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## Response of plant growth substances on vegetative growth and fruiting of tomato (*Lycopersicon esculantum* Mill.) plant under Tarai region

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### Abstract

This investigation was undertaken at college campus orchard, B.R. D. Post Graduate College, Deoria, UP-274001 to study entitled "Response of plant growth substances on vegetative growth and fruiting of tomato (*Lycopersicon esculantum* Mill.) under Tarai region" during Rabi season-2022 to investigate the response of plant growth substances on plant height, number of branches plant<sup>-1</sup>, days to flowering, length of fruit, diameter of fruit, number of fruit plant<sup>-1</sup> and yield plant<sup>-1</sup>. The experiment was laid out in Randomized Block Design (RBD) with nine treatment and each replicated thrice. Ten treatments of plant growth substances are water spray-T<sub>1</sub>, 15 ppm GA<sub>3</sub> (T<sub>2</sub>), 25 ppm GA<sub>3</sub> (T<sub>3</sub>), 35 ppm GA<sub>3</sub> (T<sub>4</sub>), 15 ppm NAA (T<sub>5</sub>), 25 ppm NAA (T<sub>6</sub>), 35 ppm NAA (T<sub>7</sub>), 3 ppm 2,4-D (T<sub>8</sub>), 4 ppm 2,4-D (T<sub>9</sub>) and 5 ppm (T<sub>10</sub>). Spraying of GA<sub>3</sub> @ 35 ppm (T<sub>4</sub>) recorded the maximum plant height (105.30 cm), maximum number of leaves plant<sup>-1</sup> (65.22), number of branches plant<sup>-1</sup> (11.50), earliest flowering (42.08 days), length of fruit (6.00 cm), diameter of fruit (5.10 cm), number of fruit plant<sup>-1</sup> (31.40) and yield plant<sup>-1</sup> (3.67 kg plant<sup>-1</sup>). Therefore, considering vegetative growth and fruiting parameters, GA<sub>3</sub> @35 ppm (T<sub>4</sub>) was found best compared to other treatment during experiment.

**Keywords:** Tomato, plant growth regulators, growth, yield

### Introduction

Tomato is a very popular vegetable among people of India and abroad. In India, its price is fluctuate season to season. They are grown in temperate, subtropical and tropical region. Uttar Pradesh, Maharashtra, Haryana and Punjab etc. are leading state in India. Tomato is a rich source of vitamins, minerals and other organic acid. Tomatoes are used directly as a sandwich and salad making. Other processed products are paste, puree, syrup, juice, ketchup, drinks etc. Tomato is a good appetizer and its syrup is good remedy for patients suffering from costiveness (Kalloo, 2005) [1].

China is the leading producer of tomato among country followed by India. Other leading countries are Egypt, Russia, USA etc. (Singh *et al.*, 2011) [10]. The leaves, stems and fruits of tomato contain a steroidal glucoalkaloid "tomatine" which is responsible for the bitter taste in it (Roddick and Butcher, 1972) [8].

Botanical name of tomato is *Lycopersicon esculantum* Mill. and belong to Solanaceae family. Origin place of tomato is Peruvian and Mexican region. It was reported. The growth, flowering, fruiting and yield of tomato crop are affected by many ways. Increasing the growth and development of plant are an important role of plant growth substances. Among these are very effective to increase the fruit set, fruit size, growth as well as yield and quality under low and high temperature environment (Singh and Lal, 2002) [11]. The positive response of growth substances has elaborated by Phookan *et al.*, 1991 [5]; Singh and Singh, 1996) [12]. Similar views were given by Mishra and Panda (2017) [3]. Keeping this in view, the present investigation was carried out to test the performances of various plant growth substances on vegetative growth and fruiting of tomato plant under tarai region.

### Materials and Methods

This experiment was conducted at college campus orchard, B.R. D. Post Graduate College, Deoria, UP-274001 during Rabi season -2022 to observe the plant growth substances on vegetative growth and fruiting of tomato plant. The experiment site is situated in Tarai region of Uttar Pradesh. The soil type of investigation field was sandy loam in texture with pH 7.1, medium organic carbon (0.53%), phosphorus (16 kg/ha), potassium (163 kg/ha).

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The climate of this region is Tarai sub tropical. The trial was laid out in Randomized Block Design (RBD) with three replication. In the study there were ten treatments *viz.* water spray-T<sub>1</sub>, 15 ppm GA<sub>3</sub> (T<sub>2</sub>), 25 ppm GA<sub>3</sub> (T<sub>3</sub>), 35 ppm GA<sub>3</sub> (T<sub>4</sub>), 15 ppm NAA (T<sub>5</sub>), 25 ppm NAA (T<sub>6</sub>), 35 ppm NAA (T<sub>7</sub>), 3 ppm 2,4-D (T<sub>8</sub>), 4 ppm 2,4-D (T<sub>9</sub>) and 5 ppm 2,4-D (T<sub>10</sub>). Tomato seedlings of about four week were transplanted. The name of variety is Agasta. This variety was purchase from Somani Kanak Seeds PVT. Agasta is a semi-determinate variety. The fertilizer source is Urea, SSP and MOP to ful fill the requirement of N, P and K, respectively. The data recorded during experiment were plant height(cm), number of leaves plant<sup>-1</sup>, number of branches plant<sup>-1</sup>, days to 50% flowering, length of fruit (cm), diameter of fruit (cm), number of fruit plant<sup>-1</sup> and fruit yield (kg plant<sup>-1</sup>). The data of experiment were processed statically (Panse and Sukhatme, 1967)<sup>[4]</sup>.

