



Effect of micronutrients and PGRs on growth and yield of Tomato (*Solanum lycopersicum* L.) cv. Azad-T6

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ARTICLE INFO	ABSTRACT
<p>Original Research Article Received on May 13, 2024 Revised on May 21, 2024 Accepted on June 23, 2024 Published on June 25, 2024</p> <p>Article Author Vipin Kumar, Hari Baksh</p> <p>Corresponding Author Email vipinkup63@gmail.com</p>	<p>The present investigation entitled “Effect of micronutrients and PGRs on growth and yield of tomato (<i>Solanum lycopersicum</i> L.) cv. Azad-T6” was carried out during autumn season of 2022 at Experimental Unit, Department of Horticulture, Tilak Dhari Post Graduate College, Jaunpur (U.P.) India. Experiment was planned with eleven treatments, three replications and was laid out in randomized block design. The treatments were T₁ (control), T₂ (GA₃ 50ppm), T₃ (GA₃ 100 ppm), T₄ (NAA 50 ppm), T₅ (NAA 100 ppm), T₆ (ZnSO₄ 0.5%), T₇ (ZnSO₄ 1%), T₈ (Boric acid 50 ppm), T₉ (Boric acid 100 ppm), T₁₀ (FeSO₄ 100 ppm) and T₁₁ (FeSO₄ 150 ppm). The tomato crop's vegetative growth, flowering, and yield were found greatly enhanced by the application of micronutrients (ZnSO₄, Boric acid, FeSO₄) and plant growth regulators (GA₃, NAA) at two distinct concentrations. Better quality and productivity resulted from these treatments improved the plant's overall performance. The most successful treatment for improving vegetative development, blooming, and yield metrics was T₃ GA₃ (100 ppm).</p>
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One of the most extensively planted vegetables in India is the tomato (*Solanum lycopersicum* L.), which has gained popularity among the general public over the past 60 years. It is cultivated for both fresh consumption and processing in market gardens and small home gardens. It can be eaten raw, cooked, or processed into sauces, ketchups, purees, and other products. India is currently the second-largest tomato producer in the world. The Indian states of Uttar Pradesh, Karnataka, Maharashtra, Haryana, Punjab, and Bihar are the main producers of tomatoes. In addition to promoting digestion, gastric secretion, and blood purification, tomatoes are helpful in the treatment of intestinal infections, mouth sores, and cancer.

In order to produce at their best, tomatoes need a lot of nutrients, including nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), sodium (Na), and sulfur (S). The proper timing and quantity of these nutrients must be provided. However, overuse of inorganic fertilizers has resulted in declining soil health, decreased food quality, and decreased nutrient uptake (Biswas *et al.*, 2015). Trace elements, sometimes referred to as minor elements, are necessary for plants' regular life processes and are required in trace amounts. Boron (B) enhances fruit quality and set and is essential for the growth and development of new cells in the plant meristem.

IAA (Indole-3-Acetic Acid), which increases flower quantity and fruit set, is formed by zinc (Zn) and is engaged in a variety of enzymatic activities (Chatterjee *et al.*, 2013, Gulati *et al.*, 2013 and Kumar *et al.*, 2011).

Materials and Methods

From July to December 2022, the Experimental Unit, Department of Horticulture, Tilak Dhari Post Graduate College, Jaunpur (U.P.) India, conducted the current study, "Effect of micronutrients and PGRs on growth and yield of tomato (*Solanum lycopersicum* L.) cv. Azad-T6". The study concentrated on particular edaphic (soil-related) and meteorological variables. It discussed the materials employed, experimental methods, and treatment evaluation standards. Eleven treatments, three replications and Randomized Block Design were used to assess the effect of micronutrients and PGRs on tomato var. Azad-T6. Measurements were made of the plant's height (cm), number of branches, number of flowers, number of clusters, number of fruits, average fruit weight (g), and yield (kg/plant). Statistical techniques and procedures were used to analyze the experiment's results.

Results and Discussion

Plant Height (cm)

In the experiment, plant height was significantly affected by different combination of micronutrients and PGRs. Treatment T₂ (GA₃ 100 ppm) had the highest plant height (50.79 cm, 80.11 cm, and 119.43 cm) at 30, 60, and 90 DAT, respectively which were closely followed by treatment T₁ (GA₃ 50 ppm) with 49.6 cm, 78.17 cm, and 117.45 cm plant height at 30, 60, and 90 DAT, respectively. However, (T₀) control had the smallest plant height (37.08 cm).

Number of Branches per Plant

During investigation, treatment T₂ (GA₃ 100 ppm) had the highest number of branches per plant (4.91, 7.74, and 13.76) at 30, 60, and 90 DAS respectively, followed by plants in treatment T₁ (GA₃ 50 ppm) conversely, control (T₀) had the smallest number of branches per plant (3.32, 4.17, and 8.70) at 30, 60, and 90 DAS respectively.

