



# Effect of different plant growth regulators and micronutrients on fruit quality and plant micronutrient content of tomato

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**Abstract :** An experiment was conducted to find out the effect of different plant growth regulators and micronutrients on fruit quality and micronutrient content of tomato at Horticulture Farm, Junagadh Agricultural University, Junagadh, Gujarat, India during 10 December, 2010 to 10 April, 2011. Eleven different treatments which consisted of four plant growth regulators and three micronutrients were used, viz., T<sub>1</sub>= Gibberellic acid @ 50 ppm, T<sub>2</sub>= Gibberellic acid @ 75 ppm, T<sub>3</sub>= Naphthalene acetic acid @ 50 ppm, T<sub>4</sub>= Naphthalene acetic acid @ 75 ppm, T<sub>5</sub>= Boron 50 ppm, T<sub>6</sub>= Boron 75 ppm, T<sub>7</sub>= Zinc 0.5%, T<sub>8</sub>= Zinc 1%, T<sub>9</sub>= Iron 100 ppm, T<sub>10</sub>= Iron 150 ppm and T<sub>11</sub> = Control (No application of plant growth regulator and micronutrients) in the study. The fruit quality and micronutrient content parameters in plant significantly differed due to different plant growth regulators and micronutrients in tomato. The maximum acidity per cent (1.41%) and ascorbic acid (109.33 mg/100g pulp) were found in T<sub>4</sub>= Naphthalene acetic acid @ 75 ppm, maximum reducing sugars (1.68%), non-reducing sugars (1.98%), total sugars (3.67%) and TSS (4.33 °Brix) were found in treatment T<sub>2</sub> (GA<sub>3</sub> 75 ppm), whereas maximum boron content (10.33 ppm), Fe content (10.33 ppm) and Zn content (22.33 ppm) were found in treatment T<sub>8</sub> (Boric acid 75 ppm), T<sub>10</sub> (FeSO<sub>4</sub> 150 ppm) and T<sub>6</sub> (ZnSO<sub>4</sub> -1%), respectively, the minimum for all the parameters were found in control treatment.

**Key Words :** Naphthalene acetic acid, Gibberellic acid, Boron, Zinc, Iron, Growth, Yield, Tomato

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## INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) belonging to Solanaceae and its origin is the Andean zone particularly Peru-Ecuador Bolivian areas, but cultivated tomato originated in Mexico (Salunkhe *et al.*, 1987). Tomato is one of the most highly praised vegetables consumed widely and it is a major source of vitamins and minerals. It is one of the most popular salad vegetables and is taken with great relish. It is widely employed in cannery and made into soups, conserves, pickles, ketchup, sauces, juices etc. Tomato juice has become an exceedingly popular appetizer and beverage. The well ripe tomato (per 100 g of edible portion) contains water (94.1%), energy (23 calories), calcium (1.0 g), magnesium (7.0 mg), vitamin A (1000 IU), ascorbic acid (22 mg), thiamin (0.09 mg), riboflavin (0.03 mg) and niacin

(0.8 mg) (Davies and Hobes, 1981). Plant growth substances are essential for growth and development of tomato plant. It plays an important role in flowering, fruit setting, ripening and physiochemical changes during storage of tomato. GA<sub>3</sub> significantly increases growth characters, yield and also improved quality of tomato whereas NAA application increased total soluble solid percentage significantly (Pundir and Yadav, 2001). Fruit set in tomato was successfully improved by application of plant growth regulators and micronutrients. In fact the use of growth regulators had improved the production of tomato including other vegetables in respect of better growth and quality (Saha, 2009). This ultimately led to generate interest between the scientists and farmers for commercial application of growth regulators and micronutrients. So the present investigation was undertaken, to find out the

effect of different plant growth regulators on fruit quality and micronutrient content in plant of tomato.

## MATERIALS AND METHODS

The experiment was carried out at Horticultural Farm in Junagadh Agricultural University, Junagadh, Gujarat, India during *Rabi* season (10 December, 2010 to 10 April, 2011). The area had sub-tropical climate characterized by high temperature (28<sup>o</sup>32<sup>o</sup>C) accompanied by moderately high rainfall during *Kharif* (June-September) season and low temperature (10<sup>o</sup>-20<sup>o</sup>C) in the *Rabi* (October-March) season. The soil medium black belongs to the "Saurashtra region", Junagadh district, Gujarat India. GT-3 variety of tomato was used in the experiment. Two different plant growth regulators with two different concentrations each and three micronutrients with two different concentration each and control were used as treatments, *viz.*, T<sub>1</sub>= GA<sub>3</sub> Gibberellic acid @ 50 ppm, T<sub>2</sub>= Gibberellic acid @ 75 ppm, T<sub>3</sub>= NAA Naphthalene acetic acid @ 50 ppm, T<sub>4</sub>= NAA Naphthalene acetic acid @ 75 ppm, T<sub>5</sub>= Boron 50 ppm, T<sub>6</sub>= Boron 75 ppm, T<sub>7</sub>= Zinc 0.5%, T<sub>8</sub>= Zinc 1 %, T<sub>9</sub>= Iron 100 ppm, T<sub>10</sub>= GA<sub>3</sub> Iron 150 ppm and T<sub>11</sub>= Control (No application of plant growth regulator and micronutrients) in the study. The experiment was laid out in a Randomized Block Design with three replications. Thirty days old and a height of 10 cm seedlings were collected from Horticultural farm, Junagadh Agricultural University, Junagadh, Gujarat, India and transplanted at the spacing of 60cm x 45cm in the experimental plot on 10 December, 2010. Manures and chemical fertilizers were applied at the rate of cow dung 10 t/ha, urea 160 kg/ha, triple super phosphate (TSP) 200 kg/ha and muriate of potash (MOP) 140 kg ha as per recommendation. The size of the experimental plot was 6m x

