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Response of tuberose *(Polianthes tuberosa* L.*)* cv. Single to plant growth regulators

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ABSTRACT

Tuberose is an important, popular flower crop being cultivated on a large scale for its scented flowers in many parts of the world and in plains of India. The flowers remain fresh for long time and withstand long distance transportation and find the useful place in the flower market. The investigation to understand the influence of plant growth regulators on the performance of tuberose was undertaken in the Department of Horticulture, Annamalai University. The eleven treatments were analyzed in randomized block design. The results revealed that the growth and yield attributes were influenced by different growth regulators. The results revealed that the growth parameters viz., plant height, number of side shoots per plant, number of leaves per plant and leaf area, and the yield and quality parameters viz., number of spikes per plant, spike length, rachis length, number of florets per spike, flower length, flower diameter and flower yield per plant were favourably enhanced by foliar application of Gibberellic acid @ 150 ppm which was followed by application of GA_3 *@ 100 ppm.*

Key words: Tuberose, plant growth regulators

INTRODUCTION

Tuberose (*Polianthes tuberosa* L.) an ornamental bulbous plant, belongs to the family Amaryllidaceae, native of Mexico. Tuberose is commercially cultivated for cut and loose flowers. The flowers are used for wedding ceremonies, garland making, decoration, bouquets and also various traditional rituals. The flowers are good source of essential oils (Yadav *et al.,* 2005). The oil is used in the preparation of various high quality perfumes and cosmetics. The absolute of tuberose is expensive natural oil used in cosmetic industry. Tuberose blooms profusely throughout the year and is considered as a potential money-spinner with immense export prospects especially to gulf countries. It has also got emetic properties. Dried tuberose bulbs in the powdered form are used as a remedy for gonorrheoea. The bulbs contain alkaloid lycorine which causes vomiting.In India, the crop occupies 0.98 lakh hectares with an average production of 5.56 lakh tonnes per annum. In Tamil Nadu, tuberose is cultivated in an area of 1529 hectare, with an annual production of 15290 tonnes and productivity of 10.00 tonnes per hectare (Anon, 2014). There are four tuberose cultivars popularly grown in India viz., single, double, semi double and variegated. The cultivar single occupies the foremost position than the others. The waxy white flowering spikes of single flowered cultivars of tuberose with sweet lingering fragrance are in great demand. Since, the demand for cut and loose flowers of tuberose is rapidly increasing in recent years, the standardization of production technology of this crop on commercial basis need to be explored. Overwhelming importance of growth regulating chemicals in the field of floriculture is well recognized. Synthetic plant growth regulators are reported to co ordinate and control various phases of growth, flowering and bulb production in tuberose at optimum concentrations. It is generally accepted that exogenously applied growth regulators act through the alteration in the level of naturally occurring hormones, these modifying the growth and development of the plant. Several plant growth regulators have been widely used in many ornamental crops and their efficacy have been demonstrated for nursery production, ornamental foliage plant and several other flower crops (Sanap *et al.,* 2000). Hence the study was undertaken to assess the effect of plant growth regulators on tuberose.

MATERIALS AND METHODS

The investigation was undertaken in the Department of Horticulture, Annamalai University. The experiment was laid out in a randomized block design replicated thrice with eleven treatments which consisted of foliar spray with plant growth regulators such as GA_3, NAA, BA, CCC and MH along with control. The required quantity of growth regulators viz., GA_3, NAA, BA and MH available in powder forms were weighed and dissolved first in small quantity of ethyl alcohol and then transferred to volumetric flask containing distilled water. The required quantity of CCC taken in the form of liquid was transferred to volumetric flask containing distilled water and then required concentration was made up. The growth regulators were applied as foliar spray on 30, 60 and 90 days after planting. The observations for growth, yield and quality attributes of tuberose were taken 120 days after planting.

RESULTS AND DISCUSSION

The results revealed that the growth parameters *viz.,* plant height(48.01 cm), number of side shoots per plant (10.46), number of leaves per plant (41.73) and leaf area (38.88 cm^2), were favourably enhanced by foliar application of Gibberellic acid @ 150 ppm which was followed by application of GA_3 @ 100 ppm (Table 1).