Number of Flowers per Cluster

The data revealed that number of flowers cluster⁻¹ significantly affected by different treatments. Treatment T₂ (GA₃ 100 ppm) had the maximum (7.91) number of flowers cluster⁻¹, followed by 7.52 flowers in plants treated with T₁ (GA₃ 50 ppm). On the other hand, control (T₀) had the fewest flowers per cluster (5.32).

The Number of Clusters per Plant

The results of varying micronutrient and plant growth regulator levels in different treatment combinations are displayed in Table 3. Significant findings were obtained from the statistical analysis of the data on the number of tomato cluster plants⁻¹. Treatment T₂ (GA₃ 100 ppm) had the maximum number of cluster plants⁻¹ (6.56), followed by treatment T₁ (GA₃ 50 ppm). On the other hand, control (T₀) had the lowest number of cluster plants⁻¹ (4.32).

Number of Fruits per Cluster

The results of varying micronutrient and plant growth regulator levels in different treatment combinations are displayed in Table 4. Significant findings were obtained from the statistical analysis of the data on the number of fruits per cluster. Treatment T₂ (GA₃ 100 ppm) produced the maximum fruit per cluster (6.90), followed by treatment T₁ (GA₃ 50 ppm). On the other hand, control (T₀) had the fewest fruits per cluster (4.16).

Number of Fruits per Plant

The results of varying micronutrient and plant growth regulator levels in different treatment combinations are displayed in Table 4. Significant findings were obtained from the statistical analysis of the data on the number of tomato fruit plants⁻¹. The highest number of fruit plants⁻¹ (33.84) was recorded in treatment T₂ (GA₃ 100 ppm) followed by T₁ (GA₃ 50 ppm) In contrast, control (T₀) had the lowest number of fruit plants⁻¹ (11.49) ever recorded.

Number of Fruits per Cluster

The results of varying micronutrient and plant growth regulator levels in different treatment combinations are displayed in table 4.

Table 1. Effect of micronutrients and PGRs on plant height (cm) in tomato at different interval

Notations	Treatment Combinations	30 DAS	60 DAS	90 DAS
T ₀	Control	37.08	59.87	96.87
T ₁	GA ₃ 50ppm	49.6	78.17	117.45
T ₂	GA ₃ 100ppm	50.79	80.11	119.43
T ₃	NAA 50ppm	48.13	76.17	114.78
T ₄	NAA 100ppm	47.87	77.13	115.85
T ₅	ZnSO ₄ 0.5%	41.16	72.01	107.12
T ₆	ZnSO ₄ 1%	42.21	67.15	111.18
T ₇	Boric acid 50ppm	41.77	75.47	113.21
T ₈	Boric acid 100ppm	42.55	72.45	108.54
T ₉	FeSO ₄ 100ppm	44.23	72.5	109.53
T ₁₀	FeSO ₄ 150ppm	46.44	71.81	110.54
	C.D. at 0.5%	2.103	2.92	4.91
	S.Em.	0.70	0.98	1.65
	S.Ed.	1.00	1.39	2.34

Table 2. Effect of micronutrients and PGRs on number of branches plant⁻¹ in tomato at different interval

Notations	Treatment Combinations	30 DAS	60 DAS	90 DAS
T ₀	Control	3.32	4.17	8.70
T ₁	GA ₃ 50ppm	4.74	7.53	13.50
T ₂	GA ₃ 100ppm	4.91	7.74	13.76
T ₃	NAA 50ppm	4.49	6.80	12.31
T ₄	NAA 100ppm	4.63	6.77	12.85
T ₅	ZnSO ₄ 0.5%	4.32	5.72	10.54
T ₆	ZnSO ₄ 1%	4.22	6.14	11.59
T ₇	Boric acid 50ppm	4.16	6.31	10.57
T ₈	Boric acid 100ppm	4.3	6.30	10.26
T ₉	FeSO ₄ 100ppm	4.19	6.12	11.65
T ₁₀	FeSO ₄ 150ppm	4.19	5.72	11.53
	C.D. at 0.5 %	0.27	0.30	0.63
	S. Em	0.09	0.10	0.21
	S. Ed.	0.12	0.14	0.30

Table 3. Effect of micronutrients & PGRs on number of flowers per cluster & number of clusters per plant in tomato