0.90m. Data were collected from ten randomly selected plants for each plot *viz.*, acidity per cent, ascorbic acid, reducing sugars, non-reducing sugars, total sugars, TSS, boron, Fe and Zn content in plant. The values of all characters studied, were subjected to statistical analysis of variance. The determination of difference between the treatment mean at 0.05 and 0.01 levels of probability was done. Standard error of mean (SEm), critical difference (CD.) at five and one per cent, and co-efficient of variance (C.V.%) were worked out-for the interpretation of the results (Panse and Sukhatame, 1985).

## RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

### Quality parameters :

The data pertaining to acidity (%) and ascorbic acid as affected by various levels of plant growth regulators and micronutrients have been presented in Table 1 and depicted graphically in Fig. 3 and 1. Data presented in Table 1 revealed that acidity (%) and ascorbic acid were significantly affected by various treatments of plant growth regulators and micronutrients. Significantly the highest percentage of acidity (1.41%) and ascorbic acid (109.33 mg/100g pulp) was recorded by treatment T<sub>4</sub> (NAA 75 pmm), which was found at par with treatments T<sub>3</sub>, T<sub>2</sub> and T<sub>1</sub>. The minimum percentage of acidity (1.01%) and ascorbic acid content (76.00 mg/100g pulp) was obtained by treatment T<sub>11</sub> (control). The augment of ascorbic acid with plant growth regulator treatment might be either due to encouragement of biosynthesis of ascorbic acid or protection of synthesized ascorbic acid from oxidation through the enzyme ascorbic acid oxidase. Meena (2010) and Babu

**Table 1 : Effect of plant growth regulators and micronutrients on acidity, ascorbic acid, total sugars, TSS, reducing and non-reducing sugars in tomato**

Treatments	Acidity (%)	Ascorbic acid (mg/100g pulp)	Total sugars (%)	TSS (°Brix)	Reducing sugars (%)	Non-reducing sugars (%)
T <sub>1</sub> :GA <sub>3</sub> - 50 ppm	1.29	102.67	3.57	3.95	1.63	1.93
T <sub>2</sub> :GA <sub>3</sub> - 75 ppm	1.31	104.31	3.67	4.33	1.68	1.98
T <sub>3</sub> :NAA - 50 ppm	1.35	105.13	3.23	3.73	1.47	1.77
T <sub>4</sub> :NAA - 75 ppm	1.41	109.33	3.50	3.85	1.60	1.90
T <sub>5</sub> :ZnSO <sub>4</sub> - 0.5 %	1.20	84.00	2.50	3.42	1.10	1.40
T <sub>6</sub> : ZnSO <sub>4</sub> -1%	1.21	85.33	2.70	3.52	1.20	1.50
T <sub>7</sub> :Boric acid 50 ppm	1.19	92.00	2.90	3.62	1.30	1.60
T <sub>8</sub> :Boric acid 75 ppm	1.20	96.67	2.97	3.65	1.33	1.63
T <sub>9</sub> :FeSO <sub>4</sub> 100 ppm	1.22	93.33	2.90	3.62	1.30	1.60
T <sub>10</sub> :FeSO <sub>4</sub> 150 ppm	1.23	91.33	3.10	3.70	1.42	1.68
T <sub>11</sub> :Control	1.01	76.00	2.37	3.13	1.03	1.33
S.E.±	0.06	2.69	0.16	0.14	0.08	0.08
C.D. at 5%	0.17	7.93	0.46	0.40	0.23	0.23
C.V. %	8.13	4.92	8.91	6.34	9.90	8.13

(2002) showed similar results in their experiment.

