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Research Paper

Effect of ABT-6 hormone on growth and yield of BINA tomato-5

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ABSTRACT

A pot experiment was conducted at the Horticultural farm, HSTU, Dinajpur, Bangladesh during December 2010 to March 2011 to study the effect of ABT-6 hormone on growth and yield responses on BINA tomato-5. Four levels of ABT-6 viz. 10, 20, 30, 40ppm and control were used as treatments. The study was conducted in a completely randomized design (CRD) with four replications. The growth and yield contributing characters were significantly differed in various level of ABT-6 hormone on tomato. The maximum plant height was 85.29cm at 60 days after transplanting (DAT), number of leaves 29.33 at 80 DAT, number of branches 10.33 at 80 DAT, fruit setting time 42.92 days, number of flowers 10.50 at 47 DAT, number of fruits 12.58, fresh fruit weight 845.75g and dry weight of fruits 61.22g per plant in 20ppm ABT-6 and the minimum for all the parameters were found in control. The maximum number of fruits shedding per plant (2.83) and first flowering time (37.25 days) was found in control and minimum in 20ppm (2.00) and 30ppm (33.00) ABT-6, respectively. The present study showed that 20ppm ABT-6 hormone was given the best response for tomato production.

Keywords: ABT-6 hormone; Growth; Yield; Tomato.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) (Family- *Solanaceae*) is a popular, palatable and nutritious vegetable in the world. In Bangladesh it is the third largest vegetable crop after potato and sweet potato in terms of production (Rashid, 1993). It is commonly consumed fresh as salad and is processed into different items like jam, jelly, juice, sauce, stew pickles etc. Tomato juice has become an exceedingly popular appetizer and beverage. Its food value is very rich because of higher content of vitamin A, B and C including Calcium and Carotene (Bose and Som, 1990). The yield of tomato in Bangladesh is very low compared to that of the advanced countries (Sharfuddin and Siddique, 1985). Tomato consumption in the country is increasing day by day and its yield can be increased by agronomic, nutritional management or by some exogenous supplementation with growth hormones. Several important growth and development processes i.e. flowering, fruiting, pre harvest fruit drop, ripening and

physiochemical changes during storage in plant are controlled and influenced by plant growth regulators (PGR) (Berleth and Sachs, 2001). It's used to enhance plant growth and improve the yield by increasing fruit number, fruit set and size (Batlang, 2008). The ABT-6 is a new type of hormone or plant growth regulator (PGR) having trade name "ABT-6 Rooting Powder" invented in China with broad spectrum effects on various crop plants (Tao,1992). ABT-6 enhances endogenous hormone synthesis of plants which affect growth, physiological attributes and finally yield (Antonio, 1995). The old and the new types of ABT hormones have different effects increasing output in addition to labour cost (Anonymous, 1994). The use of ABT-6 hormone in Bangladesh environment is a new. So far our knowledge goes none used ABT-6 hormone to improve the yield of tomato in Bangladesh. So, the present experiment was conducted to evaluate the efficacy of ABT-6 hormone on growth characters and yield performance of tomato.

MATERIALS AND METHODS

The experiment was conducted on tomato during the rabi (winter) season in the Horticultural Farm, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh. The area had sub tropical climate characterized by high temperature (28-32°C) accompanied by moderately high rainfall during Kharif (April-September) season and low temperature (15-20°C) in the rabi (October-March) season. The soil belongs to the Old Himalayan Piedmont Plain (AEZ-1) and silty loam in texture having pH 6.5(FAO, 1988). The BINA tomato-5 was used in the experiment. Twenty five days old seedlings were transplanted in earthen pots. The size of each pot was 30cm × 28cm and each pot was filled with 8kg of sun-dried soil. The fertilizer doses was 1.2 t/ha of cowdung, 400kg/ha of urea, 350kg/ha of TSP and 250kg/ha of MOP. Full amount of Cowdung, TSP, MOP and half of urea was applied during pot preparation. The remaining half of the Urea was applied as top dressing 30 days after transplanting (BINA, 1998). The plant growth hormone ABT-6 was collected from China and four concentrations of ABT-6 (Control, 10, 20, 30 and 40ppm) were applied in this experiment which was laid out in a completely randomized design (CRD) with four replications. For preparation of ABT-6 working solution 1, 2, 3 and 4mg of original powder were added separately to one litter of water contained in a volumetric flask and spray was done at 35 DAT (days after transplanting) in afternoon with hand sprayer. Spraying was performed on foliage in afternoon to avoid rapid drying-off of the spray solution, due to transpiration. The intercultural operations were done as per necessary. Data on plant height, number of leaves, number of branches, first flowering and fruit setting time (days), number of flowers, fruits and fruit shedding per plant, fresh and dry weight of fruits per plant were recorded using standard procedures. The mean were separated by Duncan's Multiple Range Test (DMRT) at 5% level of significance (Gomez and Gomez, 1984).

RESULTS

Tables 1, 2 and figures 1, 2 showed the different doses of ABT-6 hormone on growth and yield of BINA tomato-5 in comparison to control.

