regards the effect of temperature treatment, pre-plant storage of bulbs at 10°C for a period of 30 days resulted in the earliest flowering and highest yield of spikes and flowers (Table 3 and Figure 1). This treatment also improved the quality of spikes by increasing their length.

4. Discussion

The results of the present investigation revealed that larger bulbs took more time for sprouting. This might be due to the presence of more layers of membranous scales which interfered exchange of gases and inhibited metabolic process (Kamerbeek, 1962). Plant height (leaf length) and number of leaves per clump showed gradual increase with the increase in bulb size upto 2.0 cm in diameter. Bulbs measuring from 2.0-2.5 cm caused less vegetative growth compared to those having 1.5-2.0 cm diameter. The increased growth in 1.5-2.0 cm bulb size was due to more number of active leaf bases in such bulbs which in turn absorbed more water and nutrients than large bulbs and encouraged more growth. Similar results were obtained by Hagiya and Amaki (1966) in tulip. Increase in bulb size upto 2.0 cm caused earliest flowering and gave the highest yield of spikes and flower compared to the delayed flowering and lowest yield in the smallest ones. This was due to better vegetative growth of the plants and sufficient stored food materials in such bulbs. Early flowering and higher yield of flowers in larger bulbs were also recorded by several workers (Kale and Bhujbal, 1972; Sadhu and Das, 1978 and Pathak *et al.*, 1980).

Soaking of bulbs in different chemical solutions before planting improved the growth and flowering of the crop. Among the different chemicals used, GA_3 and thiourea proved superior than the others. Thiourea promoted plant height and leaf number while GA_3 improved flowering. Treatment with GA_3 at 200 mg/l caused earliest flowering and gave the maximum yield of spikes and flowers. Early flowering, longer spikes and more number of flower per spike in plants obtained from GA_3 treated bulbs were also observed by Ramaswamy *et al.* (1979). Thiourea was also found very effective in increasing the growth and flowering which was also confirmed by Roychoudhury *et al.* (1985).

Bulb storage at different temperature and its duration significantly influenced its sprouting and subsequent growth and flowering of plants. Storage of bulbs at a medium temperature of 10°C for a period of 30 days was found beneficial in improving the growth and flowering. The present results are in confirmity with those reported by Brierley (1941) and Stuart (1943).

References

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

Brierley, P., 1941. Effect of cold storage of Easter lily bulbs on subsequent forcing performance. J.Agric.Res., 62: 317-335.

Hagiya, K., and Amaki, W., 1966. Nutritional studies on tulips.III. Seasonal changes in the absorption of three major elements and water. J.Jap.Soc.Hort.Sci., 35: 170-176.

Kale, P.N., and Bhujbal, B.G., 1972. Effect of bulb size on flower production of tuberose (Polianthes tuberosa L.). Ind.J.Orn.Hort., 3: 102-103.

Kamerbeek, G.A., 1962. Respiration of the iris bulb in relation to the temperature and the growth of the primordia. Acta bot.neerl., 11: 331-410.

Pathak, S., Choudhuri, M.A., and Chatterjee, S.K., 1980. Germination and flowering in different sized bulbs of tuberose (Polianthes tuberosa L.). Indian J.Plant Physiol., 23 : 47-54.

Ramaswamy, N., Paulraj, C., and Chockalingam, P., 1970. Studies on the influence of growth regulators on flowering and yield of tuberose (Polianthes tuberosa L.). ANARA, Annamalai University Agricultural Research Annual, 7/8: 29-33.

Roychoudhuri, N., Biswas, J., Dhua, R.S., and Mitra, S.K., 1985. Effect of chemicals on germination, growth, flowering and corm yield of gladiolus. Indian Agric., 29: 215-217.

Sadhu, M.K., and Bose, T.K., 1973. Tuberose for most artistic garlands. Indian Hort., 18: 17-20.

Sadhu, M.K., and Das, P.K., 1978. Effect of bulb size, planting density and depth of planting on growth, flowering and bulb production of tuberose (Polianthes tuberosa L.). Indian J.Hort., 35: 147-150.

Stuart, N.W., 1943. The influence of storage temperature on forcing performance of Creole Easter lilies. Proc. Amer.Soc.Hort.Sci., 42 : 597.

Yadav, L.P., Bose, T.K., and Maiti, R.G., 1984. Effect of bulb size and depth of planting on growth and flowering of tuberose (Polianthes tuberosa L.). Progressive Hort., 16: 209-213.

