



Staking and pruning enhance the production of ‘Roma VF’ tomato in coastal region of Bangladesh

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ARTICLE INFO

Article history

Accepted: 27 August 2020

Online release: 17 September 2020

Keyword

Tomato, staking, pruning

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ABSTRACT

Staking and pruning could improve the yield of tomatoes. The present investigation was aimed to find out the staking and pruning effect on tomato production. The research was done on ‘Roma VF’ tomato in coastal region of Bangladesh” to determine the effect of staking and pruning on growth and yield of tomato plants. The experiment was laid out in Randomized Complete Block Design (RCBD) on single variety tomato plant with three treatments (no staking and no pruning, only pruning, staking and pruning) and three replications in coastal region. The parameters of the study were plant height (cm), number of branches per plant, number of leaves per plant, number of flowers per plant, number of fruits per plant, fruit brix (%). Among all treatments staking and pruning was responsible for maximum average height (46 cm), number of branches per plant (7.67), number of leaves per branch (21), number of flowers per plant (18), number of fruits per plant (8.33) and fruit brix (11.3%). The statistical analysis of data showed the significant effect of treatments on tomato plants. Among all treatments staking and pruning is the best treatment, and it is suitable for farmers in tomato production.

INTRODUCTION

Tomato (*Lycopersicon esculentum* L.) is one of the most important horticultural crops and is produced, traded and consumed all over the world (Fernqvist, 2014). It belongs to family Solanaceae, which is used in almost every meal in all homes, chops bars and restaurants to create appetite and taste (Sowley et al., 2013). Tomatoes originate in the Andes of South American. The cultivated tomato was brought to Europe by the Spanish conquistadors in the sixteenth century and later introduced from Europe to southern and eastern Asia, Africa and the Middle East. Recently, wild tomato has been distributed into other parts of South America and Mexico (Dam et al., 2005). In Bangladesh tomato is cultivated all parts of the country during winter season and summer season. The cultivated area under tomato in Bangladesh is 6.81%, average yield 5451 kg/acre, total production 368000 tons (BBS, 2016). The yield of tomato in Bangladesh is not satisfactory enough. The yield of tomato could be increased

substantially through improved agronomic techniques like staking and pruning. A significant yield is increase by staking practice on tomato cultivation (Ahmad and Singh, 2005). Pruning is the removal of side stem or shoots to limit plant growth and to divert nutrients to flower clusters on the remaining stem or shoot. Pruning in tomatoes has been reported to increase yields and quality of fruits (Hadfield, 1989; Preece, 1995; Srinivasan et al., 2001). Staking and pruning gave clean and bigger fruits with an increase in total marketable fruit yield by weight (Sowley et al., 2013). Staking and stem pruning are the most important factors which improves fruit quality by keeping plants and fruits off the ground thus reduces rotting, pruning diverts nutrients to flower clusters and fruits on the main stem and allows more efficient air circulation (Ali and Moniruzzaman, 2017). So, the requirements of stem pruning and staking system are very important for proper growth and yield of tomato. But in Bangladesh, majority of the farmers do not get good quality fruit and high yield because of their lack of knowledge about proper

staking and pruning practices. In this context, proper staking and stem pruning for the 'Roma VF' tomato especially in winter season in Bangladesh is important to ensure higher yield and economic return. Hence, this investigation was undertaken to find out a suitable agronomic techniques for maximum growth and yield of 'Roma VF' tomato variety.

MATERIALS AND METHODS

Study area

The experiment was conducted during the period of November, 2018 at research field of Agriculture department, Noakhali Science and Technology University, Bangladesh. The climate of the experimental area was temperate in nature. The soil was sandy loam in texture to slightly saline which pH was 7.5-8.3.

Sample preparation

In this experiment used local variety 'Roma VF' and the experiment was laid out in Randomized Complete Block Design (RCBD) with three treatments (no staking and no pruning, only pruning, staking and pruning) and three replications. 'Roma VF' is a determinate type of plant. Determinate type of plants are not heavily pruned. Pruning removes small shoots where each leaf joins the stem. Remove the shoot sucker when they are less than 4 inches long to avoid injuring the plant. Staking requires wooden or metal stakes 3 to 4 feet long for determinate varieties. When staking determinate varieties, prune only once to remove the first suckers.

Treatments

In this experiment three treatments were considered: T1= No staking and no pruning on tomato plant, T2= Only pruning on tomato plant, T3= Staking and pruning on tomato plant and replications: 3. Tomato seedlings were raised in three seedbeds of 3.0 m × 1.0 m size. In each seedbed seeds were sown on November 15, 2018. After sowing, seeds were covered with light soil. The emergence of the seedlings took place with 6 to 7 days after sowing. 30 days old seedlings were transplanted to the experimental field. The plot

size was 2.8 m × 2.0 m and spacing was 70 cm × 50 cm.