Plant height: The application of different concentrations of ABT-6 significantly influenced the plant height of tomato at different days (Fig. 1). It was found that plant height of tomato increased with the advancement of time and was maximum in pots where ABT-6 was applied as 20ppm attaining 85.29 cm at 60 days after transplanting (DAT). The plant height was found minimum 39.79 cm at 30 DAT in control.

Number of leaves per plant: Number of leaves per plant varied significantly at different growth stages with different concentrations of ABT-6 (Table 1). The number of leaves increased with the increasing time i.e. at different days. Application of ABT-6 at 20ppm concentration produced the highest number of leaves 29.33 at 80 DAT. The lowest number of leaves 14.25 at 50 DAT was produced in control.

Number of branches per plant: Different concentrations of ABT-6 varied significantly in respect of number of branches per plant at different growth stages (Table 1). At 20ppm the highest number of branches were produced in 70 DAT (7.66) and 80 DAT (9.41) but the 30ppm ABT-6 treatment were produced the highest number of branches at 50 DAT(3.08) and 60 DAT(5.83). The treatment 10ppm was produced moderate number of branches per plant whereas the control treatment produced lowest number of branches per plant at all DAT.

First flowering time: Significant variation was also observed in the first flowering time due to application of ABT-6 at pre-flowering stage (Table 2). The longest time required (37.25 days) for first flowering from the control which was statistically similar to 10ppm (35.0) while the earliest flowering (33.0 days) was recorded by the application of 30ppm ABT-6 which was statistically similar to 20ppm (24.33) and 40ppm (33.67).

First fruit setting time: Statistically significant variation was observed on first fruit setting time due to the application of different concentrations of ABT-6 (Table 2). The maximum time (42.92 days) is required for first fruit setting at 20ppm ABT-6 treated while the minimum time (39.17 days) for first fruit setting was recorded in control. From the application of 10ppm, it was observed that the time required for first fruit setting was identical with the treatment of 30ppm and 40ppm.

Number of flowers per plant: Influence of ABT-6 was significant in respect of number of flowers per plant (Fig. 2). In all the growth stages 20ppm ABT-6 showed the maximum flowers, but application of more concentrations of ABT-6 resulted in decreasing of flowers per plant. The minimum number of flowers per plant showed in control in all growth stage.

Number of fruits per plant: Number of fruits per plant was significantly affected by the different concentrations of ABT-6 hormone (Table 2). The highest number of fruits per plant (12.58) was obtained by in 20ppm treated pot, whereas, the lowest number of fruits (9.41) was recorded in control.

Number of fruits shedding per plant: Different concentrations of ABT-6 were also varied significantly to the number of fruit shedding (Table 2). Number of fruit shedding per plant was found highest (2.83) with the control treatment whereas the treatment of 20ppm ABT-6 showed lowest (2.0) amount of fruit shedding.

Fresh fruit weight per plant: The influence of ABT-6 application at different concentrations on the fresh fruit weight per plant was significant (Table 2). The highest fresh fruit weight per plant (845.75g) was found by the application of 20ppm ABT-6 while the lowest fruit weight per plant (596.42g) was recorded in control.

Dry matter of fruits per plant: Application of hormone ABT-6 showed highly significant variation in relation to the dry weight of fruits per plant (Table 2). The highest dry weight of fruits per plant (61.22g) was obtained from the concentration of 20ppm of ABT-6 and the lowest dry weight of fruits (42.22g) was observed from the control.

DISCUSSION

Here we investigated the effects of different levels of ABT-6 hormone on growth and yield of BINA tomato-5. Application of ABT-6 hormone had significant influence on growth and yield parameters in tomato then control. Remarkable increase in the plant height was observed with ABT-6 at 20ppm. This might be due to the hormone enhanced cell division with considerable stem elongation and the ultimate result was the longest plant of tomato (Shittu and Adeleke, 1999). Among the treatment ABT-6, 20ppm recorded maximum in number of leaves per plant. It was possible that the plant height increased by the application of hormone and ultimately the number of leaves per plant was increased (Muhadjir, et al., 1995). Number of branch per plant also increased with the application of ABT-6 hormone. Similar trend of result was reported by Singh and Singh (2005). The maximum of flowers per plant was obtained when ABT-6 applied at 20ppm (Onofeghara, 1981). Adlakha and Verma (1965) supported the result of present study in case of fruit setting per plant where they found that 20ppm ABT had increased the number of fruit setting per plant. Jansen (1970) also mentioned that increasing concentration of ABT reduced the number of fruits per plant. The maximum number of fruit shedding per plant was found in control and minimum in 20ppm ABT-6. Fruit drop after development of flowers (pre mature fruit drop) reduces yield significantly in fruit trees/vegetables. Both 2, 4-D and GA3 decrease the fruit drops in citrus due to delay in citrus rind maturity by altering wax deposition and rate and extents of respiratory gas exchange (Prasad and Kumar, 2003). Adlakha and Verma (1964) reported that application of ABT-6 at 30 ppm increased fruit size and weight which is similar with the research work. Similar trend of the result in tomato was found by Saleh and Abdul (1980).

