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EFFECT OF FOLIAR SPRAY OF GA_3 AND KNO_3 ON FLOWER QUALITY OF TUBEROSE

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ABSTRACT

A study was conducted to evaluate the effect of GA_3 on flower yield and quality of tuberose at horticulture Section, college of Agriculture, Nagpur, Dr. PDKV, Akola, India, in 2019-2020. Randomized Block Design was used consisting of fifteen treatments and three replications. Treatments were T_1 - GA_3 100 ppm, T_2 - GA_3 200 ppm, T_3 - GA_3 300 ppm, T_4 - KNO_3 1 %, T_5 - KNO_3 1.5 %, T_6 - KNO_3 2 %, T_7 - GA_3 100 ppm + KNO_3 1%, T_8 - GA_3 100 ppm + KNO_3 1.5 %, T_9 - GA_3 100 ppm + KNO_3 2%, T_{10} - GA_3 200 ppm + KNO_3 1%,T_{11} - GA_3 200 ppm + KNO_3 1.5%,T_{12} - GA_3 200 ppm + KNO_3 2%, T_{13} - GA_3 300 ppm + KNO_3 1%, T_{14} - GA_3 300 ppm + KNO_3 1.5%, T_{15} - GA_3 300 ppm + KNO_3 2%. The quality parameters in respect of length of spike, diameter of spike, length of floret, diameter of floret, length of rachis, diameter of bulb and vase life in tuberose, weight of bulbs plant^{-1} and weight of bulblets plant^{-1} were recorded maximum with the application of GA_3 200 ppm + KNO_3 1.5% spray.

(Key words: Foliar spray, GA_3, KNO_3, Spike, ppm, Tuberose)

INTRODUCTION

Tuberose (*Polianthes tuberosa* L.) belongs to family Amaryllidaceae is native of Mexico. In India, it is popularly known as Rajanigandha, Nishigandha, Sugandharaja, Gulchadi and Gul-e-Shahu. Tuberose is much adorned for its colour, elegance and fragrance. It is grown mainly for cut flowers, interior and table decoration, bouquet, garland, veni and gajra. Tuberose is of good source of essential oil, which are utilized in preparation of various cosmetics and perfumes.

The cultivation of tuberose on commercial basis is being taken up around big cities in India. With the improvement in the standard of living of the people, the demand for flowers is increasing by leaps and bounds. To meet this demand it is being cultivated on large scale in different states of country. It is a cut flower, loose flower and for its aromatic value.

One of the most important growth substances is GA_3 which influence the growth and promote flowering in many flowering crops. The role of GA_3 stimulate vegetative growth by cell multiplication and cell elongation in ornamental bulbous plants has received considerable attention in recent years. Gibberellins function as controllers of growth in plants. They work to start the germination of seeds, shoot growth and maturation of leaves, and affect flowering with seed germination.

Similarly, KNO_3 contains the essential plants elements like nitrogen and potassium and is ideal for hydroponics, fertigation and foliar application. KNO_3 regulate physiological processes in plants. KNO_3 contains readily available nitrate nitrogen and readily available potassium as well as it is safe. KNO_3 combats salinity, efficient for plant nutrition, for stronger and healthier plants, improves water use efficiency and save water, increases the spike yield in tuberose.

MATERIALS AND METHODS

The present experiment was carried out at farm of Horticulture Section, College of Agriculture, Nagpur during 2019 - 2020. Nagpur city comes under Vidarbha region of Maharashtra state.An experiment was conducted in Randomized Block Design with 3 replications and 6 treatments of foliar application of GA_3 and KNO_3 with different concentrations and alone viz., T_1 - GA_3 100 ppm, T_2 - GA_3 200 ppm, T_3 - GA_3 300 ppm, T_4 - KNO_3 1 %, T_5 - KNO_3 1.5 %, T_6 - KNO_3 2 %, T_7 - GA_3 100 ppm + KNO_3 1%, T_8 - GA_3 100 ppm + KNO_3 1.5 %, T_9 - GA_3 100 ppm + KNO_3 2%, T_{10} - GA_3 200 ppm + KNO_3 1%,T_{11} - GA_3 200 ppm + KNO_3 1.5%,T_{12} - GA_3 200 ppm + KNO_3 2%, T_{13} - GA_3 300 ppm + KNO_3 1%, T_{14} - GA_3 300 ppm + KNO_3 1.5%, T_{15} - GA_3 300 ppm + KNO_3 2%. FYM was applied 20 tonnes ha^{-1} was mixed at the time of last harrowing in the field prior to application of chemical fertilizers. As per the recomm-

