EFFECT OF PRUNING ON GROWTH AND YIELD OF TOMATO (*Lycopersiconesculentum* Mill.)

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ABSTRACT
The experiment was conducted in the farm of Sher-e-Bangla Agricultural University, Dhaka-1207 during October 2006 to March 2007 to determine the effect of pruning on growth and yield of tomato. The experiment consisted of four levels of pruning: No pruning; one stem pruning; two stem pruning and three stem pruning. Three stem pruning produced the maximum fruits per plant (35.33) and highest yield (66.86 t/ha) while the minimum fruits per plant (27.05) and yield (52.32 t/ha) was obtained from one stem pruning.

Keywords: pruning, growth, yield and tomato

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is a member of Solanaceae family is one of the important, popular and nutritious vegetables grown in Bangladesh during winter season and cultivated mostly in all parts of the country (Haque *et al.*, 1999). It is adapted to a wide variety of climates. At present, tomato ranks third, next to potato and sweet potato, in terms of world vegetable production (FAO, 2002). The leading tomato producing countries of the world are China, India, Egypt, Turkey, Iran, Italy, Mexico, Brazil and Indonesia (FAO, 2002). Its food value is very rich because of higher contents of vitamins A, B and C including calcium and carotene (Bose and Som, 1990). It is much popular as salad in the raw state and is made into soups, juice, ketchup, pickles, sauces, conserved puree, paste, powder and other products (Ahmad, 1976; Thompson and Kelly, 1983 and Bose and Som, 1990). Bangladesh produced 102 thousand tons of tomato in 15,790 thousand hectares of land during the year 2002-2003 and the average yield being 6.46 t ha^{-1} (BBS, 2004). The yield of tomato in our country is not satisfactory enough in comparison to requirement (Aditya *et al*., 1999). The low yield of tomato in Bangladesh, however, is not an indication of low yielding ability of this crop, but of the fact that the tomatoes grown here are not always of high yielding cultivars. Moreover the cultural practices commonly used by the growers are not improved. Since the soil and climatic conditions of Bangladesh during the winter season are congenial to proper growth of tomato, it is expected

that improved management practices would augment the yield considerably. Tomato plant can be severely pruned without affecting the yield (Patil*et al.*, 1973). Proper pruning method gives the best quality and early fruit in tomato (Lopez and Chan, 1974). Although pruning needs extra cost, the practice could increase the economic return by increasing yields and improvement of the quality of fruits (Davis and Ester, 1993). Pruning and training in tomato plants are practiced in certain areas of the United States, especially in some parts of the Southern States and in few other regions (Thompson and Kelly, 1957). But majority of the tomato growers of Bangladesh have little knowledge about the advantage of pruning in tomato production. Usually the farmers of Bangladesh cultivate tomato without pruning and even they do not maintain proper plant density. Therefore, the present study was aimed to find out the suitable pruning practices for higher yield and better quality.

MATERIALS AND METHODS

The experiment was conducted in the experimental farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka -1207 during the period from October 2006 to March 2007.Soil of the study site was silty clay loam in texture belonging to series. The area represents the Agro-Ecological Zone of Madhupur tract (AEZ-28) with P^H 5.8-6.5 (Haider *et al*., 1991). The experiment consisted of four levels of pruning: P_0: No pruning; P_1: One stem pruning; P_2: Two stem pruning and P_3: Three stem pruning. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. An area of 41.5 m x 13 m and the size of each plot was 3.2 m x 2 m. The tomato variety used in the experiments was "Ratan" and the seeds were collected from the Horticulture Research Centre, Bangladesh Agricultural Research Institute (BARI) at Joydebpur. Tomato seedlings were raised in five seedbeds of 3 m x 1m size. All weeds and stubbles were removed and 5 kg well rotten cow dung was mixed with the soil. 10 gram of seeds was sown on each seedbed on 27 October 2006. After sowing, seeds were covered with light soil. Heptachlor 40 WP was applied @ 4 kg ha^{-1}, around each seedbed as precautionary measure against ants and worm. The land of the experimental field was ploughed with a power tiller. After ploughing and laddering, all the stubbles and uprooted weeds were removed and then the land was ready. The quantity of manure, cow dung was also determined as recommended at the rate of 10 t/ha (BARC, 2005).The entire amount of cow dung and TSP were applied as basal during land preparation. Urea and MP were used as top dressing. Healthy and uniform 30 days old seedlings were uprooted separately from the seed bed and were transplanted in the experimental plots in the afternoon of 1 December, 2006 maintaining a spacing of 50 cm x 40 cm between the rows and plants respectively. This allowed an accommodation of 32 plants in each plot. All Intercultural operations were done when necessary. Fruits were harvested at 3 days intervals during early ripe stage when they attained slightly red color. Harvesting was started from 26 February, 2007 and was continued up to 29 March 2007. Ten plants were selected randomly from each plot for data collection. The data were collected on Plant height, flower clusters per plant**,** flowers per plant, flowers per cluster, fruits per plant, fruits per cluster, weight of individual fruit, fruit length, fruit diameter, dry matter of leaves, dry matter of fruits, yield of fruits per plot (kg), yield of fruits per hectare (ton).The recorded data on various parameters were statistically analyzed using MSTAT statistical package programmed and means were determined by Duncan`s Multiple Range Test (DMRT) according to Gomez and Gomez, (1984) at 5% level of significance.

