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Response of Summer Tomato to Hormone and Planting Time at Hill Slope

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Abstract: Field study was carried out to know the performance of summer tomato and suitable time of planting for maximizing yield potential during 1997-1999. The results indicated that the plants planted in 15th April performed the best yield (26.78 t ha^{-1}) as compared to other planting times. It might be the cause of maximum vegetative growth as well as cool night temperature. Similarly, spraying tomato tone hormone (2%) efficiently produced the highest fruit yield (22.16 t ha^{-1}) and maximum number of fruits (28.13 $plant^{-1}$) than that of untreated plants. The results showed that from interaction effects, it was evident that 15th April planting with efficient use of tomato tone hormone exhibited best performance (31.37 t ha^{-1}) and declined yield with the change of planting time.

Key words: Summer tomato, planting time, Tomato tone hormone, vegetative growth

Introduction

Tomato (*Lycopersicon esculentum* Mill.) is a very popular consumable vegetable crop, occupying the top of the list as canned vegetable having multiple uses (Choudhury, 1979). Tomato is popular also because it contains rich amount of vitamin C and adds varieties of colours and flavour to the general dish and culinaries. It is adapted to wide range of soils and grown abundantly during winter season in Bangladesh. However, in Bangladesh average yield of tomato is very low as compared to neighboring countries like India and Pakistan. Improved technologies and proper management techniques are prime importance for high yield potential. Fruit set and pollination mainly depend on the sensitivity of temperature. If the day and night temperature remain cool within the range of 26.5°C and 12-22°C respectively, the flower initiation set off early and fruit development begins very rapidly. During summer, day temperature prevails more higher than winter. But if the night temperature gets within the range of 16-19°C during flower initiation in summer and promotes greater flower production. Sprays of hormone specially tomato tone on flower cluster effectively increase the fruit set as well as fruit production. As tomato tone hormone stimulates the normal flow of growth hormone which makes the flower stigma sticky to receive the pollen grain promptly. It is observed that 35% higher fruit set and 23% heavier fruits when plants were treated with GA_3 at 100 ppm. High temperature before and after cool season interferes fruit set and its development. So, there is a limitation of growing tomato over a longer period. Use of growth hormone like Auxin may help to overcome such problem. Auxin like 2, 4-D is also effective in increasing fruit set, size of fruit and prompting early maturity under low and high temperature (Mehta and Mathi, 1995). It was stated that application of 2, 4-D influenced sized and yield of tomato (Sharma and Tiwari, 1987). Time of planting is also another limiting factor for production of tomato. Hossain *et al.* (1986) reported that early November is the best time for planting tomato while others found high incidence of diseases and low yield of tomato by late planting. In keeping the views, this experiment was under taken to know the response of hormone and planting time for maximizing yield of tomato in hilly regions.

Materials and Methods

The field studies were conducted at the Hill Tracts Agricultural Research Station, Ramgarh, Khagrachari in two consecutive years of 1997-1999. The experiment was laid out in a randomized complete block design with three replications. The soil properties of the experimental site are shown in Table 1. There were twelve treatment combinations, such as six planting times (15 and 30th

Table 1: Physical and Chemical Properties of Soil

Properties	Values
Textural class	Sandy loam
Sand(%)	72.00
Silt(%)	21.50
Clay(%)	8.22
pH	4.58
Organic matter	0.96
Exchangeable bases (%)	
Ca	1.62
Mg	0.58
K	0.11
Available nutrients (µ/ml)	
NH_4^+-N	29.00
P	10.00
S	6.00
B	0.15
Cu	1.25
Fe	229.00
Mn	4.00
Zn	1.03

April; 15 and 30th May; 15 and 30th June) and hormone and without hormone were taken in the study. The plot dimension and plant spacing were 4.2 x 1.2m and 60 x 40 cm, respectively. The soil of the experimental site was sandy loam having pH 5.5. The 30 days seedlings of BARI tomato – 5 were planted giving 15 days interval after first planting. The plots were covered with polythene shed with the help of bamboo sticks. Manures and fertilizers were applied at 10 ton cowdung and urea, Triple Super Phosphate (TSP) and Muriate of Potash (MP) at 500, 450 and 250 kg ha^{-1} respectively. Fifty percent cowdung TSP and MP were applied at the final land preparation and rest half of cowdung, TSP, MP and one third of urea were applied in pits just before planting. The rest urea was top-dressed in two installments 2 and 5 weeks after transplanting. During blooming of the flower cluster, tomato tone hormone (2%) was sprayed on the flower in the early morning of the day at 8-10 days interval. All the necessary cultural operations were performed as required by the experiment. Ten plants were selected randomly from unit plot for recording data. Data were pooled and analyzed statistically. Difference between treatment means were compared by least significant difference (LSD) at 5% level of significance.