Data collection

Data on the following parameters were recorded from the experimental plot (no staking and no pruning on tomato plant, only pruning on tomato plant, staking and pruning on tomato plant). The height of each plant was measured (cm) from the base of the plant to the apex with a tape measure. Height of the tomato plants were recorded at 30, 45 and 60 days after transplanting. The number of branches per plant was recorded at 30, 45 and 60 days after transplanting. Randomly selected branches of plants were used for the measurement of leaves per branch at 30, 45, and 60 days after transplanting. The number of flowers per plant was recorded at 45, 55, and 65 days after transplanting. The number of fruits per plant was recorded at 55, 70, and 85 days after transplanting. The individual fruit brix (%) of each treatment plot was done at 90 days after transplanting by refractometer. The brix (%) was estimated by using correction factor chart.

Data analysis

All of the data were recorded by counting through eye estimation. Data were analyzed using SPSS statistical software (Version 25, Chicago, IL, USA) and Microsoft Office Excel 2013 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% level of probability.

RESULT AND DISCUSSIONS

Plant height (cm)

Plant height varied significantly due to the no staking and no pruning, only pruning and staking and pruning at 30, 45, 60 DAT found average height were (30.67 cm, 31.67 cm, 32.67 cm), (34.33 cm, 35.33 cm, 35 cm) and (35 cm, 41 cm, 46 cm) respectively. The maximum plant height (46 cm) at 60 DAT was found from staking and pruning and the minimum (35 cm) was found from no staking and no pruning at 60 DAT (Figure 1).

Pruning affected plant height and staked and pruned plants were significantly higher than unstaked and unpruned plants. Alam et al. (2016) was said that, the increase in plant height of tomato might be due to removal of branches that leads to supply nutrients in the remaining branches.

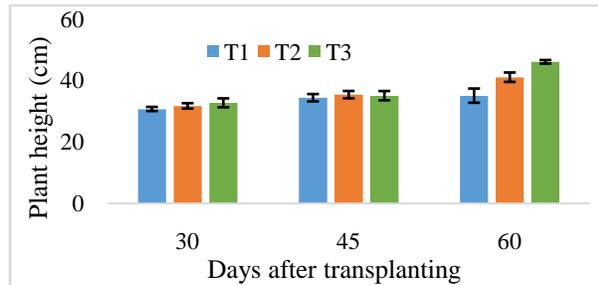


Figure 1: Staking and pruning effect on height of tomato plant. Vertical bar indicates LSD at 5% level of significance. (T1= No staking and no pruning, T2= Only pruning, T3= Staking and pruning, DAT= Days after transplanting)

Number of branches per plant

Number of branch varied significantly due to the staking and pruning practices. The highest branches number was found on staking and pruning (7.67) and the lowest branches number on no staking and no pruning practices (5.67) at 60 DAT (Figure 2). Sowley et al. (2013) said that staking and pruning influenced the number of branches per tomato plant.

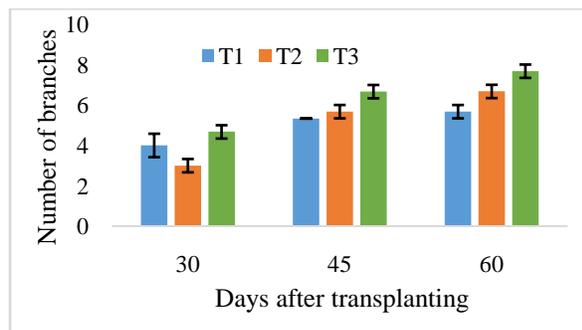


Figure 2: Staking and pruning effect on branches of tomato plant. Vertical bar indicates LSD at 5% level of significance. (T1= No staking and no pruning, T2= Only pruning, T3= Staking and pruning, DAT= Days after transplanting)

Number of leaves per branch

The plants have significant effect on number of leaves per branch by staking and pruning treatments. The leaves per branch were recorded maximum (21) at 60 DAT where staking and pruning system was done and the minimum number of leaves (19) per branch was found at 60 DAT where no staking and no pruning was done which was statistically significant (Figure 3).

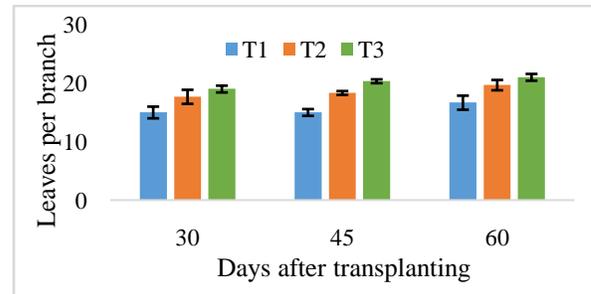


Figure 3: Staking and pruning effect on leaves per plant of tomato plant. Vertical bar indicates LSD at 5% level of significance. (T1= No staking and no pruning, T2= Only pruning, T3= Staking and pruning, DAT= Days after transplanting)

Number of flowers per plant

By staking and pruning treatments the plants show significant effect on number of flowers per plant at 45 and 55 DAT, but non-significant effect shown at 65 DAT for all treatments (Figure 4).