RESULTS AND DISCUSSION

Plant height: Plant height varied significantly due to the pruning at 50, 60, 70 DAT and at harvest except at 40 DAT. At 40 DAT, the longest (56.25 cm) plant height was recorded from two stem pruning while the shortest (52.65 cm) plant height was obtained from no pruning. The longest (77.23 cm) plant height was

recorded from one stem pruning which was closely followed (96.56 cm) by P_2 and the shortest (68.72 cm) plant height was found from P_0 which was identical (70.29 cm) to three stem pruning at 50 DAT. At 60 DAT, the longest (99.82 cm) plant height was recorded from P_1 which was closely followed (96.56 cm) by P_2 and the shortest (92.00 cm) plant height was obtained from P_0 which was statistically identical (93.21 cm) to P_3. The longest (111.30 cm) plant height was recorded from P_1 which was statistically similar to P_2 (108.39 cm) and P_3 (106.10 cm) and the shortest (100.69 cm) plant height was found from P_0 at 70 DAT. At harvest the longest (137.59 cm) plant height was recorded from P_1 which was closely followed (123.43 cm) by P_2 and the shortest (108.50 cm) was recorded from P_0 (Figure 1). Rajendra and Patil (1979) reported that yield contributing character like plant height increases with the single stem plant than un-pruned plant. Atherton and Rudic (1986) stated that one or two side-shoots under the first truss on the main stem were found profitable in some growing areas.

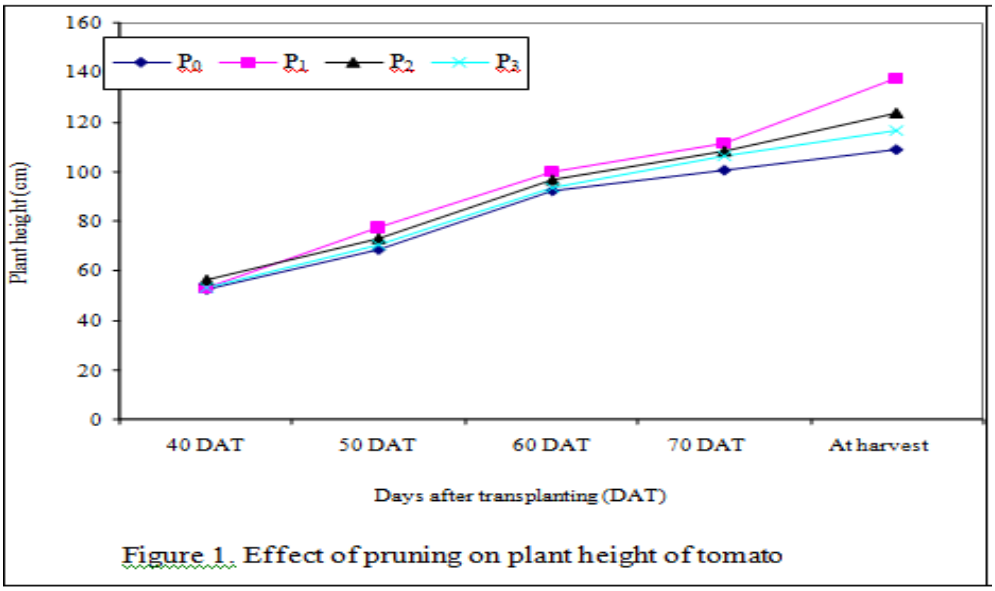

Figure 1. Effect of pruning on plant height of tomato

Flower clusters per plant: Number of flower cluster per plant varied significantly due to the pruning. The maximum (10.42) number of flower cluster per plant was recorded from three stem pruning while the minimum (7.05) number of flower cluster per plant was obtained from one stem pruning (Table 1). Rahman *et al.* (1988) reported that number of flower clusters plant^{-1} were maximum in un-pruned plant than single stem pruning followed by two time pruning which was disagree to the present findings.

