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Impact of Gibberellic Acid on Physiological Yield and Quality Attributes of Tomato (*Lycopersicon esculentum* Mill.) Underneath Semi-Arid Condition of Eastern U.P.

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ABSTRACT: The present study was conducted to observe the impact of gibberellic acid on physiological growth, yield & lycopene content of tomatoes in open field at Horticulture Farm of Krishi Vigyan Kendra Varanasi during (2020-21). The tomato Narendra Tomato-2 variety used for this experiment, Six treatments with four concentration levels of gibberellic acid (i.e. GA_3; 15ppm, 30ppm, 45ppm, 60ppm) set in randomized block design (RBD) with 03 replication. The plants are sprayed at 20, 40, 60 days interval after transplanting. The outcome results shows that highest plant height, number of leaves, number of fruits, fruit weight, lycopene content, ascorbic acid & total soluble solids(TSS) was found maximum in GA_3 60ppm, compare with unsprayed tomato plants. Our result indicates that spraying of GA_3 with 60 ppm concentration is more economical & effective to boost the fruit set and qualitative production tomatoes in semi arid condition of eastern U.P.

Keywords: *Lycopersicon esculentum,* phytohormone GA3, lycopene, ascorbic Acid, T.S.S.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) belongs to the family of solanaceae. Tomatoes are edible/consumed berry worldwide known as "Poor man's orange". Tomato is a highly valued vegetable crop, rich source of vitamins, antioxidants, minerals & lycopene which plays vital role in human health and diet. Tomato is cultivated in tropics & semi tropics region of the globe. A large percentage of the world tomato crop is used for processing products includes canned tomato, tomato juice, tomato sauce, ketchup, puree paste, soups, conserves & dehydrated pulp.

Plant growth regulators (also referred plant hormones) are varied chemical substances that deeply influence the expansion and differentiation of plant cells, tissues and organs. Plant growth regulators perform as chemical messengers for communication. In tomato, totally different growth regulators play a crucial role in germination, root development, branching, flower initiation, fruiting, carotenoid development, synchronization and early maturation, parthenocarpic fruit development, ripening, TSS, acidity, seed production etcetera. to spice up the tomato production in Republic of India these versatile resources greatly facilitate the professionals and researchers (Pramanik et al., 2017).

The influence in yield and quality might vary greatly relying upon the kind of plant phyto-hormone and their concentration and its technique of application. Presently an outsized range of plant growth regulators are on the market within the market however their technique of application and concentrations might vary crop to crop, season to season and climate to climate. Recently, there has been international realization of the vital role of PGR's in increasing crop yield. GAs represent a group of plant hormones that manage development processes like germination, shoot elongation, tuber formation, flowering, and fruit set and growth in various species. Gibberlic acid is a crucial phyto-hormone which will have several uses to switch the expansion, yield & yield contributory characters of plant (Rafeeker *et al.,* 2002). Keeping facts in mind this investigation is finalized to reveal the impact of gibberellic acid on physiological growth and yield of tomato.

MATERIALS AND METHODS

This study was conducted at K.V.K. Varanasi (during 2020-21) eastern U.P. The experiment is conducted on tomato variety NDT 2. Four levels of gibberellic acid concentration (GA3 -15ppm, 30ppm, 45ppm, 60ppm) were set in randomized block design (RBD) with 03 replicates and 05 treatments (T0 control, T1 -15ppm GA3 ,T2 -30 ppm GA3 ,T3 -45ppm GA3 ,T4 -60ppm GA3). The stock solution prepared by required weight of plant growth regulator (PGRs) was taken by using

electronic balance and dissolving @ 1 mg/L. The PGRs solution sprayed with hand held atomizer directly on the plants, 03 times @ 20, 40 and 60 days after transplanting (DAT). The spraying was done at early within the morning to avoid its drying because of transpiration. All the recommended cultural practices were done during the period of experiment. The determined /recorded information includes average plant height (in cm.) average range of leaves, average number of fruits, average fresh fruit weight (in kilo.) Water soluble ascorbic acid (mg/100g.), total soluble solid (TSS) (°Brix) estimated the method by Rangana (1986). To estimate lycopene (mg/100g), method of Adsule *et al*. (1979) was adopted for lycopene contents in different varieties. Statistical analysis of the data was worked out using Randomized Block Design.