## Results and Discussion

Field experiment was carried out at college campus orchard during Rabi season 2022. Table-1 shows that vegetative growth and fruiting parameters were significantly affected by various plant growth substances. Maximum plant height (105.30 cm) was recorded under T<sub>4</sub> (GA<sub>3</sub> @35 ppm) followed by T<sub>3</sub> (GA<sub>3</sub> @25 ppm) than T<sub>1</sub> (water spray). These findings

are in accordance with Prasad *et al.*, 2013 and Kumar *et al.*, 2014<sup>[6, 2]</sup>.

Number of leaves and primary branches plant-1 under each treatment was influenced by spraying of plant growth substances during investigation. Maximum number of leaves and number of primary branches plant-1 was recorded under T<sub>4</sub> i.e. 105.31 and 65.22., respectively.

Number of days required for flowering under each treatment was influenced by plant growth substances during study (Table-1). Days to flowering under different treatments was counted from transplanted tomato seedlings. The data regarding days to flowering (42.30 days) was recorded under T<sub>4</sub> (GA<sub>3</sub> -35ppm) followed by T<sub>3</sub> (GA<sub>3</sub> -25 ppm).

The length and diameter of the fruit was influenced by use of plant growth substances. Maximum length and diameter of fruit was highest under T<sub>4</sub> (GA<sub>3</sub>-35 ppm) and lowest under the control (T<sub>1</sub>). Similar results were also observed for number of fruit per plant. Above results also confirm the findings of several earlier workers (Saha, P. 2009, Prasad *et al.*, 2013, Ram *et al.*, 2014 and Kumar *et al.*, 2014)<sup>[9, 6, 7, 2]</sup>.

The maximum yield plant<sup>-1</sup> was recorded under T<sub>4</sub> (GA<sub>3</sub> 35 ppm). It was statistically similar to T<sub>3</sub> (GA<sub>3</sub>-25 ppm). Similar research trend was also reported by Saha, P. 2009<sup>[9]</sup>, Prasad *et al.*, 2013<sup>[6]</sup>, Ram *et al.*, 2014<sup>[7]</sup> and Kumar *et al.*, 2014<sup>[2]</sup>.

**Table 1:** Growth, flowering, fruiting and yield of tomato plant influenced by plant growth regulators

Treatment Combinations	Plant Height (cm)	No. of leaves plant-1	No. of branch plant-1	Days to flowering	Fruit (Length cm)	Fruit (Diameter cm)	Number of fruit plant-1	Yield (kg plant-1)
T <sub>1</sub> -Control	90.40	56.10	9.40	60.07	4.30	4.16	22.80	1.30
T <sub>2</sub> -GA <sub>3</sub> -15 ppm	95.40	57.30	9.90	44.22	4.70	4.20	23.07	1.78
T <sub>3</sub> -GA <sub>3</sub> 25 ppm	97.56	58.40	10.20	43.40	4.80	4.28	24.14	3.20
T <sub>4</sub> -GA <sub>3</sub> -35 ppm	105.30	65.22	11.50	42.08	6.00	5.10	31.40	3.67
T <sub>5</sub> -NAA-15 ppm	91.40	61.03	11.00	44.05	5.80	4.80	24.70	2.70
T <sub>6</sub> -NAA-25 ppm	92.22	62.50	10.80	43.10	5.65	4.60	28.12	2.40
T <sub>7</sub> -NAA-35 ppm	94.60	63.50	10.60	58.20	5.40	4.70	29.32	2.90
T <sub>8</sub> -2,4-D- 3 ppm	91.78	59.60	10.20	57.01	4.80	4.47	25.00	2.00
T <sub>9</sub> -2,4-D-4 ppm	93.04	60.80	11.02	58.50	4.95	4.97	24.70	2.45
T <sub>10</sub> -2,4-D-5 ppm	96.10	62.30	10.70	45.30	5.10	4.65	23.00	2.08
CD at 5%	1.45	0.79	0.75	4.88	0.35	0.31	1.66	0.57

## Conclusion

Vegetative growth (plant height, number of leaves and number of branches plant<sup>-1</sup>), days to flowering, fruiting (fruit length, fruit diameter and yield plant<sup>-1</sup>) were boosted under the application of GA<sub>3</sub> (35ppm). Based on the above results treatment T<sub>4</sub> (GA<sub>3</sub> @35 ppm) can be recommended for cultivation of tomatoes in Tarai region of Uttar Pradesh.

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