Flowers per cluster: Number of flowers per cluster varied statistically due to the pruning of tomato plant. The maximum (7.05) number of flowers per cluster was recorded from one stem pruning which was statistically similar (6.86) with P_2 and P_3 (6.75), while the minimum (6.33) number of flowers per cluster was found from no pruning (Table 1). Adriance and Brison (1979) found that where tomatoes are to be staked it is necessary to prune the plants 1, 2 or 3 stems with closer spacing for attaining maximum number of flowers per cluster.

Flowers per plant: Number of flowers per plant varied significantly due to the pruning. The maximum (70.61) number of flowers per plant was recorded from three stem pruning, while the minimum (50.93) number of flowers per plant was recorded from one stem pruning. Rahman *et al.* (1988) reported that number of flowers were maximum in un-pruned plant than single stem pruning followed by two time pruning.

Table 1. Effect of pruning on yield contributing characters of tomato

Treatment(s)	Number of flower cluster per plant	Number of flowers per cluster	Number of flowers per plant	Dry matter content of leaves (%)	Dry matter content of fruits (%)
No pruning	9.44 b	6.33 b	60.88 b	10.30 ab	10.85
One stem pruning	7.05 c	7.05 a	50.93 c	10.78 a	11.41
Two stem pruning	9.61 b	6.86 a	66.54 a	9.94 b	11.12
Three stem pruning	10.42 a	6.75 a	70.61 a	10.23 ab	11.16
$LSD_{(0.05)}$	0.371	0.396	4.197	0.574	1.635
Level of significance	**	**	*	**	**
CV(%)	6.28	6.36	9.94	6.82	10.12

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Dry matter content of leaves: Dry matter content on leaves did not show the significant variation due to pruning. The maximum (10.78%) dry matter content on leaves was recorded from one stem pruning, while the minimum (9.94%) dry matter content on leaves was found from two stem pruning (Table 1).

Dry matter content of fruits: No significant differences were recorded on dry matter content of fruits due to the pruning. The maximum (11.41%) dry matter content on fruits was recorded from one stem pruning, while the minimum (10.85%) dry matter content on fruits was obtained from no pruning (Table 1).

Fruits per plant: Number of fruits per plant varied significantly due to pruning. The maximum (35.33) number of fruits per plant was recorded from three stem pruning which was statistically similar (34.11) to two stem pruning, while the minimum (27.05) number of fruits per plant was found from one stem pruning (Table 2). Sharfuddin and Ahmed (1986) noted that plants under un-pruned treatment produced maximum number (36) of fruits plant^{-1} which was antagonistic to the present study.

Length of fruit: Significant differences were recorded on length of fruit due to pruning in tomato. The maximum (8.02 cm) length of fruit was recorded from one stem pruning, while the minimum (6.62 cm) length of fruit was obtained from no pruning and two stem pruning (Figure 2). Rahman *et al.* (1988) reported highest fruit length of tomato from single stem pruning followed by two time pruning. Hernandez *et al.* (1992) found that fruit length was greatest in plants pruning to one stem and the number of fruits was higher.

Table 2. Effect of pruning on yield contributing characters and yield of tomato

Treatment(s)	Number of fruits per plant	Diameter of fruit (cm)	Weight of Individual fruit (g)	Number of fruits per cluster	Yield (kg/plot)
No pruning	33.97 a	5.64 b	86.89 b	3.44 b	34.97 bc
One stem pruning	27.05 b	6.40 a	103.26 a	4.25 a	33.49 c
Two stem pruning	34.11 a	5.47 b	86.25 b	3.36 b	36.57 b
Three stem pruning	35.33 a	5.67 b	90.67 b	3.69 b	42.79 a
$LSD_{(0.05)}$	2.729	0.239	8.170	0.339	2.234
Level of significance	**	**	**	**	**
CV(%)	11.54	6.36	11.92	11.61	7.42

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Diameter of fruit: Diameter of fruit showed significant differences due to pruning. The maximum (6.40 cm) diameter of fruit was recorded from one stem pruning, while the minimum (5.47 cm) diameter of fruit was found from two stem pruning which was statistically identical (5.64 cm and 5.64 cm) to three stem pruning and no pruning (Table 2). Rahman *et al.* (1988) reported that fruit diameter were the highest from single stem pruning followed by two time pruning. Hernandez *et al.* (1992) found that fruit diameter was highest in plants pruning to one stem in tomato.