Table1: Influence of plant growth regulators on growth characters of tuberose at 120 DAP

Treatments	Plant height (cm)	Number of side shoots per plant	Number of leaves per plant	Leaf area (cm^2)
T_1-Naphthalene acetic acid @ 250 ppm	45.02	8.66	34.36	34.50
T_2- Naphthalene acetic acid @ 500 ppm	46.66	8.93	36.40	36.97
T_3- Gibberellic acid @100 ppm	47.01	9.00	38.58	37.96
T_4- Gibberellic acid @150 ppm	48.01	10.46	41.73	38.88
T_5- Benzyl adenine @ 50 ppm	44.53	5.81	23.83	26.83
T_6- Benzyl adenine @ 100 ppm	43.06	6.84	29.73	29.60
T_7- Cycocel @ 1000 ppm	41.53	6.37	26.83	28.20
T_8- Cycocel @ 1500 ppm	40.06	7.33	30.66	30.01
T_9- Maleic hydrazide @ 1000 ppm	38.06	7.73	31.93	30.53
T_{10}- Maleic hydrazide @ 1500 ppm	37.01	8.04	33.75	32.83
T_{11}- Control (water spray)	42.16	5.53	22.07	26.01
S. Ed	0.23	0.13	0.45	0.25
CD (P=0.05)	0.45	0.25	0.90	0.50

Plant height increased in GA_3 treated plants, but decreased in Maleic hydrazide treated plants. GA_3 increased the plant height, number of leaves, number of side shoots and leaf area. This was due to increase in cell division and cell elongation by gibberellins (Singh and Srivastava, 2009). Arun *et al.* (2000) quoted that increased size of meristematic region as well as the proportion of cells undergoing division as the reason for enhanced growth. These results are in agreement with those results obtained by Padaganur *et al.*(2005) in tuberose. Plants treated with growth retardants exhibited reduced plant height. Growth retardants are known to reduce influence of auxin and, thus reduce cell division and cell elongation. Growth retardants interact with gibberellins or IAA oxidase or lower the level of diffusible auxin and thereby suppress vegetative growth (Ana *et al.,* 2005). The yield and quality parameters were also found to be influenced by foliar application of various plant growth regulators (Table 2). Among the various treatments, foliar application of GA_3 @ 150 ppm recorded the maximum values for number of spikes per plant (4.67), spike length (96.13 cm), rachis length (33.13 cm), number of florets per spike (55.00), flower length (6.83 cm), flower diameter (4.02 cm) and flower yield per plant (124.60 g) which was closely followed by application of GA_3 @ 100 ppm. The increase in reproductive attributes might be due to fact that GA_3 treated plants produced more number of leaves with maximum leaf area, which might have resulted in production and accumulation of more photosynthates. Thus, photosynthates produced were translocated towards the reproductive parts of plant for development of floral parts as reported by Singh and Desai (2013). Increased loose flower yield in plants treated with GA_3 @ 150 ppm was mainly due to increased number of florets per spike and increased fresh weight of florets.

Table 2: Influence of plant growth regulators on yield attributes of tuberose

Treatments	No. of spikes per plant	Spike length (cm)	Rachis length (cm)	No. of florets per spike	Flower length (cm)	Flower diameter (cm)	Flower yield per plant (g)
T_1	3.91	90.53	28.02	47.93	6.02	3.84	115.30
T_2	4.11	92.53	29.86	48.06	6.38	3.87	118.10
T_3	4.33	94.06	31.24	52.33	6.67	3.96	121.40
T_4	4.67	96.13	33.13	55.00	6.83	4.02	124.60
T_5	3.09	80.18	21.01	36.93	4.87	3.12	98.41
T_6	3.24	83.93	23.87	38.49	5.10	3.57	103.51
T_7	3.16	82.02	21.73	37.28	5.00	3.41	101.22
T_8	3.43	85.66	24.35	42.00	5.48	3.61	106.30
T_9	3.61	87.00	26.05	44.35	5.70	3.68	109.10
T_{10}	3.79	88.40	27.91	46.96	5.91	3.73	112.40
T_{11}	3.02	78.30	18.27	35.13	4.52	3.04	96.20
S. Ed	0.03	0.67	0.05	0.48	0.05	0.02	1.05
CD (P=0.05)	0.06	0.45	0.25	0.90	0.50	0.03	2.1

This in turn might be ascribed to the better partitioning of photosynthates to developing respective sinks under the direction of GA_3. Similar increase in yield with GA_3 treatment was reported in rose by Arun *et al.* (2000). The spike length was reduced under growth retardants when compared to GA_3 and NAA which might be due to inhibition of longitudinal cell expansion and division in the sub apical meristematic region. The results are in confirmatory with Kumar and Haripriya (2010) in nerium.

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