CONCLUSIONS

Thus ABT-6 hormone had significant influence on growth and yield of tomato and 20ppm ABT-6 gave the highest yield then other doses. So, 20ppm ABT-6 gave the best response for tomato production.

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Table- 1: Effect of ABT-6 hormone on growth characteristics of tomato.

ABT-6 (ppm)	No. of leaves per plant at				No. of branches per plant at			
	50 DAT*	60 DAT	70 DAT	80 DAT	50 DAT	60 DAT	70 DAT	80 DAT
0	14.25c	18.25c	21.00c	23.58c	2.08b	3.80c	5.50b	7.83c
10	17.08b	20.33b	23.33b	27.00b	2.66ab	5.00b	6.83a	9.41b
20	19.25a	22.17a	25.33a	29.33a	2.91ab	5.50ab	7.66a	10.33a
30	18.00b	20.83b	24.00b	28.00ab	3.08a	5.83a	7.58a	10.25ab
40	17.17b	20.50b	23.83b	27.42b	2.83ab	5.33ab	7.16a	9.66ab
CV (%)	6.49	5.23	4.49	4.64	26.46	13.86	11.20	7.85

- In a column, figures with uncommon letter (s) differ significantly at $P < 0.05$ as per DMRT; Days after transplanting.

Table- 2: Effect of ABT-6 hormone on different reproductive characters of tomato.

ABT-6 (ppm)	1st flowering time (days)	1st fruiting time (days)	No. of fruits plant^{-1}	No. of fruit shedding plant^{-1}	Fresh fruit wt. plant^{-1} (g)	Dry matter of fruits plant^{-1} (g)
0	37.25a	39.17b	9.41c	2.83a	596.42b	42.22b
10	35.00ab	40.50ab	10.83b	2.41a	776.83a	54.69a
20	34.33b	42.92a	12.58a	2.00b	845.75a	61.22a
30	33.00b	40.08b	11.67ab	2.16ab	835.25a	59.94a
40	33.67b	39.92b	11.17b	2.33ab	789.50a	55.88a
CV (%)	6.70	5.69	10.06	25.96	11.12	11.57

- In a column, figures with uncommon letter (s) differ significantly at $P < 0.05$ as per DMRT.

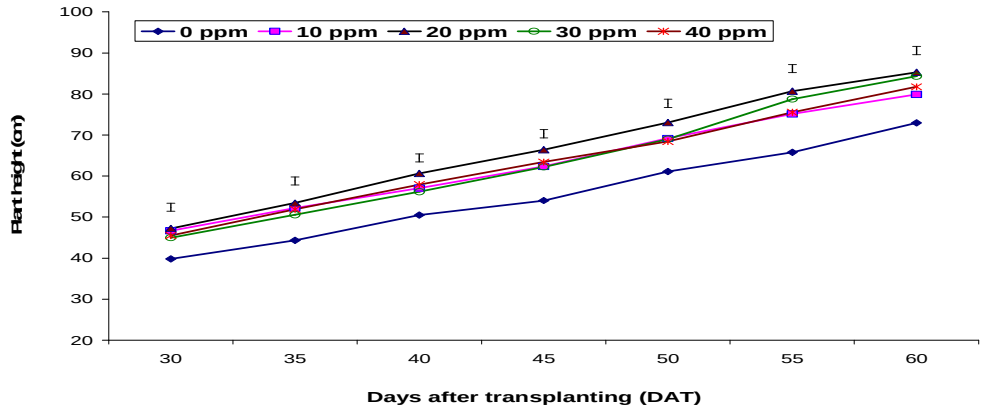

Figure-1: Effect of ABT- 6 on plant height of tomato at different days after transplanting (DAT).

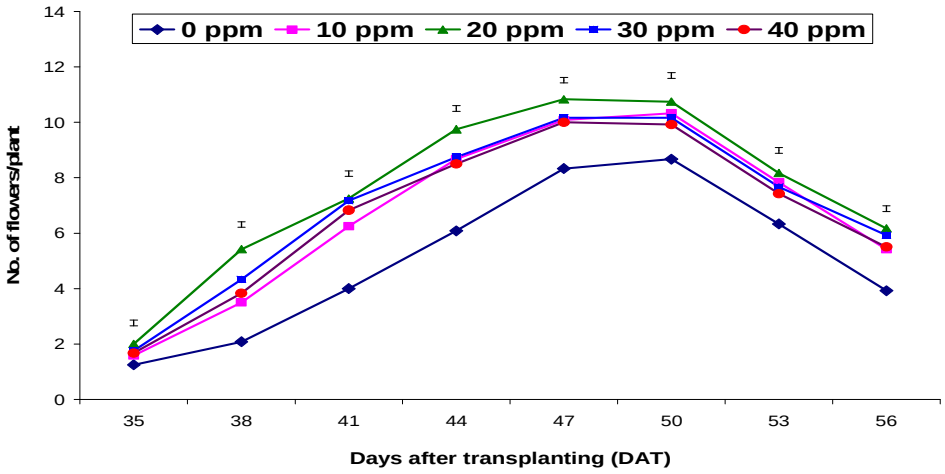

Figure-2: Effect of ABT-6 on number of flowers per plant of tomato at different days after transplanting (DAT).