Results and Discussions

Effect of planting time: The significantly influences of all the parameters studied were made by time of planting (Table 2). A significant effect of planting time was recorded over flower cluster, number of flowers per plant, fruit cluster, fruits per plant, fruit weight, fruit size and fruit yield respectively. Fifteenth April planting produced the maximum number of flowers per plant (67.0). But the production of flowers gradually decreased after changing the planting dates. It might be the reason of fluctuating of night and day temperature (Fig. 1) This is confirmed with that of Hoque and Rahman (1988) and Bose and Som (1986). Similarly, number of fruits per cluster, number of fruit per plant, fruit size, fruit weight and yield were significantly increased in 15th April planting. It might be indicated that early planting enhanced rapid vegetative growth prior to flower initiating with moderate night temperature. Highest number of fruits (30.1 $plant^{-1}$), maximum fruit weight (52.17 g) and fruit size (7.06 x 14.98 cm) and maximum fruit yield (26.78 t ha^{-1}) were recorded in 15th April planting. This was followed by successive planting time descending order. The plantation on 30 June showed poor performance and produced the lowest yield (10.8 t ha^{-1}) (Table 3).

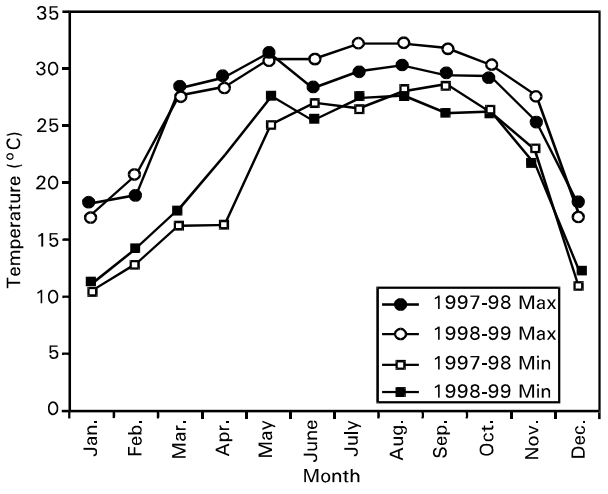

Fig. 1: Temperature date for the year 1997-98 to 1998-99.

Effect of hormone: The significant response of hormone was found to all the parameters including fruits per plant, weight of fruit, individual fruit weight, fruit size, flower cluster, fruit per cluster and fruit yield (Table 3). The plants sprayed with tomato tone hormone (2% conc) significantly increased flower cluster, flowers per plant and fruits per cluster than untreated plants. Maximum number of flowers (52.13 $plant^{-1}$) and highest number of fruits (4.82) per cluster were recorded by spraying 2% tomato tone hormone. Increased concentration sometime may cause toxicity to the plant. Onofegahara (1981) also confirmed that higher concentration of growth hormone were toxic to tomato plant. Individual fruit weight, fruit size, number of fruits $plant^{-1}$ and fruit yields also substantially increased with efficient use of tomato tone hormone. Significantly highest fruit weight (47.86 g), maximum number of fruits (780 $plant^{-1}$) and maximum fruit yield (22.16 t ha^{-1}) were recorded in hormone treated plant where untreated plant gave comparatively lower yield (16.07 t ha^{-1}). Mahta and Mathi (1975) and EI-Soad *et al.* (1976) reported that lower concentration of 2, 4-D significantly influenced fruit weight.

Interaction effects of hormone and time of planting: Yield and yield attributes of tomato were significantly influenced by hormone and time of planting (Table 2, Fig.2). Plants planted on 15th April sprayed with tomato tone showed tremendous response in producing flower cluster and fruit set .As the increase of planting time decreased flower cluster and fruits per cluster per plant. Number of flowers per cluster, number of flower per plant and number of fruit set per cluster per plant were found significantly higher in 15th April planting with spraying hormone. Maximum number of fruits (72.03) and fruits per cluster (5.33) were also observed in treated plants planting on 15th April. While same planting with untreated plants produced minimum number of flowers and fruits per cluster. It might be that late planting helped poor vegetative growth with severe pest incidence and prior to flower initiation coupled with low night temperature favoured more flower cluster and fruits per cluster per plant. Rakitina *et al.* (1976) also confirmed this

Table 2: Interaction effect of hormone and time of planting on the yield and yield attributes of summer tomato.