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endation of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola recommended fertilizer dose of fertilizer (NPK) 200:300:200 kg $ha^{-1}$was applied. The plot size was 1.8 m x 1.2 m with plant to plant spacing 30 cm x 30 cm. Observations were recorded on flower quality of tuberose (length of spike, diameter of spike, length of floret, diameter of floret, diameter of floret, length of rachis, diameter of bulbs, weight of bulb $plant^{-1}$, weight of bulblets $plant^{-1}$ and vase life. The data were statistically analayzed as per the method suggested by Panse and Sukhatme (1967) for randomized block design.

RESULTS AND DISCUSSION

1) Quality parameter

The data regarding the effect of foliar application of GA_3 and KNO_3 on flower quality of tuberose are presented in Table 1 and Table 2. The data regarding longest length of spike (112.85 cm) was observed in the treatment T_{11} i.e. GA_3 200 ppm + KNO_3 1.5% which was significantly superior over all the treatments but found at par with treatments T_{13} i.e. GA_3 300 ppm + KNO_3 1% (110.76 cm), T_{10} i.e. GA_3 200 ppm + KNO_3 1% (108.90 cm), T_2 i.e. GA_3 200 ppm (106.19 cm), T_8 i.e GA_3 100 ppm + KNO_3 1.5% (105.39 cm), T_7 i.e. GA_3 100 ppm + KNO_3 1% (103.33 cm). However, the shortest length of spike was observed in the treatment T_4 i.e. KNO_3 1% (89.85 cm).

Maximum diameter of spike (0.98 cm) was observed in the treatment T_{11} i.e. GA_3 200 ppm + KNO_3 1.5% which was significantly superior over T_{13} i.e. GA_3 300 ppm + KNO_3 1% (0.97 cm), T_{10} i.e. GA_3 200 ppm + KNO_3 1% (0.96 cm), T_2 i.e. GA_3 200 ppm (0.95 cm), T_8 i.e GA_3 100 ppm + KNO_3 1.5% (0.92 cm), T_7 i.e. GA_3 100 ppm + KNO_3 1% (0.90 cm) and T_{12} i.e. GA_3 200 ppm + KNO_3 2% (0.88 cm). However, the shortest diameter of spike was observed in the treatment T_4 i.e. KNO_3 1% (0.71 cm).

Maximum length of florets (6.87 cm) was observed in the treatment T_{11} i.e. GA_3 200 ppm + KNO_3 1.5% which was significantly at par with the treatmentsT_{13} i.e. GA_3 300 ppm + KNO_3 1% (6.55 cm) and T_{10} i.e. GA_3 200 ppm + KNO_3 1% (6.53 cm). However, the shortest length of florets was observed in the treatment T_4 i.e. KNO_3 1% (5.03 cm).

Longest diameter of florets (3.93 cm) was observed in the treatment T_{11} i.e. GA_3 200 ppm + KNO_3 1.5% which was significantly superior over T_{13} i.e. GA_3 300 ppm + KNO_3 1% (3.88 cm), T_{10} i.e. GA_3 200 ppm + KNO_3 1% (3.86 cm), T_2 i.e. GA_3 200 ppm (3.85 cm), T_8 i.e GA_3 100 ppm + KNO_3 1.5% (3.79 cm), T_7 i.e. GA_3 100 ppm + KNO_3 1% (3.75 cm) and T_{12} i.e. GA_3 200 ppm + KNO_3 2% (3.70 cm).However, the shortest diameter of florets was observed in the treatment T_4 i.e. KNO_3 1% (2.98 cm).