Notations	Treatment Combinations	Number of Flowers per Cluster	Number of Clusters per Plant
T ₀	Control	5.32	4.32
T ₁	GA ₃ 50ppm	7.52	5.43
T ₂	GA ₃ 100ppm	7.91	6.56
T ₃	NAA 50ppm	6.65	5.79
T ₄	NAA 100ppm	6.83	5.02
T ₅	ZnSO ₄ 0.5%	6.14	5.1
T ₆	ZnSO ₄ 1%	6.33	5.46
T ₇	Boric acid 50ppm	6.36	5.4
T ₈	Boric acid 100ppm	6.46	5.22
T ₉	FeSO ₄ 100ppm	6.33	5.22
T ₁₀	FeSO ₄ 150ppm	6.35	5.29
	C.D. at 0.5	0.31	0.25
	S. Em	0.10	0.08
	S. Ed.	0.15	0.12

Table 4. Effect of micronutrients and PGRs on number of fruits per cluster and number of fruits per plant of tomato

Notations	Treatment Combinations	Number of Fruits per Cluster	Number of Fruits per Plant
T ₀	Control	4.16	11.49
T ₁	GA ₃ 50 ppm	6.34	24.65
T ₂	GA ₃ 100 ppm	6.9	33.84
T ₃	NAA 50 ppm	5.4	22.12
T ₄	NAA 100 ppm	5.9	20.69
T ₅	ZnSO ₄ 0.5%	5.52	19.51
T ₆	ZnSO ₄ 1%	5.36	20.43
T ₇	Boric acid 50 ppm	5.34	20.12
T ₈	Boric acid 100 ppm	5.26	19.01
T ₉	FeSO ₄ 100 ppm	5.3	19.15
T ₁₀	FeSO ₄ 150 ppm	5.12	18.7
	C.D. at 0.5	0.20	0.68
	S. Em	0.06	0.23
	S. Ed.	0.09	0.32

Table 5. Effect of micronutrients and PGRs on average fruit weight (g) and Fruit yield plant (kg) in tomato

Notations	Treatment Combinations	Average Fruit Weight (g)	Fruit Yield per Plant (kg)
T ₀	Control	36.45	0.418
T ₁	GA ₃ 50ppm	59.51	1.466
T ₂	GA ₃ 100ppm	63.41	2.145
T ₃	NAA 50ppm	58.3	1.289
T ₄	NAA 100ppm	60.71	1.256
T ₅	ZnSO ₄ 0.5%	50.52	0.985
T ₆	ZnSO ₄ 1%	49.83	1.018
T ₇	Boric acid 50ppm	44.01	0.885
T ₈	Boric acid 100ppm	48.57	0.923
T ₉	FeSO ₄ 100ppm	43.22	0.827
T ₁₀	FeSO ₄ 150ppm	52.44	0.980
	C.D. at 0.5	2.48	0.04
	S. Em	0.83	0.01
	S. Ed.	1.18	0.02

Significant findings were obtained from the statistical analysis of the data on the number of fruits per cluster. Treatment T₂ (GA₃ 100 ppm) produced the maximum fruit per cluster (6.90), followed by treatment T₁ (GA₃ 50 ppm). On the other hand, control (T₀) had the fewest fruits per cluster (4.16).

Number of Fruits per Plant

The results of varying micronutrient and plant growth regulator levels in different treatment combinations are displayed in table 4.

Significant findings were obtained from the statistical analysis of the data on the number of tomato fruit plants⁻¹. The highest number of fruit plants⁻¹ (33.84) was recorded in treatment T₂ (GA₃ 100 ppm) followed by T₁ (GA₃ 50 ppm) In contrast, control (T₀) had the lowest number of fruit plants⁻¹ (11.49) ever recorded.

Average Fruit Weight (g)

The results of varying micronutrient and plant growth regulator levels in different treatment combinations are displayed in table 5.

Significant findings were obtained from the statistical data analysis of the average tomato fruit weight. Treatments T₂ (GA₃ 100 ppm) had the highest average fruit weight (63.41) followed by T₁ (GA₃ 50 ppm). The Control (T₀) had the lowest average fruit weight which was 36.45 gram.

Average Fruit Yield Plant⁻¹ (kg)

Table 5 displayed the results of varying micronutrient and plant growth regulator levels in various treatment combinations have a major impact on fruit yield plant⁻¹ (kg). Treatment T₂ (GA₃ 100 ppm) produced the highest fruit plant⁻¹ (2.145 kg), followed by T₁ (GA₃ 50 ppm) conversely, control (T₀) had the lowest fruit yield plant⁻¹ (0.418 kg).

Conclusion

Two seasons were allotted for the current investigation. On the basis of the results, however, it can be said that sprays of plant growth regulators were the most effective way to boost crop growth and production because they assist control physiological processes, development, and environmental response. The study concluded that the tomato variety Azad-T6's vegetative growth, flowering, and yield parameters were most improved by treatment T₃ (GA₃ 100 ppm.)

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