Treat. code	Planting time	Fruits/ plant	Wt. of fruit/ plant	Fruit weight	Fruit size		Flower		Fruit		Yield t ha^{-1}
					Length (cm)	Diameter (cm)	Flower/ cluster	Flower/ plant	Fruit/ cluster	Fuits/ plant	
Hormone	15th April	36.2	1080	55.0	7.1	15.2	6.1	72	5.3	36.2	31.37
	30th April	34.7	900	53.0	6.9	15.0	5.7	66	5.2	34.7	25.33
	15th May	33.0	740	47.0	6.7	14.7	4.9	55	5.1	33.0	24.87
	30th May	26.0	690	46.0	6.6	14.2	4.8	51	4.5	26.0	23.09
Without	15th June	20.1	660	43.9	6.0	13.9	4.6	50	4.1	20.1	16.11
Hormone	30th June	18.5	580	42.1	4.8	12.8	4.7	51	3.1	18.5	12.19
	15th April	24.0	780	49.3	6.9	14.7	3.51	40	3.1	24.0	22.19
	30th April	22.43	690	48.7	6.7	14.4	3.6	40	3.0	22.4	19.92
	15th May	21.3	650	41.7	5.7	13.8	3.8	41	2.8	21.3	18.28
	30th May	19.6	580	38.7	5.4	13.2	3.4	37	2.6	19.6	15.44
	15th June	18.0	520	35.8	5.1	12.2	2.8	35	2.3	18.6	11.18
	30th June	15.7	440	34.5	4.1	11.1	2.9	33	1.9	15.7	9.42
LSD (0.05)		1.67	0.07	2.23	0.17	0.34	0.15	2.12	0.11	1.52	2.12

Table 3: Main effect of hormone and time of planting on the yield and yield attributes of summer tomato

Planting time	Fruits/ plant	Wt. of fruit/ plant	Fruit weight	Fruit size		Flower		Fruit		Yield t ha^{-1}
				Length (cm)	Diameter (cm)	Flower/ cluster	Flower/ plant	Fruit/ cluster	Fuits/ plant	
15th April	30.1	930.00	52.1	7.0	14.9	5.8	67.00	5.2	30.1	26.78
30th April	28.1	800.00	50.8	6.8	14.7	5.5	60.00	5.1	28.1	22.63
15th May	27.6	690.00	44.3	6.2	14.2	4.7	52.00	4.1	27.6	21.58
30th May	22.8	640.00	42.3	6.0	13.7	3.5	43.00	3.3	22.8	19.27
15th June	19.0	590.00	39.9	5.6	13.0	2.8	37.00	2.2	19.0	13.64
30th June	17.1	510.00	38.3	4.5	11.9	2.23	36.00	2.02	17.1	10.8
LSD (0.05)	1.18	0.04	1.62	0.12	0.07	0.10	1.40	0.09	1.39	1.5
Effect of Hormone										
Hormone	28.1	780.00	47.86	6.4	14.3	5.5	52.00	4.8	28.1	22.16
Without hormones	20.1	610.00	41.4	5.6	13.2	4.8	44.00	3.8	20.1	16.07
LSD (0.05)	0.68	0.00	0.94	0.009	0.14	0.007	0.89	0.005	0.7	0.86

finding. Similarly, interaction effect of hormone and early planting significantly produced larger fruit (55.0 g) and fruit size (7.165 x 15.22 cm), highest number of fruits (1080 plant^{-1}) and maximum fruit yield (31.37 t ha^{-1}) respectively. Where as late planting combined with or without hormone failed to produce desire yield (10.80 t ha^{-1}). It might be also the cause of high temperature restricted vegetative growth and retarded flower initiation. It revealed from two years study that mid April planting was found best for summer tomato production in hilly regions. Similarly, efficient spray of tomato tone hormone (2% conc.) on flower cluster leads to significant fruit set in summer tomato due to prolong day length along with prevailing moderate day and night cool temperature. Hereafter, mid April planting with efficient use of hormone (2% conc.) may be suggested for summer tomato cultivation in Chittagong Hill Tracts Regions leading to maximum yield with sustainable economic market return.

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