Maximum length of rachis (35.60 cm) was observed in the treatment T_{11} i.e. GA_3 200 ppm + KNO_3 1.5% which was significantly at par with the traetment T_{13} i.e. GA_3 300 ppm + KNO_3 1% (34.33 cm), T_{10} i.e. GA_3 200 ppm + KNO_3 1% (34.20 cm), T_2 i.e. GA_3 200 ppm (33.40 cm), T_8 i.e GA_3 100 ppm + KNO_3 1.5% (32.87 cm) and T_7 i.e. GA_3 100 ppm + KNO_3 1% (32.60 cm). However, the shortest length of rachis was observed in the treatment T_4 i.e. KNO_3 1% (27.70 cm).

Significantly longest diameter of bulb (4.59 cm) was observed in the treatment T_{11} i.e. GA_3 200 ppm + KNO_3 1.5% which was at par with the treatments T_{13} i.e. GA_3 300 ppm + KNO_3 1% (4.88 cm), T_{10} i.e. GA_3 200 ppm + KNO_3 1% (4.84 cm), T_2 i.e. GA_3 200 ppm (4.75 cm), T_8 i.e GA_3 100 ppm + KNO_3 1.5% (4.62 cm), T_7 i.e. GA_3 100 ppm + KNO_3 1% (4.59 cm). However, the shortest diameter of bulb was observed in the treatment T_4 i.e. KNO_3 1% (2.72 cm).

Table 1. Effect of foliar spray of GA_3 and KNO_3 on flower quality of tuberose

Tr. No.	Treatments	Days to initiation of spike	Length of spike (cm)	Diameter of spike (cm)	Length of floret (cm)	Diameter of floret (cm)
T_1	GA_3 100 ppm	104.67	100.12	0.84	5.93	3.65
T_2	GA_3 200 ppm	99.00	106.19	0.95	6.23	3.85
T_3	GA_3 300 ppm	105.67	94.07	0.77	5.60	3.56
T_4	KNO_3 1%	106.67	89.85	0.71	5.03	2.98
T_5	KNO_3 1.5 %	106.00	93.42	0.75	5.33	3.53
T_6	KNO_3 2 %	106.00	91.73	0.73	5.10	3.10
T_7	GA_3 100ppm + KNO_3 1%	101.00	103.33	0.90	6.03	3.75
T_8	GA_3 100ppm + KNO_3 1.5%	100.67	105.39	0.92	6.10	3.79
T_9	GA_3 100ppm + KNO_3 2%	103.00	100.39	0.85	5.94	3.68
T_{10}	GA_3 200ppm + KNO_3 1%	98.67	108.90	0.96	6.53	3.86
T_{11}	GA_3 200ppm + KNO_3 1.5%	97.33	112.85	0.98	6.87	3.93
T_{12}	GA_3 200ppm + KNO_3 2%	102.33	101.63	0.88	6.00	3.70
T_{13}	GA_3 300ppm + KNO_3 1%	98.33	110.76	0.97	6.55	3.88
T_{14}	GA_3 300ppm + KNO_3 1.5%	104.67	99.14	0.81	5.86	3.63
T_{15}	GA_3 300ppm + KNO_3 2%	105.67	95.73	0.78	5.83	3.60
	SE (m)±	1.91	3.46	0.05	0.21	0.16
	CD at 5 %	5.52	10.02	0.16	0.60	0.46

The treatment T_{11} i.e. GA_3 200 ppm + KNO_3 1.5% (197.33 g) had produced significantly maximum weight of bulbs plant^{-1} and which was significantly superior over all the treatments followed by T_{13} i.e. GA_3 300 ppm + KNO_3 1% (194.67 g) andT_{10} i.e. GA_3 200 ppm + KNO_3 1% (168.67 g). However, the minimum weight of bulbs plant^{-1} (g) was observed in the treatment T_4 i.e. KNO_3 1% (70.67 g). The treatment T_{11} i.e. GA_3 200 ppm + KNO_3 1.5% (13.91 g) had produced significantly maximum weight of bulblets plant^{-1} and it was found statistically at par with the treatmentsT_{13} i.e. GA_3 300 ppm + KNO_3 1% (13.50 g), T_{10} i.e. GA_3 200 ppm + KNO_3 1% (13.22 g), T_2 i.e. GA_3 200 ppm (13.00 g), T_8 i.e GA_3 100 ppm + KNO_3 1.5% (12.97 g), T_7 i.e. GA_3 100 ppm + KNO_3 1% (12.33 g) and T_{12} i.e. GA_3 200 ppm +$KNO_3$2%(11.79 g). However, the minimum weight of bulblets plant^{-1} (g) was observed in the treatment T_4 i.e. KNO_3 1% (9.78 g).

