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Influence of Plant Growth Regulators on Growth, Flowering and Quality of Tomato (*Lycopersicon Esculentum* Mill), cv. H-86

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ABSTRACT

The experiment was laid out in randomized block design with three replication at Horticulture Research Farm, under DAPS (Horticulture), BBAU Lucknow, during rabi season 2011 to 2012 with the objectives to study the effect of varying levels of NAA, 2, 4-D and GA_3 on growth, quality and yield of tomato and to ascertain the best concentration of NAA, 2, 4-D and GA_3 for vegetative growth and fruit quality of tomato. The experiment consisted one tomato variety *viz* .kashi vishesh (H-86) and different levels of NAA (15, 30, 45 ppm), 2, 4-D (5, 10, 15 ppm) and GA_3 (20, 30, 40 ppm) of different concentrations were used. The result showed maximum yield per hectare. These results are of my own study and are unique and can be very useful in research from trial to field, so it will be of interest to implement these results to the field to harvest good yield of tomato.

Key words: GA_3, NAA, 2, 4-D, tomato and quality.

INTRODUCTION

Among the vegetables, tomato (*Lycopersicon esculentum* Mill. 2n=24) is commercially an important crop throughout the world both for fresh fruit market and for the processed food industries. It ranks second in position after potato in many countries. It is grown under wide range of climates. The leading tomato growing countries in the world are USA, several European Countries, Japan and China. Tomato is one of the praised vegetables consumed widely and it is a major source of vitamins and minerals. It is one of the most popular salad vegetables. 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. 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. Gibberelic acid plays role on controlling fruit setting, pre harvest fruit drop, increasing fruit yield and extending shelf life. Fruit set in tomato was successfully improved by application of NAA. In fact the use of growth regulators had improved the production of tomato including other vegetables in respect of better growth and quality which ultimately led to generate interest between the scientists and farmers for commercial application of growth regulators. So the, present investigation was undertaken to find out the effect of different plant growth regulators on growth and yield of tomato.

MATERIALS AND METHODS

The experiment was laid out during rabi season 2011 to 2012 at Horticulture Research Farm, under DAPS (Horticulture), BBAU Lucknow, which is subjected to the extreme of weather conditions. Geographically this area falls under humid sub-tropical climate and located between 18.60 and 20.200 north latitude and 76.00 and 78.00 east longitude on an elevation of about 111 meters from sea level in the genetic alluvial plains of eastern Uttar Pradesh, which is subjected to the extreme of

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weather conditions. (IISR, Lucknow). The climate of region is subtropical with maximum temperature ranging from 22 ^{0}C to 45 ^{0}C in summer, minimum temperature ranging from 3.5 ^{0}C to 15 ^{0}C in winter and relative humidity ranging from 60-80% in different season of the year. The variety of tomato *viz.*, kashi vishesh was selected for the present study. The seed of the cultivar was obtained from the IIVR. The treatment comprised of different level of plant growth substances i.e.GA_3 (20,30,40 ppm) 2,4-D (5,10,15 ppm) and NAA (15,30 ,45 ppm).The experiment was laid out in RBD with three replications.

RESULTS AND DISCUSSION

Average height of plant (cm): Maximum plant height of 103.47 cm was recorded at 40 ppm of GA_3. NAA and GA_3 were significantly superior over control. Minimum plant height (61.16) was recorded at 15 ppm of 2, 4-D.

Days of first flowering: The data indicated that the GA_3 at 40 ppm concentration required a minimum of 29.98 days as compared to 34.87 days in 2, 4-D at 15 ppm. Thus the data of blooming was advanced roughly by week as a result of GA_3 application at 40 ppm concentration the data was statistically significant. Singh et al. reported that the initiation time of first flowering and first fruiting was significantly and highly increased with the concentration of GA_3.

