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Influence of sucker pruning and old leaves removal on growth and yield of cherry tomato

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ABSTRACT

A field experiment was conducted to evaluate the influence of different pruning techniques viz. P_0= control, P_1= sucker pruning, P_2= old leaf pruning on growth and yield characteristics of cherry tomato. JP-13 cherry tomato line, collected from ASRBC, ACI Ltd was used in this experiment. The experiment was arranged in a Randomized Completely Blocked Design (RCBD) with three replications. Highest plant height (195.4 cm), fruit length (17.0 mm), fruit diameter (37.6 mm), single fruit weight (25.1 gm) and chlorophyll percentage (55.7) was obtained from treatment P_1 whereas highest no. of fruit (22.7), yield/plant (381.6 gm) and yield/ha (20.3 ton) was found in treatment P_2. Both the pruning treatments showed superiority in yield contributing characters compared to control. Thus integration of these techniques can be a viable way to increase production of cherry tomato.

Key Words: *Cherry tomato, Sucker pruning, Old leaf pruning, Growth and Yield*

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I. Introduction

Cherry tomato is commonly called garden tomato which size and shape varies from a thumb tip to up to the size of a golf ball with round to oblong shape (Prema et al., 2011). Small to medium sized fruits are particularly desired in the market (Field and Nichols, 2004). It is very popular all over the world now-a-days due to having high content of vitamin A, C, lycopene, β-carotene and low calories (Rosales et al., 2011) including Bangladesh. Fruit set in cherry tomato can easily occur in comparatively high temperature hence can act as a source of germplasm for providing disease resistance and adaptability to hot seasons (Anon, 2009). In the segment of tomato, fruit quality and off season supply are factors that can ensure the production success (Guimarães et al., 2007). Appropriate crop management techniques can be a viable option in ensuring this quality and appearance of the produce (Marim et al., 2005). In this context, along with the vertical staking, a recommended cultural practice for cultivation in protected environment is the removal of basal leaves or old leaf pruning to improve the use of sunlight, increase aeration between plants, and consequently decrease incidence and transmission of diseases and pests (Alvarenga, 2004). In contact with the ground, these leaves tend to be gateway for

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pathogens, and form a favorable humid environment for their development (Heuvelink et al., 2005). Another method of proper management of cherry tomato and table tomato plants is removal of suckers. This is done to manipulate the plants with indeterminate growth and also helps in maintaining a proper ratio between the vegetative and reproductive part (Maboko, 2006) that ensures higher yield with quality produce. Keeping these views in mind, the present study was conducted to evaluate the effect of different pruning technique *viz.* sucker pruning and old leaf removal on growth and yield of JP-13 cherry tomato.

II. Materials and Methods

The experiment was conducted in Horticulture Farm of department of Horticulture, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during the months of April - July, 2016. The cherry tomato line JP-13 was used in this experiment. Three treatments *viz.* P_0= Control, P_1= Sucker pruning and P_2= Old leaf pruning were used to accomplish the experiment. The seeds were sown in 36 plug trays filled with cocodust:sand:vermicompost at a ratio of 1:1:1 for germination and subsequent seedling growth. The experiment was set in a Randomized Completely Blocked Design (RCBD) with three replications. Thirty days old seedlings were transplanted in plots measuring 3m X 1m maintaining a spacing of 40cm X 60cm. The plots were covered with transparent polyshed. Manure and fertilizers were applied according to the recommendations of Bangladesh Agricultural Research Institute (BARI) (Mondal et al., 2011). Intercultural operations and watering was done as and when necessary. In case of sucker pruning, all the suckers below the first flower cluster were removed. Old leaves were removed at the onset of fruiting. Data on plant height, number of branch, no. of leaves/plant, days to first flower, chlorophyll percentage (using SPAD-5 Chlorophyll meter), no. of flower/plant, no. of fruit/plant, fruit length, fruit diameter, single fruit weight, yield/plant and yield/ha were recorded and arranged accordingly for analysis done by MSTAT-C computer program. Differences between varieties were evaluated by Least Significance Difference Test (LSD) at 5% level of significance (Gomez and Gomez, 1984).

III. Results and Discussion

Plant height

Plant height showed significant variation in case of different treatments. The tallest plant (195.4 cm) was obtained from P_1 and the lowest was obtained from P_0 (183.8cm) (Table 01).

No. of branch per plant

Significant variation was observed in case of number of branches/plant in different pruning treatments in JP-13 cherry tomato. The maximum no. of branch/plant was obtained from P_0 (5.7) and the minimum no. of branch/plant (2.3) was obtained from P_1 (Table 01).

No. of leaves per plant

Different pruning treatments showed significant variation on no. of leaves/plant in JP-13 cherry tomato. P_0 showed the highest number of leaves (23.3) whereas the minimum was obtained from P_2 (13.1) (Table 01).