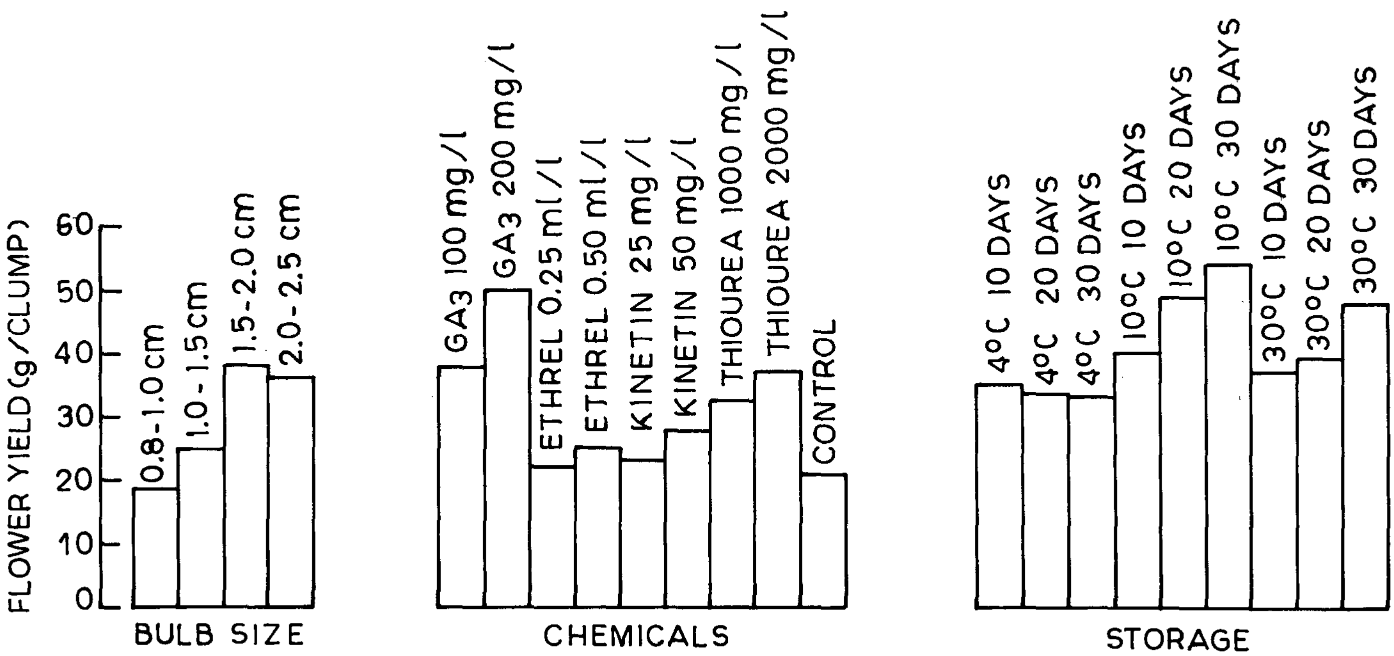

FIGURE 1 FLOWER YIELD AS INFLUENCED BY SIZE OF BULB, TREATMENT WITH CHEMICALS AND STORAGE OF BULB.

Table 1 - Influence of bulb size on sprouting of bulbs, vegetative growth and flowering in tuberose.

Bulb size (diameter in cm)	Days required for sprouting of bulbs	Plant height (leaf length in cm)	Number of leaves/ clump	Days required for flowering	Number of flower spikes/ clump	Length of flower spike (cm)	Flower yield (t/ha)
0.8-1.0	8.5	51.1	32.0	156.0	1.0	82.5	4.3
1.0-1.5	13.2	53.4	33.6	98.4	1.2	97.5	6.2
1.5-2.0	17.4	64.5	37.5	78.4	1.9	100.3	9.6
2.0-2.5	18.4	56.1	34.3	82.0	1.8	94.6	8.9
C.D. at 5%	0.40	0.60	1.36	1.63	0.33	1.31	1.05

Table 2 - Effect of chemicals on growth and flowering of tuberose.

Treatment	Days required for sprouting of bulbs	Plant height (leaf length in cm)	Number of leaves/ clump	Days required for flowering	Number of flower spikes/ clump	Length of flower spike (cm)	Flower yield (t/ha)
GA_3 100 mg/l	19.5	61.2	90.1	108.0	1.3	104.2	9.4
GA_3 200 mg/l	24.2	67.7	111.1	91.5	2.0	109.4	12.5
Ethrel 0.25 ml/l	9.9	60.2	82.5	148.5	1.0	80.9	5.5
Ethrel 0.50 ml/l	8.5	57.5	88.5	129.5	1.1	83.4	6.2
Kinetin 25 mg/l	10.8	55.2	64.1	139.2	1.2	101.2	8.2
Kinetin 50 mg/l	10.1	53.6	86.0	159.2	1.0	103.5	6.9
Thiourea 1000 mg/l	9.8	65.2	100.3	109.2	1.2	105.1	8.1
Thiourea 2000 mg/l	10.1	66.8	127.0	107.5	1.2	107.5	9.3
Control	16.4	50.3	51.5	187.7	1.0	85.2	5.2
C.D. at 5%	0.89	1.12	3.55	2.18	0.12	1.01	1.97

Table 3 - Influence of temperature treatment of bulbs on vegetative growth and flowering of tuberose.

Temperature and duration of storage	Days required for sprouting of bulbs	Plant height (leaf length in cm)	Number of leaves/ clump	Days required for flowering	Number of flower spikes/ clump	Length of flower spike (cm)	Flower yield (t/ha)
4°C, 10 days	25.7	61.7	35.2	121.5	1.0	84.2	4.9
4°C, 20 days	26.1	61.3	33.5	108.3	1.1	87.9	6.0
4°C, 30 days	31.1	60.1	33.4	98.1	1.1	88.3	8.1
10°C, 10 days	25.3	61.7	40.1	117.5	1.1	85.4	5.0
10°C, 20 days	22.0	65.1	49.0	106.0	1.3	86.0	8.0
10°C, 30 days	17.5	69.8	54.0	97.0	1.4	98.1	8.9
30°C, 10 days	16.5	55.4	37.1	182.3	0.9	81.3	4.7
30°C, 20 days	10.7	59.8	39.5	175.1	1.0	83.5	5.7
30°C, 30 days	10.1	65.2	47.5	170.8	1.1	83.5	5.7
C.D. at 5%	2.15	1.03	1.82	1.98	0.14	1.84	1.36