IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 7, Issue 7 Ver. IV (July. 2014), PP 28-30
www.iosrjournals.org

Effect of Gibberellic Acid on Growth, Quality and Yield of Tomato (Lycopersicon esculentum Mill.)

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Abstract**:** *This study was conducted with the objective to determine the effects of Gibberellic acid (GA_3) on growth, fruit yield and quality of tomato. The experiment consisted of one tomato variety- Golden, and six treatments with five levels of gibberellic acid (GA_3- 10 ppm, 20 ppm, 30 ppm, 40 ppm and 50 ppm), arranged in randomized block design with three replications. The highest plant height, Number of leaves, Number of fruits, Fresh fruit weight has been observed and ascorbic acid, total soluble solid (TSS) was estimated for GA_3 50 ppm.*
Key Words**:** *Tomato, Lycopersicon esculentum Mill., GA_3 spray, ppm, growth, yield.*

I. Introduction

Tomato (Lycopersicon esculentum Mill.) belongs to family solanaceae having chromosome number (2n=24). It is a self pollinated crop and Peru-Ecuador region is considered to be the centre of origin. Tomato was introduced by the Portuguese. Tomato is cultivated in tropics and subtropics of the world. 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. Tomato has a significant role inhuman nutrition because of its rich source of lycopene, minerals and vitamins such as ascorbic acid and ß-carotene which are anti-oxidants and promote good health. Plant growth regulators (PGRs) are extensively used in horticultural crops to enhance plant growth and improve yield by increasing fruit number, fruit set and size. Plant growth regulators like promoters, inhibitors or retardants play a key role in controlling internal mechanisms of plant growth by interacting with key metabolic processes such as, nucleic acid metabolism and protein synthesis. Use of plant growth regulators (PGR's) might be a useful alternative to increase crop production. Recently, there has been global realization of the important role of PGR's in increasing crop yield. GAs constitute a group of plant hormones that control developmental processes such as germination, shoot elongation, tuber formation, flowering, and fruit set and growth in diverse species. The most widely available plant growth regulator is GA3 or gibberellic acid, which induces stem and internode elongation, seed germination, enzyme production during germination and fruit setting and growth **(Davies, 1995).** Gibberellic acid is an important growth regulator that may have many uses to modify the growth, yield and yield contributing characters of plant **(Rafeekher et al., 2002).** Keeping these things, the present investigations to find out the effect of gibberellic acid on growth quality and yield of tomato.

II. Materials And Methods

This study was conducted at Central research field of SHIATS, Allahabad (U.P.). The experiment consisted of one tomato variety- Golden, five levels of gibberellic acid (GA_3- 10 ppm, 20 ppm, 30 ppm, 40 ppm and 50 ppm arranged in randomized block design with three replications and six treatments (T_0- Control, T_1- 10 ppm GA_3, T_2- 20 ppm GA_3, T_3- 30 ppm GA_3, T_4- 40 ppm GA_3, T_5- 50 ppm GA_3. The required weight of the PGRs was taken using electronic sensitive balance and solution was prepared by dissolving in 1 mg L^{-1}. The solution was poured into hand-held sprayer and was directly sprayed on the plants three times at 20, 40 and 60 days after transplanting. Spraying was performed early in the morning to avoid rapid drying of the spray solution, due to transpiration. All the recommended cultural practices were followed during the conduction of the experiment. Data were collected from selected plants in the rows. The collected data includes average plant height (cm), average number of leaves, average number of fruits, average fresh fruit weight (kg), ascorbic acid (mg/100g), total soluble solids (°Brix). The data was analyzed using analysis of variance (ANOVA) and mean separation was carried out at 5% probability level.

III. Results And Discussion

Plant height (cm)

Maximum plant height was found in T5 (38.17cm) at 20 DAT and minimum was found in T0 (20cm), at 40 DAT maximum was found in T5 (50.03cm) and minimum was found in T0 (36.20cm). At 60 DAT maximum plant height was found in T5 (60.29cm) and minimum was found in T0 (40.30cm). Similar result was observed by Sittu and Adelekha (1999), Wu et al. (1983) and Khan et al. (2006) in tomato.

Table 1 : Growth characters

Treatments	Plant Height (cm)			Number of Leaves		
	20 DAT	40 DAT	60 DAT	20 DAT	40 DAT	60 DAT
T_0	20	36.20	40.30	23.67	34	43.21
T_1	23.20	39.05	45.24	28	38.09	46.39
T_2	28.14	40.06	45.42	31.30	44.14	52.71
T_3	32.30	44.33	50.11	33.15	48.47	55.89
T_4	36.17	47	52.36	35.06	52.55	59.89
T_5	38.17	50.03	60.29	39.51	57.77	65.81

Number of leaves

Maximum number of leaves was found in T5 (39.51) at 20 DAT and minimum was found in T0 (23.67), at 40 DAT maximum number of leaves was found in T5 (57.77) and minimum was found in T0 (34). At 60 DAT maximum number of leaves was found in T5 (65.81) and minimum was found in T0 (43.21). Similar result was observed by Gabal et al. (1999) in tomato and Kannan et al. (2009) in paprika.

Number of fruits

Maximum number fruits was found in T5 (38.26) and minimum was found in T0 (17.25). Similar result was found by Uddain et al. (2009). Similar result was found by Adlakha and Verma (1964), Uddain et al. (2009) and Mehta and Mathi (1975).

Fresh fruit weight

Maximum fresh fruit weight (kg/plant) was found in T5 (3.12kg) and minimum fresh fruit weight was found in T0 (1.10kg). Similar result was found by Kaushik et al. (1974) and Uddain et al. (2009).

Table 2 : Yield Characters

Treatments	Number of fruits	Fresh fruit weight(kg)
T_0	17.25	1.10
T_1	20.23	2.08
T_2	23.87	2.22
T_3	29.41	2.47
T_4	34.41	2.96
T_5	38.26	3.12

Ascorbic acid

Maximum ascorbic acid (mg/100gm) was found in T5 (1.88mg/100gm) and minimum ascorbic acid was found in T0 (1.10mg/100gm). Similar results were found by Chaudhary et al. (2006) and Ouzounidou et al. (2010).

Table 3 : Quality Characters

Treatments	Ascorbic acid (mg/100gm)	Total Soluble Solid (°Brix)
T_0	1.10	3.80
T_1	1.38	4.25
T_2	1.52	4.37
T_3	1.66	4.52
T_4	1.74	4.70
T_5	1.88	4.95

Total Soluble Solid

Maximum TSS (°Brix) was found in T5 (4.95) and minimum TSS was found in T0 (3.80). Similar results were found by Gelmesa et al. (2012) and Graham and Ballesteros (2006) in tomato.

IV. Conclusion

On the basis of experiment, it is concluded that, gibberellic acid had significant influence on growth, quality and yield of tomato, especially the treatment with the application of GA_3 @ 50 ppm. Among the different treatments of gibberellic acid-plants treated with the application of GA_3 @ 50 ppm showed an increased plant height, number of leaves, number of fruits,fruit weight, ascorbic acid and total soluble solids.

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