Days to first flower

The cherry tomato under study showed variations in case of days required for first flowering under different pruning treatments. Earliest flowering was observed in treatment P_1 (21.7 days) and treatment P_0 was last in days to first flower (30.0 days).

Chlorophyll percentage

Significant variation was observed in case of chlorophyll percentage of leaves under different pruning techniques. Maximum chlorophyll percentage was found in treatment P_1 (55.7) and minimum was observed in treatment P_0 (43.7) (Table 01).

Table 01. Influence of different pruning treatments on growth related characteristics of JP-13 cherry tomato [x]

Treatment	Plant height (cm)		No. of branches		No. of leaves/plant		Days to first flower		Chlorophyll percentage	
P_0	183.8	b	5.7	a	23.3	a	30.0	a	43.7	c
P_1	195.4	a	2.3	c	18.0	b	21.7	c	55.7	a
P_2	188.5	b	3.7	b	13.1	c	25.3	b	50.9	b
CV%	*1.3*		*13.6*		*5.9*		*4.5*		*4.1*	
LSD (0.05)	*5.5*		*1.2*		*2.4*		*2.6*		*4.6*	

[x] In a column the means having similar letter(s) are statistically identical while those having dissimilar letter(s) differ significantly at the 0.05 level of probability. Here, P_0= Control, P_1= Sucker pruning, P_2= Old leaf pruning.

No. of flower per plant

Statistical difference was observed in no. of flower with different pruning treatments. Highest number of flower (30.3) was found in treatment P_0 and the lowest was found in P_1 (20.7) (Table 02).

No. of fruit per plant

Fruit number was significantly varied in different pruning treatments. Maximum number of fruits were obtained from P_3 (22.7) whereas the minimum was obtained from P_0 (19.0) (Table 02).

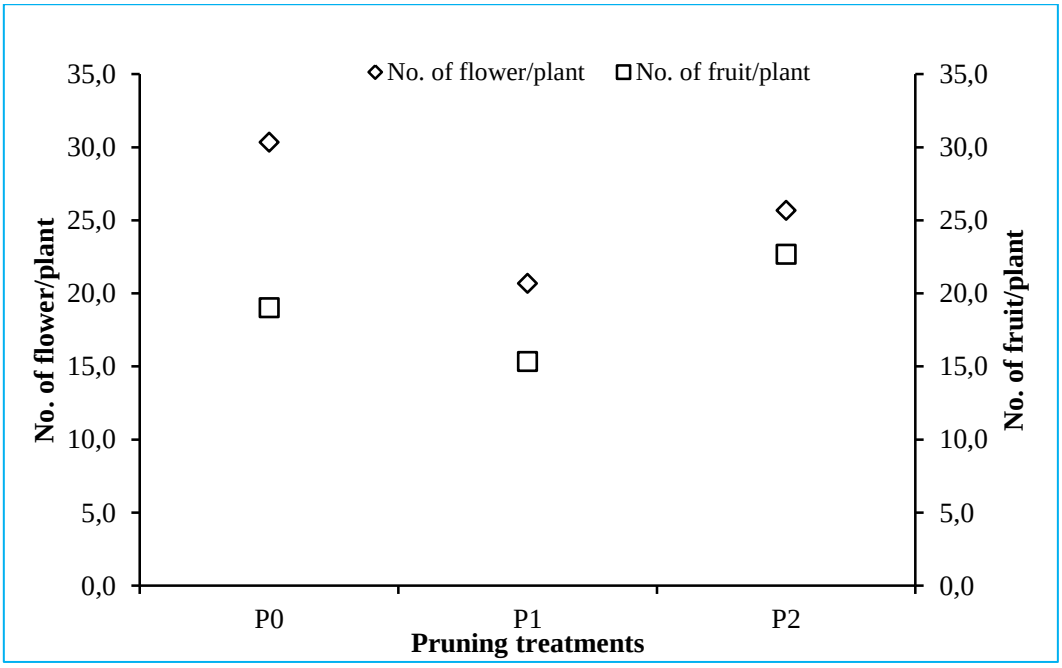

Figure 01. Influence of different pruning treatments on no. of flower/plant and no. of fruit/plant of JP-13 cherry tomato.

Fruit length

Different pruning treatments showed significant variations in case of fruit length of JP-13 cherry tomato. The highest fruit length was observed in P_1 (17.0 mm) and the minimum was observed in P_0 (13.5 mm) to which P_2 (14.5 mm) showed statistical similarity (Table 02).

Fruit diameter

Fruit diameter showed statistical difference under different pruning treatments. Maximum fruit diameter was obtained from treatment P_1 (37.6 mm) and the minimum was observed from P_0 (33.0 mm) (Table 02).

