



## Growth and yield performance of tomato by stem pruning

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### ABSTRACT

The investigation was conducted at the Horticulture Farm, Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh during the period from 2015 to 2016 to determine the performance of stem pruning on the growth and yield of tomato variety, Ratan. The experiment consisted of three treatments- no pruning, two stem pruning and three stem pruning laid out in a randomized complete block design with three replications. The shoots had significant effects on the plant height of two and three stem pruning over no pruning. Number of flowers, fruit length, fruit diameter were significantly higher in double stem pruning over triple stem pruning and no pruning. Number of fruits per cluster, number of ripe fruits per plant, individual fruit weight, fruit weight per plant and fruit yield per plot were higher in double stem pruning followed by triple stem pruning over no pruning. Moreover, double stem pruning had higher yield (57.16 t/ha), afterwards triple stem pruning (54.55 t/ha) over no pruning (49.77 t/ha).

### INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) belongs to the family Solanaceae is one of the most demanding and quality vegetables of Bangladesh. In Bangladesh, it ranks 2<sup>nd</sup> which is next to potato (BBS, 2015). The total production of tomato in Bangladesh was about 414000 t from 30769 hectares of land with an average yield of 13.45 t/ha (BBS, 2015). It was 69.41 t/ha in USA, 14.27 t/ha in India, 26.13 t/ha in China, 13.25 t/ha in Indonesia and 59.26 t/ha in Japan (FAO, 2014). Tomato is popular fruit vegetable for its nutritional value and diversified use like salad, juice, sauce etc. In fertile soil with favorable environmental conditions, tomato plants particularly indeterminate type, grow continuously and produce large number of branches. In that case, pruning is necessary because the branch bend down to the ground due to bearing load of fruits. Tomato plant can be severely pruned without affecting the yield (Patil *et al.*, 1973). Proper

pruning practices may lead to the production of relatively large size fruit with better quality, increase yield, early harvest, easy harvesting of fruits and conveniences in intercultural operations without damage to the fruits or plants. Appropriate pruning method gives the best quality and early fruit in tomato (Lopez and Chan, 1974; Balraj and Mahesh, 2005). But in Bangladesh, majority of the growers do not get good quality fruit and high yield because of their ignorance about proper pruning practices. Therefore, this investigation was undertaken to find out a suitable pruning practice for maximum growth and yield of tomato.

### MATERIALS AND METHODS

This investigation was conducted at the Horticulture Farm, Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh during the period from 2015 to 2016 to study the performance of stem pruning on the growth and yield of tomato. The texture of the soil was silty-loam with a pH 6.6. The climate of the

experimental area was subtropical in nature. The planting material was seeds of Ratan, a high yielding indeterminate type tomato genotype collected from Horticulture farm, BAU.

The seedlings were raised in five seedbeds of 3 x 1 m<sup>2</sup>. 35 days old seedlings were transplanted to the experimental field following RCBD with 3 replications. The plot size was 2.8 x 2.0 m<sup>2</sup> and spacing was 70 x 50 cm<sup>2</sup>. Standard management practices were done for tomato. Three pruning operations were practiced-P<sub>1</sub>, P<sub>2</sub> and P<sub>3</sub> [No pruning (No stem pruning practices), Double stem Pruning (Pruning plants keeping double stem) and Triple stem Pruning(Pruning plants keeping triple stem)].

Pruning was started 35 days after transplanting and continued throughout the whole period of plant growth leaving the required number of stem as per treatments. Data were collected on the following parameters- plant height, days to first flowering, number of flower clusters per plant, flowers per cluster, flowers per plant, fruit cluster per plant, fruits per cluster, ripe fruits per plant, fruit length, fruit diameter, weight of individual fruit, weight of fruits per plant, weight of fruits per plot and fruit yield per hectare.