Weight of individual fruit: Weight of individual fruit showed significant differences due to pruning. The maximum (103.26 g) weight of individual fruit was recorded from one stem pruning, while the minimum (86.25 g) weight of individual fruit was found from two stem pruning which was statistically identical to no pruning and three stem pruning (Table 2). Kusumo (1978) obtained larger and smooth skin when the plants were restricted to single stem it was found that fruit size increased when plants were pruned. Rajendra and Patil (1979) obtained maximum fruit weight (89.19 g) in case of single stem pruned plant while fruit weight was lowest (63.07) in unpruned plants.

Fruits per cluster: Number of fruits per cluster varied significantly due to the pruning. The maximum (4.25) number of fruits per cluster was recorded from one stem pruning, while the minimum (3.36) number of fruits per cluster was obtained from two stem pruning which was statistically identical to no pruning and three stem pruning (Table 2). Campos *et al. (*1987) reported that stem pruning increased number of fruits per cluster.

Yield (kg/plot): Yield per plot showed significant differences due to the pruning of tomato. The maximum (42.79 kg/plot) yield was recorded from three stem pruning, while the minimum (33.49 kg/plot) yield was obtained from one stem pruning which was statistically identical (34.97 kg/plot) with P_0 (no pruning) (Table 2). Patil*et al.* (1973) pointed out that tomato plants can be severely pruned without affecting the yield.

Yield (t/ha): Yield per hectare showed significant differences due to the pruning of tomato plant. The highest (66.86 t/ha) yield was recorded from three stem pruning, while the lowest (52.32 t/ha) yield was recorded from one stem pruning which was statistically identical to no pruning (Figure 3). Thompson and Kelly (1957) reported the effect of pruning on tomato increased yield per acre for the first 2 or 3 weeks and further added that in most of the experiments there was little or no increase in early yield per acre from pruning unless the pruned plants were set closer together than the un-pruned ones. Homme (1965) reported from an experiment that 2 and 3-stemmed plants gave the best yield then others single stemmed plants. Orzco*et al.* (1975) reported that un-pruned plant gave the highest yield (58.09 t/ ha) and 43.47 t/ha from pruned plants where the shoots were pinched after 3 months.

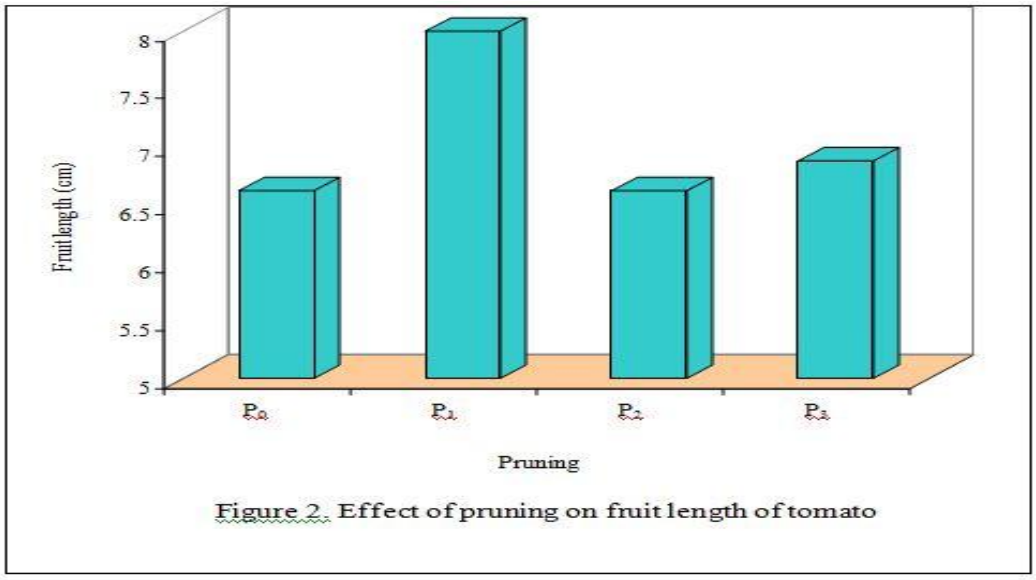

Figure 2. Effect of pruning on fruit length of tomato

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