Number of flower per plant: The maximum number of flowers per plant (46.63) was recorded from GA_3 at 40 ppm while the minimum number of flowers per plant (39.66) was recorded from 2,4-D at 15 ppm resulted superior in respect of number of flower per plant was found in GA_3 application. This might be caused that GA_3 promoted flower primodia production in tomato plant. Similar trend of result was found by Gelrnesa. D et al.

Number of fruit per cluster: The maximum number of fruit cluster (4.62) was recorded from GA_3 at 40 ppm which was closely followed by 2, 4-D at 15 ppm, while the minimum numbers of fruits cluster. (3.42) was recorded from control. GA_3 played role on controlling fruit setting. Similar trend of result was divulged by Gemmic. M et al.

Number of flower cluster per plant: There had remarkable variation in number of flower cluster plant in tomato due to application of different plant growth regulators. A maximum number of 6.28 clusters per plant were recorded at 40 ppm GA_3 which was followed by 2, 4-D at 15 ppm, while the minimum number of cluster per plant (3.43) was recorded from control. The result revealed that GA_3 increased the number of flower cluster plant. Flower primodia was promoted by GA_3 carrying number of flower cluster plant. The result of the present study divulged with the result of Onofeghara

Number of fruit per plant: Statistically significant variation was found in the number of fruits plant of tomato due to application of plant growth regulators. The maximum number of fruit plant (43.49) was recorded from GA_3 at 40 ppm, while the minimum number of fruit plant (20.38) was recorded from 2,4-D at 15 ppm. It was found that GA_3 produces higher number of fruits plant over other plant growth regulators. It might be due to that Gibberelic acid enhanced fruit setting in tomato. Serrani et al. supported this finding.

Internodal length (cm): A maximum number of 5.8 cm internodal length of plant were recorded at 40 ppm GA_3 which was followed by NAA and

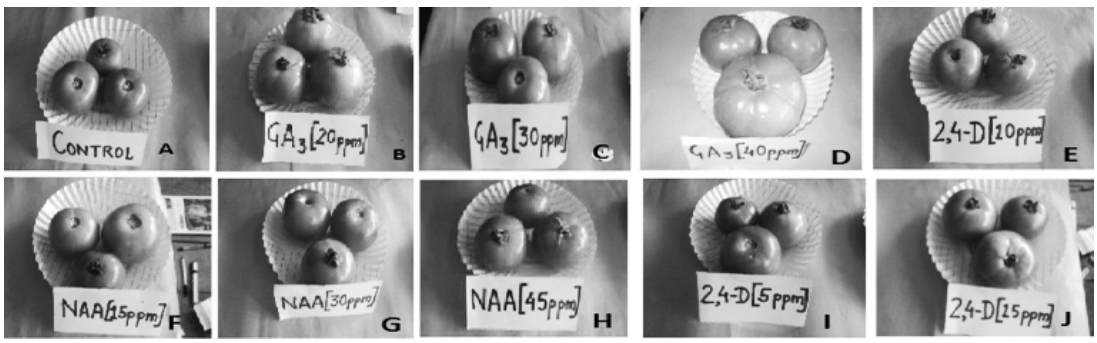

Plate : Germination stages in different photoperiodic conditions; (A) Control (B) GA_3 20 ppm (C) $GA_3$30 ppm (D) GA_3 40 ppm (E) 2,4-D 10 ppm (F) NAA 15 ppm (G) NAA 30 ppm (H) NAA 45 ppm (I) 2,4-D 5 ppm (J) 2,4-D 15 ppm

2,4-D at 15 ppm, while the minimum number of cluster per plant (2.8) was recorded from control. This result was also followed by Udden et al.

Average Fruit Length (cm): A maximum fruit length of 4.70 cm was recorded at 40 ppm GA_3 concentration as compared to 3.53 cm in control.

Average Fruit Weight (g): A maximum average fruit weight of 92.00 gm was recorded at GA_3 40 ppm, followed by 76.75 gm by the 45 ppm NAA concentration as compared to 38.33 gm in control.