### Statistical Analysis

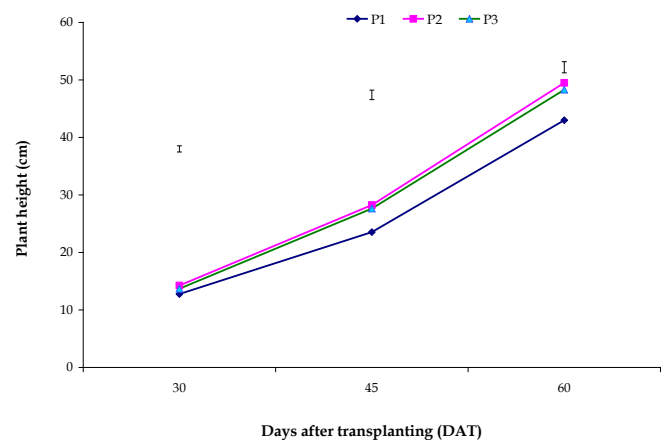
The data on different yield components and yields were statistically analyzed using SPSS software to find out the significance of the difference among the treatments. The analysis was performed by F-test and the significance of the difference between pairs of treatment means was evaluated by Least Significant Different (LSD) test at 5% and 1% level of probability.

## RESULTS AND DISCUSSION

The results of the main effects of stem pruning have been presented and described below-

### Plant height

Plant height was recorded at 30 DAT, 45 DAT, and 60 DAT. The main effects of stem pruning on plant height of tomato at different DAT were significant. The maximum plant height (49.49cm) at 60 DAT were found from double stem pruning and the minimum (43.00cm) was observed from no stem pruning practices (Figure 1). In case of all pruning practices it was observed that the plant height increased gradually with the progress of time. Hernandez *et al.* (1992) also observed higher plant height in pruned tomato plant than unpruned tomato.



**Figure 1.** Effect of stem pruning on plant height in tomato at different days after transplanting. Vertical bar indicates LSD at 1% level of significance.

(P<sub>1</sub> = No pruning, P<sub>2</sub> = Double stem pruning, P<sub>3</sub> = Triple stem pruning.)

### Days to first flowering

Significant variation was found in respect of different stem pruning required for days to first flowering. Days required to first flowering decreased with the increasing stem pruning. Double stem pruning produced early flowering (34.84 days) and delayed flowering (36.18 days) from no stem pruning (Table 1). Hernandez *et al.*

(1992) did not found any significance among pruned and unpruned tomato plants.

***Number of flower clusters per plant, flowers per cluster and flowers per plant***

The main effects of stem pruning on number of flower cluster per plant, flowers per cluster and flowers per plant were also significant (Table 1). The highest number of flower clusters per plant (23.63) was found from double stemmed plants and the lowest number of flower cluster per plant (22.63) was found no stem pruning practices. The finding agrees with the findings of Dhar *et al.* (1993) and Balraj and Mahesh (2005). The highest number of flowers per cluster (7.16) was produced at double stem pruning and the minimum (5.67) was produced from control treatment with no pruning practices (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. In case of number of flowers per plant the highest number of flowers (180.31) per plant was obtained at double stem pruning and the lowest number (126.73) was produced at no pruning practices. Similar result

were observed by Adriance and Brison (1979) and Dhar *et al.* (1993).

***Number of fruit clusters per plant, fruits per clusters and ripe fruits per plant***

The number of fruit clusters per plant, fruits per clusters and ripe fruits per plant are important growth characteristics of tomato plant. The main effects of stem pruning on number of fruit clusters per plant fruits per clusters were significant (Table 1 and 2). The highest number of fruit clusters per plant (7.12) was obtained at double stem pruning and the lowest (6.51) number was obtained at no stem pruning. Dhar *et al.* (1993) and Balraj and Mahesh (2005) reported that stem pruning increased number of fruits per cluster. The number of fruits per cluster increased due to the increase in different pruning practices at a certain level. The highest number of fruits per cluster (3.25) was obtained from double stem pruning and the lowest number (3.04) was produced from control treatment with no pruning practices. Similar finding were found by Dhar *et al.* (1993) and Balraj and Mahesh (2005).

Table 1  
Effect of pruning on the flowering characters of tomato.

Pruning	Days to first flowering	No. of flower cluster per plant	No. of flowers per cluster	No. of flowers per plant	No. of fruits per cluster
P1	36.18	22.63	5.67	126.73	3.04
P2	34.84	23.63	7.16	180.31	3.25
P3	35.56	23.26	6.40	153.11	3.17
LSD0.05	0.16	0.18	0.20	1.81	0.06
LSD0.01	0.21	0.25	0.27	2.50	0.08
Level of significance	**	**	**	**	**

\*\* = Significant at 1% level of probability

P<sub>1</sub> = No pruning, P<sub>2</sub> = Double stem pruning,

P<sub>3</sub> = Triple stem pruning.