The data pertaining to reducing sugars, non reducing sugars, total sugars and total soluble solids as affected by various levels of plant growth regulators and micronutrients have been presented in Table 1 and depicted graphically in Fig. 1 and 4. It was observed from the data that various levels

of plant growth regulators and micronutrients exerted a significant effect on reducing sugars, non reducing sugars, total sugars and total soluble solids. Significantly the maximum reducing sugars (1.68%), non reducing sugars (1.98%), total sugars (3.67%) and total soluble solids (4.33 °Brix) was obtained by treatment T<sub>2</sub> (GA<sub>3</sub> 75 ppm), which was found at par with

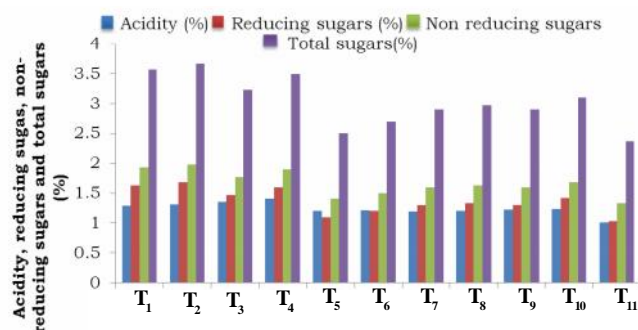


Fig. 1: Effect of plant growth regulators and micronutrients on acidity (%), reducing sugars (%), non-reducing sugars (%) and total sugars (%)

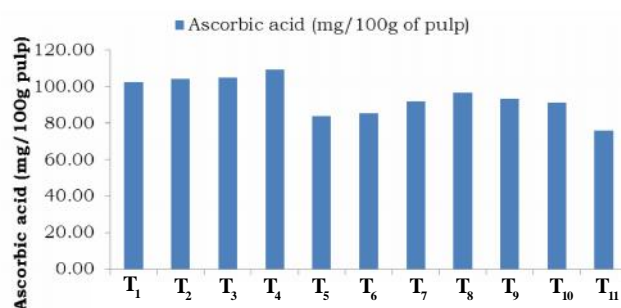


Fig. 3: Effect of plant growth regulators and micronutrients on ascorbic acid (mg/100g pulp)

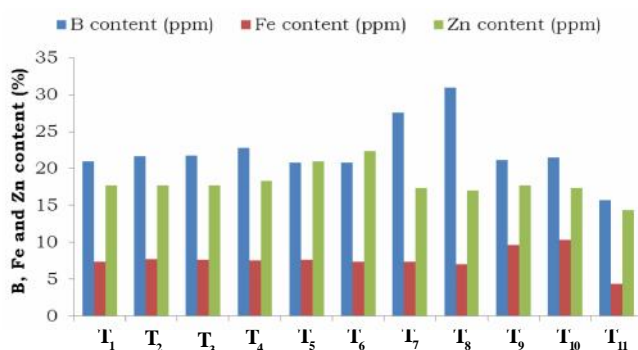


Fig. 2: Effect of plant growth regulators and micronutrients on B, Fe and Zn content (%) in plant

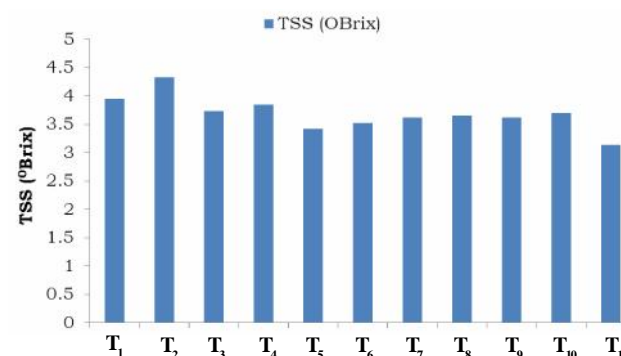


Fig. 4: Effect of plant growth regulators and micronutrients on TSS (°Brix)

Table 2 : Effect of plant growth regulators and micronutrients on boron, Fe and Zn content in tomato

Treatments	B content (ppm)	Fe content (ppm)	Zn content (ppm)
T <sub>1</sub> :GA <sub>3</sub> - 50 ppm	21.00	7.33	17.67
T <sub>2</sub> :GA <sub>3</sub> - 75 ppm	21.67	7.70	17.67
T <sub>3</sub> :NAA - 50 ppm	21.77	7.63	17.67
T <sub>4</sub> :NAA - 75 ppm	22.83	7.50	18.33
T <sub>5</sub> :ZnSO <sub>4</sub> - 0.5 %	20.77	7.65	21.00
T <sub>6</sub> : ZnSO <sub>4</sub> -1%	20.77	7.33	22.33
T <sub>7</sub> :Boric acid 50 ppm	27.53	7.37	17.33
T <sub>8</sub> :Boric acid 75 ppm	31.00	7.00	17.00
T <sub>9</sub> :FeSO <sub>4</sub> 100 ppm	21.13	9.67	17.67
T <sub>10</sub> :FeSO <sub>4</sub> 150 ppm	21.53	10.33	17.33
T <sub>11</sub> :Control	15.67	4.33	14.33
S.E.±	1.19	0.47	0.60
C.D. at 5%	3.50	1.39	1.78
C.V. %	9.21	10.68	5.81