Acidity (%): The data indicates that all growth regulator treatments had resulted in decreasing the percentage acidity of tomato fruits. GA_3 at 40 ppm concentration had recorded a minimum acidity of 0.470 per cent as compared to 0.578 per cent in control.

Total Soluble Solids (T.S.S.) ^{0}Brix: The data indicated that the treatments GA_3 at 40 ppm concentration was found to be statistically significant in increasing total soluble solid. A maximum T.S.S. of 4.20 ^{0}brix was recorded at 40 ppm of GA_3 as compared to 3.86 ^{0}brix in control.

Percentage of fruit set: The data indicated that the treatments of GA_3 and NAA were found to be statistically significant in increasing per cent fruit set. A maximum fruit set of 64.83 per cent fruit set was recorded at 40 ppm of GA_3 as compared to 49.29 per cent in control.

CONCLUSION

Our study was concentrated to the effect of various plant growth regulators on trial crop in the tropic region of Lucknow. Results showed that the combinatorial use of GA_3, NAA and 2,4-D at specific concentration (GA_3 at 40 ppm, NAA at 45 ppm and 2,4-D at 5 ppm) considerably increases

Table 1: Effect of different concentration of GA_3, NAA and 2, 4-D on different observation of tomato

Treatment	Average height of plant (cm)	Days of first flowering	Number of flower per plant	Number of fruit per cluster	Number of cluster per plant	Number of fruit per plant	Internodal length (cm)	Percentage of fruit set
Control	70.08	34.73	40.26	3.42	3.43	20.58	2.8	49.22
GA_3 20 ppm	78.60	30.65	44.67	4.41	5.83	40.60	5.0	60.96
$GA_3$30 ppm	97.33	30.57	45.68	4.24	5.63	41.34	5.6	61.81
GA_3 40 ppm	103.47	29.98	46.63	4.62	6.28	43.49	5.8	64.83
NAA 15 ppm	80.52	32.56	44.92	3.76	5.85	32.58	4.6	58.20
NAA 30 ppm	88.80	30.48	43.86	3.81	5.46	35.78	3.8	61.29
NAA 45 ppm	78.77	30.89	44.89	4.12	5.04	39.62	5.5	61.60
2,4-D 5 ppm	73.15	31.14	42.97	3.85	4.02	25.81	4.3	58.79
2,4-D 10 ppm	66.07	33.28	40.97	3.63	3.30	22.75	3.5	46.78
2,4-D 15 ppm	61.16	34.87	39.83	3.36	3.00	20.38	2.9	48.44
SEm ±	6.01	0.71	0.96	0.25	0.31	1.01	0.46	1.69
C.D. (P=0.05)	12.36	1.49	2.01	53	0.67	2.12	0.97	3.56

Table 2: Effect of different concentration of GA_3, NAA and 2,4-D on different observation of tomato

Treatment	Average fruit Length (cm)	Average Fruit Weight (g)	Per cent Acidity	T.S.S. ^{0}Brix
Control	3.53	38.33	0.57	3.86
GA_3 20 ppm	4.26	82.58	0.47	4.10
$GA_3$30 ppm	3.96	78.33	0.47	4.13
GA_3 40 ppm	4.70	92.00	0.48	4.20
NAA 15 ppm	3.61	76.75	0.47	4.03
NAA 30 ppm	3.54	76.75	0.47	4.03
NAA 45 ppm	4.00	73.33	0.47	4.03
2,4-D 5 ppm	3.96	53.16	0.47	3.80
2,4-D 10 ppm	4.15	50.66	0.47	3.86
2,4-D 15 ppm	3.90	66.50	0.48	3.87
SEm ±	0.17	7.07	0.005	0.08
C.D. (P=0.05)	0.35	14.87	0.001	0.18

the weight of fruits and significantly increases the total yield per hectare. These results are of my own study and are unique and can be very useful in research from trial to field, so it will be of interest to implement these results to the field to harvest good yield of tomato.

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