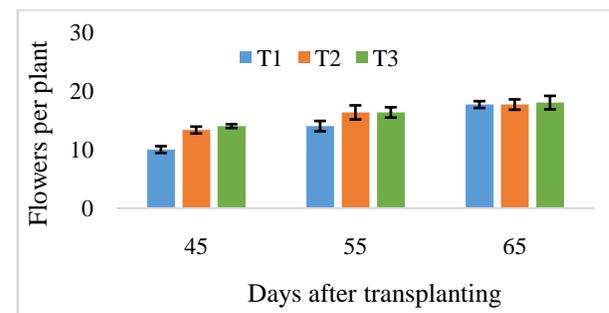


Figure 4: Staking and pruning effect on flowers per plant of tomato plant. Vertical bar indicates LSD at 5% level of significance for 45 DAT and 55 DAT and non-significant for 65 DAT. (T1= No staking and no pruning, T2= Only pruning, T3= Staking and pruning, DAT= Days after transplanting)

The highest number of flowers were found (18) at 65 DAT on staking and pruning and the plants found lowest number of flowers (17.67) at 65 DAT on no staking and no pruning practices and only pruning which was statistically similar. Hernandez et al. (1992) did not found any significant in case of number of flowers per plant among pruned and unpruned tomato plants. Ara et al. (2007) found that, number of flower per cluster was influenced significantly as spacing but no interaction effect was found in case of number of flower per cluster by staking and pruning practices.

Number of fruits per plant

The main effect of staking and pruning in relation to the number of fruits per plant was significant. The maximum number of fruit per plant was recorded (8.33) at 85 DAT where staking and pruning was done (Figure 5). The minimum number of fruit per plant (5.67) at 85 DAT where no staking and no pruning was done. According to Ara et al. (2007), yield of tomato plant is affected by pruning practice. Ogundare et al. (2015) observed that staking significantly affected number of fruits per plant. Sowley et al. (2013) showed that the number of fruits was affected by pruning and staking.

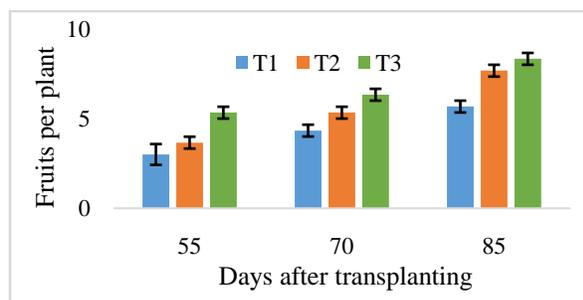


Figure 5: Staking and pruning effect on fruits per plant of tomato plant. Vertical bar indicates LSD at 5% level of significance. (T1= No staking and no pruning, T2= Only pruning, T3= Staking and pruning, DAT= Days after transplanting)

Brix of fruit (%)

In case of staking and pruning treatment plant have significant effect on brix (%) of fruit. The plants where staking and pruning was done the

highest fruit brix (11.3%) was recorded (Figure 6). The lowest fruit brix (9.47%) was found where only pruning was done. Ara et al. (2007) was found that, brix (%) of tomato fruit was differed in different pruning level and highest brix (%) was obtained from one stem pruning.

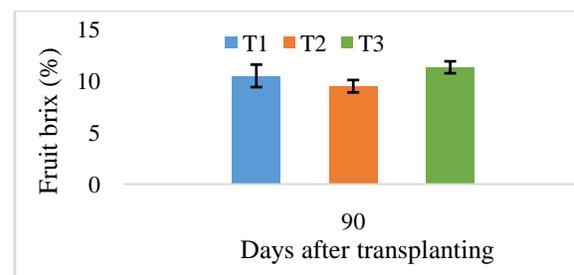


Figure 6: Staking and pruning effect on brix (%) of fruit of tomato plant. Vertical bar indicates LSD at 5% level of significance. (T1= No staking and no pruning, T2= Only pruning, T3= Staking and pruning, DAT= Days after transplanting)

CONCLUSION

From the result, it was analyzed that staking and pruning had significant effect on tomato plant growth and yield. Staking and pruning was responsive maximum average height (46 cm), number of branches per plant (7.67), number of leaves per branch (21), number of flowers per plant (18), number of fruits per plant (8.33) and fruit brix (11.3%). It was observed that staking and pruning on plants resulted in the higher average growth and yield than only pruning as well as no staking and no pruning.

CONFLICT OF INTEREST

The authors have done this research and wrote the article and there is no conflict of interest including any financial, personal or other relationships with other people or organizations.

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