It is observed that, length of florets, diameter of florets, length of spike in tuberose increased with the increasing concentration of GA_3 and KNO_3. This might be due to the fact that, GA_3 help in rapid elongation increased cell division and cell enlargements. The results revealed that, GA_3 increased quality parameters due to cell multiplication and cell elongation characters. Also, additional KNO_3 provided significant enhancement in all quality parameters.

Table 2.Effect of foliar spray of GA_3 and KNO_3 on flower quality of tuberose

Tr. No.	Treatments	Length of rachis (cm)	Diameter of bulb (cm)	weight of bulb plant^{-1} (g)	Weight of bulbets plant^{-1} (g)	Vase llife (Days)
T_1	GA_3 100 ppm	104.67	3.76	98.33	11.42	10.67
T_2	GA_3 200 ppm	99.00	4.75	164.00	13.00	12.07
T_3	GA_3 300 ppm	105.67	3.17	80.67	10.60	10.05
T_4	KNO_3 1%	106.67	2.72	70.67	9.78	9.02
T_5	KNO_3 1.5 %	106.00	2.93	71.33	10.49	9.43
T_6	KNO_3 2 %	106.00	2.91	71.00	9.98	9.33
T_7	GA_3 100ppm + KNO_3 1%	101.00	4.59	134.33	12.33	11.67
T_8	GA_3 100ppm + KNO_3 1.5%	100.67	4.62	137.33	12.97	12.00
T_9	GA_3 100ppm + KNO_3 2%	103.00	3.95	124.33	11.69	11.00
T_{10}	GA_3 200ppm + KNO_3 1%	98.67	4.84	168.67	13.22	12.11
T_{11}	GA_3 200ppm + KNO_3 1.5%	97.33	4.96	197.33	13.91	12.67
T_{12}	GA_3 200ppm + KNO_3 2%	102.33	4.00	126.33	11.79	11.33
T_{13}	GA_3 300ppm + KNO_3 1%	98.33	4.88	194.67	13.50	12.63
T_{14}	GA_3 300ppm + KNO_3 1.5%	104.67	3.71	94.33	11.18	10.33
T_{15}	GA_3 300ppm + KNO_3 2%	105.67	3.27	88.33	10.74	10.07
	SE (m)±	1.91	0.21	0.64	0.44	0.72
	CD at 5%	5.52	0.61	1.85	1.26	2.08

Karaguzel *et al.* (1999) stated that, both GA_3 at 100 ppm and KNO_3 25 g m^{-2} application shortened the time from planting to harvest and increased flowering percentage, the length of flower stem and spike, the number of flowers spike^{-1} and diameter of flower stems in gladiolus.Mahajan *et al*. (2012) observed that, number of floret spike^{-1} (38.00), length of spike (112.86 cm), length of rachis (34.46), diameter of spike (0.946 cm), length of fully open floret (6.71) and diameter of floret (3.92) were found maximum by the application of GA_3 200 ppm and KNO_3 1.5%.

Devendanam *et al.* (2007) observed that single application of GA_3 @ 150 ppm in tuberose shortened the vase life of flower and increased weight of bulbs and bulblets plant^{-1}. Kumar and Kumar (2011) reported that spraying of GA_3 300 ppm gave maximum spike length, rachis length, flowering duration and vase life of tuberose. cv. Hydrabad double. Padmalata revealed that number of corms plant^{-1}, corn weight (18.15 kg) cormlet weight (0.40 g) were maximum with 24 hrs pre soaking treatment of KNO_3 1.57 in gladiolus.

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