RESULTS AND DISCUSSION

A. Plant height

Plant height is determined maximum in T4-GA3 (40.12 cm) at 20 DAT, 49.23 cm. at 40 DAT, 55.14 cm at 60 DAT and the least plant height was found in T0 GA3 i.e. 20.63 cm at 20 DAT, 35.45 cm at 40 DAT & 41.26 cm at 60 DAT respectively (Table 1). Similar result was observed Ali *et al*. (2020); Kumar *et al.* (2014); Khan *et al.,* (2006) in tomato plant.

B. Number of Leaves

The significant variation observed as the maximum number of leaves found in T4--GA3 i.e. 41.27 at 20 DAT, 60.71 at 40 DAT & 67.86 at 60 DAT & the minimum is found in T0 -GA3 i.e. 21.05 at 20 DAT, 33.26 at 40 DAT & 41.32 at 60 DAT respectively (Table 1). Similar results was found by Rahman *et al*. (2015); Kumar *et al.* (2014); Wu *et al*. (1983).

C. Number of Fruits

The maximum number of fruit was found in T4 -GA3 i.e. 41.19 & the minimum no. of fruits was found in T0 -GA3 i.e. 19.12 respectively (Table 2). Similar results is found by Kumar *et al.* (2014); Verma *et al*. (2014); Uddain *et al.* (2009).

D. Fruit weight

The highest fruit weight was observed in T4 --GA_3 i.e. 3.52 kg per plant & the minimum fruit weight was found in T0 -GA_3 i.e. 1.21 kg/plant respectively (Table 2). A similar result had been found by Ali *et at.* (2020); Rehman (2015); Kumar *et al*. (2014).

E. Ascorbic Acid

Maximum amount of ascorbic Acid is found in T_4 --GA_3 i.e. 6.36 mg/100 gm. & the minimum was T_0 -GA_3 i.e. 3.16 mg/100gm.(Table 3) Similar result was found by Verma *et al.* (2014) ; Kumar *et al.* (2014).

F. Total Soluble Solids (T.S.S.)

Maximum T.S.S. amount exhibited in T_4 --GA_3 i.e. 5.67 and minimum in T_0 -GA_3 i.e. 3.16 (Table 3). Similar result is found by Ali *et al*. (2020); Kumar (2014).

G. Lycopene Content

Lycopene content was significantly increased in T4 --GA_3 i.e. 4.15 mg/100gm. & Lowest in T0 T0 -GA_3 i.e. 2.01 mg/100gm (Table 3). Similar result found by Gorecka *et al*. (2020); Masoor *et al.* (2006).

Table 1: Impact of various concentration of GA3 on Growth Attributes.

Treatments	Plant Height (cm)			Numbers of Leaves		
	20 DAT	40 DAT	60 DAT	20 DAT	40 DAT	60 DAT
T0	20.63	35.45	41.26	21.05	33.26	41.32
T1	24.73	41.16	47.13	27.19	36.12	46.61
T2	30.60	42.06	48.15	32.09	45.19	55.73
T3	38.34	45.14	52.07	35.16	51.14	60.46
T4	40.12	49.23	55.14	41.27	60.71	67.86

Table 2: Impact of various concentration of GA3 on Yield Characteristic.

Treatments	Numbers of fruits	Fresh fruit weight (kg.)
T0	19.12	1.21
T1	22.16	2.30
T2	28.32	2.45
T3	34.63	3.21
T4	41.19	3.52

Table 3: Impact of various concentration of GA3 on Quality Attributes.

Treatments	Ascorbic acid (Mg/100gm.)	Total soluble solids (TSS)	Lycopene content (mg/100mg.)
T0	3.16	4.01	2.01
T1	4.32	4.19	2.86
T2	4.86	4.31	3.14
T3	5.12	4.46	3.92
T4	6.36	5.67	4.15

CONCLUSION

It can be concluded that gibberellic acid considerably influenced the vegetative growth, quality, ascorbic acid, lycopene content & yield with the treatment GA3@60ppm. Among the various concentration treatments of GA3 applied on plants, because the tomato plants sprayed with GA3@60ppm exhibited most positive result in all the parameters relating to enlarged plant height, range of leaves, range of fruit, contemporary fruit weight, ascorbic acid, T.S.S. and lycopene content. Thus applying the plant growth regulators like GA3 revealing because the most promising PGR and with success improved the fruit size, growth and additionally keeping the quality of fruit which helps farmers in cultivating tomato in hostile/inauspicious climatic situation for the production of considerably good fruit yield (as today's global demand) by increasing qualitative, vegetative and procreative growth & reducing flower/fruit drops.

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Conflict of Interest. None.

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