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Single fruit weight
Significant variation was observed in case of single fruit weight of JP-13 cherry tomato under different pruning techniques. Fruits with highest average weight was observed in P_1 (25.1 gm) and the lowest was found in P_0 (17.6 gm) (Table 02).

Yield per plant
JP-13 cherry tomato under different pruning treatment showed significant inequality in case of yield/plant. The highest yield/plant was observed in P_2 (381.6 gm) and the lowest was obtained from P_1 (315.9 gm) (Table 02).

Yield per ha
Yield/ha showed significant variation in case of yield/ha in JP-13 cherry tomato variety. Maximum yield/ha was found in P_2 (20.3 ton) whereas minimum was observed in P_1 (16.5 ton) (Table 02).

Table 02. Influence of different pruning treatments on growth related characteristics of JP-13 cherry tomato [x]

Treatment	No. of flower/plant	No. of fruit/plant	Fruit length (mm)	Fruit diameter (mm)	Single fruit weight (gm)	Yield/ plant (gm)	Yield/ ha (ton)
P_0	30.3 a	19.0 ab	13.5 b	33.0 b	17.6 c	315.9 c	16.5 c
P_1	20.7 c	15.3 b	17.0 a	37.6 a	25.1 a	368.2 b	18.2 b
P_2	25.7 b	22.7 a	14.5 b	35.1 b	20.5 b	381.6 a	20.3 a
CV%	*2.6*	*12.7*	*5.0*	*3.0*	*1.7*	*1.3*	*2.0*
LSD (0.05)	*1.5*	*5.5*	*1.7*	*2.4*	*0.8*	*10.4*	*0.8*

[x] In a column the means having similar letter(s) are statistically identical while those having dissimilar letter(s) differ significantly at the 0.05 level of probability. P_0= Control, P_1= Sucker pruning, P_2= Old leaf pruning.

Discussion
Different pruning technique showed significant variation in growth and yield parameters studied in the experiment. Higher plant height was obtained from sucker pruning compared to the other treatments. These may be due to the more availability of the leaf assimilates to the plants as reported by Ara et al. (2007); Maboko and Du Plooy (2009) on tomato and Maboko et al. (2011) on sweet pepper. Also highest chlorophyll activity was found in this treatment compared to all others. Many researchers studied the effect of pruning on vegetative parameters of plants and show that pruning limits vegetative growth and allows more light penetration and increases photosynthesis efficiency and so improve vegetative growth of plants (Preece and Read, 2005). Sucker pruning also induces earlier flowering than the other treatments, a potential for gaining earlier production. Also the fruits produced were comparatively bigger and weight was higher than the fruits produced by control and old leaves pruned plant albeit the number of flower and fruits were lower. An increase in total number of flowers and fruits has been shown to increase competition for photosynthates and, thus decreased fruit size (Veliath and Ferguson, 1972). According to Marcelis (1994) and Bertin (1995), plants that are subjected to high fruit load or sink:source ratio often result in flower or fruit abortion which was observed in this experiment (Figure 01). Large reduction in tomato yield when side shoots were allowed to develop to 21 days, compared to 7 days. So sucker pruning can be a viable practice for ensuring quality production of cherry tomato. With closer spacing, the reduced number of fruits can also be covered as observed by Franco et al. (2009) and Ara et al. (2007). Higher number of fruit with small to medium round in size was found in plants with old leaves pruned off. These sizes are most desired by consumers (Field and Nichols, 2004) and growers are required to produce tomatoes within this range to ensure highest profitability (Cockshull et al., 2001). Old leaves removal also gave earlier fruiting as observed by Heuvelink et al. (2005). Removal of basal leaves also improves the use of sunlight, increase aeration between plants, and consequently decrease incidence and transmission of diseases and pests (Alvarenga, 2004). In contact with the ground, these leaves tend to be gateway for pathogens, and form a favorable humid environment for their development. Highest yield/plant and

yield/ha was also obtained from the old leaves pruning treatment. In accordance with Silva et al. (2011), the upper third of tomato plants, despite having only 23% of the total leaf area of the plant, intercepts 73% of the total solar radiation and is responsible for 66% of the production of photo assimilates. Thus, basal leaves are not very important for the net photosynthesis of plants, and its contribution to photosynthesis gradually decreases as the tomato leaf gets older (Silva et al., 2011). Thus they rather act as a sink for the photosynthates produced by the upper leaves and reduce yield. So, removal of these older leaves can ensure proper health of the tomato plant along with higher yield ensuring marketable quality.

IV. Conclusion

Pruning treatments showed potential positive effect on growth and yield of JP-13 cherry tomato in relation to control. Old leaves pruning gave highest total yield whereas larger fruits were obtained from sucker pruning. So, integration of these management techniques can play a vital role to ensure quality production in not only cherry tomatoes but also in case of table tomato.

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APA (American Psychological Association)

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