In case of the number of ripe fruits per plant, the highest number of ripe fruits per plant (25.59) was obtained from double stem pruning and the lowest number of fruits per plant (16.95) was produced from no pruning practices (Table 2). Cameos *et al.* (1987) also found higher number of fruits per plant in the double stem pruning compare to others in tomato.

### **Fruit Length and diameter**

The effects of different pruning practices on fruit length of tomato at harvest were significant. The fruit length was increased gradually with the increasing stem pruning up to double stem pruning. The longest fruit (4.90 cm) was obtained from double stem pruning and the shortest (4.05 cm) was produced from no stem pruning (Table 2). In tomato, Islam *et al.* (1996) and Uddin *et al.* (1997) observed longer fruit in pruned plants over unpruned. On contrary, the variation in diameter of fruits due to different pruning practices was found to be statistically non-significant. The maximum diameter of fruit (5.88) was found from double stem pruning and the minimum fruit diameter (5.28 cm) was produced from no stem pruning

(Table 2). Islam *et al.* (1996) and Uddin *et al.* (1997) observed higher diameter of fruit in pruned plants over unpruned in tomato plants.

### **Weight of individual fruit**

The different levels of pruning practices had significant effect on the weight of individual fruit of Tomato. The highest weight of individual fruit (66.69 g) caused by double stem pruning and the minimum weight of individual fruit (58.07 g) was produced from no stem pruning (Table 2). Similar results were observed by Balraj and Mahesh (2005) and Cameos *et al.* (1987).

### **Fruit yield per plot**

Significant difference in yield of tomato per plot due to the influence of different pruning practices was observed. The maximum yield per plot (32.01 kg) was achieved by double stem pruning and the minimum yield per plot (27.87 kg) was produced from no stem pruning (Table 2). The results in tomato pruning were similar to the findings of Dhar *et al.* (1993), Balraj and Mahesh (2005) and Cameos *et al.* (1987).

Table 2  
Effect of pruning on the flowering characters of tomato.

Pruning	No. of ripe fruits per plant	No. of fruits cluster per plant	Fruit length (cm)	Fruit diameter (cm)	Weight of individual fruit (g)	Weight of fruits per plant (kg)	Fruit yield per plot (kg)
P <sub>1</sub>	16.95	6.51	4.05	5.28	58.07	1.74	27.87
P <sub>2</sub>	25.59	7.12	4.90	5.88	66.69	2.00	32.01
P <sub>3</sub>	22.70	6.83	4.22	5.50	63.64	1.91	30.55
LSD <sub>0.05</sub>	0.16	0.11	0.13	0.07	0.94	0.05	0.45
LSD <sub>0.01</sub>	0.22	0.14	0.18	0.10	1.29	0.06	0.62
Level of significance	**	**	**	**	**	**	**

\*\* = Significant at 1% level of probability

P<sub>1</sub> = No pruning,

P<sub>2</sub> = Double stem pruning,

P<sub>3</sub> = Triple stem pruning.

### Weight of fruits per plant

The different levels of pruning practices had no significant effect on the weight of fruits per plant of tomato. The highest weight of individual fruit (2.00 kg) caused by double stem pruning and the minimum weight of individual fruit (1.74 kg) was produced from no stem pruning (Table 2).

Balraj and Mahesh (2005) and Cameos *et al.* (1987) found similar results in tomato.

### Fruit yield per hectare

Significant variation in yield per hectare of tomato due to the influence of different pruning practices was observed. The maximum yield per hectare (57.16 t) was achieved by double stem pruning and the minimum yield per plot (49.77 t) was produced from no stem pruning (Figure 2). The highest fruit yield per ha (912.0 q/ha) was obtained when the cherry tomato plants with two main stems were grown at the closest spacing for long duration under semi controlled greenhouse conditions in Delhi, India (Balraj and Mahesh. 2005). It was found that the highest yield (66.25 t/ha) was produced in the double branched plants followed by unpruned plants (66.21 t/ha) and single Branched (61.29 t ha<sup>-1</sup>) plants (Dhar *et al.* 1993). Cameos *et al.* (1987) also found similar result.

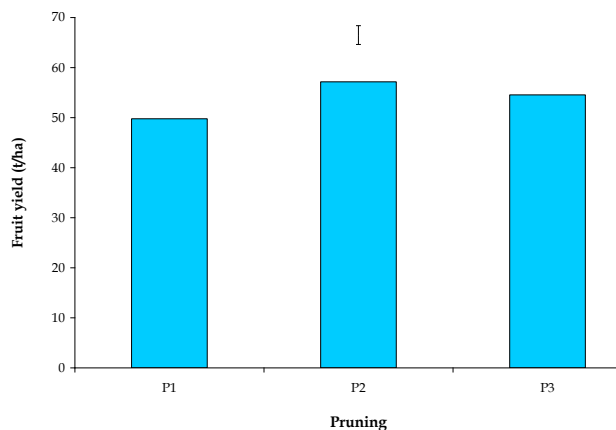


Figure 2 Effect of stem pruning on fruit yield of tomato. Vertical bar indicates the LSD at 1% level of significance.

(P<sub>1</sub> = No pruning, P<sub>2</sub> = Double stem pruning, P<sub>3</sub> = Triple stem pruning)

### CONCLUSION

From the above findings of this study, it could be concluded that two stem pruning showed higher number of flowers per plant (180.31), longer fruit (4.90 cm) and greater fruit diameter (5.88 cm) over triple stem pruning and no pruning. Higher number of fruits per cluster, number of ripe fruits per plant, individual fruit weight, fruit weight per plant and fruit yield were found followed by triple stem pruning over no pruning. Total yield per hectare was tremendously increased in double pruning (57.16 t) followed by triple stem pruning (54.55 t) over no pruning (49.77 t). In short, double-stem pruning increases tomato growth and yield over triple stem pruning and no pruning.

### REFERENCES

- Adriance GW and Brison FR (1979). Propagation of Horticultural Plants. Tata Mcgraw Hill Publishing Company Ltd., New Delhi. pp. 278-279.
- Balraj S and Mahesh K (2005). Effect of plant spacing and stem pruning on growth and yield of cherry tomato in greenhouse. Haryana Journal of Horticultural Science, 34(1-2): 179-180.
- BBS (2015). Hand Book of Agricultural Statistics, December 2015. Bangladesh Bureau of statistics, Ministry of Planning, Govt. Peoples Republic of Bangladesh, Dhaka. pp. 14.
- BBS (2015). Monthly Statistical Bulletin. Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, Govt. Peoples Republic of Bangladesh, Dhaka. pp. 55.
- Cameos JPDE, Belford CC, Galvod JD and Forties PCD (1987). The effects of stem pruning and plant population on tomato productivity. Revista Ceres, 34: 192.
- Dhar M, Chowdhury SS, Saba MC, Islam MN and Sattar MA (1993). Effect of pruning and number of plants per hill on the growth and yield of tomato. Bangladesh Horticulture, 21: 11-19.
- FAO (2014). FAO Bulletin of Statistics, Food and Agricultural Organization of the United Nations, Rome, Italy. pp. 87-88.
- Hernandez CVM, Sanchez FCD and Esplnosa PR (1992). Response to planting distance and pruning system in tomatoes growing in hydroponic

- culture in a basic greenhouse. Department de Fitecna, Universidad Autonoma Chapingo, Chapingo, Mexico. 15(72-74): 23-25.
- Islam MA, Farroque AM and Siddiqua A (1996). Effect of planting patterns and different nitrogen levels on yield and quality of tomato. Bangladesh Journal of Agricultural Science, 24(1): 4-5.
- Lopez BF and Chan JL (1974). The effects of spacing and pruning methods on the yield and quality of staked tomatoes. Agricultural Technology, Mexico, 3(9): 340-345.
- Patil VKP and Gupta TPG (1973). Influence of pruning, mulching and nitrogenous fertilizer on the growth, yield and quality of staked plants of Sioux variety of tomato. Punjab Vegetable Grower, 8: 4-9.
- Uddin MR, Hossain MA, Mian MAK, Uddin MZR and Mahtabuddin AKM (1997). Effect of stem pruning and spacing on the growth and yield of Tomato. Bangladesh Horticulture, 25 (1-2): 41-46.