Effect of Seedling Age on Growth and Yield of Tomato

Rumpa Sarker1*, Sasthi pada Ray2, Juthika Paul3, Awfiqua Nusrat3 and Mahbuba Jamil Tithi4

1. Scientific Officer, Spices Research Sub-Centre, BARI, Faridpur, Bangladesh.
2. Assistant Director, Bureau of Manpower, Employment and Training.
3. Lecturer, Agriculture, Gazipur, Bangladesh
4. Agriculture Extension Officer, Department of Agriculture Extension, Dhaka, Bangladesh.

Abstract

An experiment was conducted in the Horticultural Farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka - 1207 during the period from October 2010 to March 2011 to find out the effect of seedling age on the growth and yield of tomato. Three different seedling ages such as S1 = 20 days, S2 = 25 days and S3 = 30 days old seedling were used. The experiment was laid out in RCBD with three replications. Highest yield (87.57 t/ha) was obtained from (S3 = 30 days old seedling) while the lowest yield (59.21 t/ha) was obtained from (S1 = 20 days old seedling).

Key words: Tomato, Seedling age, Growth, Yield


1. Introduction

Tomato (Lycopersicon esculentum Mill.), under the family Solanaceae is one of the most popular and important vegetable crop grown in Bangladesh during Rabi season. It is cultivated in almost all home gardens and also in the field due to its adaptability to wide range of soil and climate [1]. It ranks next to potato and sweet potato in the world vegetable production and tops the list of canned vegetable [2]. Tomato is highly nutritious as it contains 94.1% water, 23 calories energy, 1.90 g protein, 1 g calcium, 7 mg magnesium, 1000 IU vitamin A, 31 mg vitamin C, 0.09 mg thiamin, 0.03 mg riboflavin, 0.8 mg niacin per 100 g edible portion [3]. The age of seedlings to be transplanted is very important for proper establishment in the field and production of good quality fruits as well as high yield. Tender aged or over aged seedlings are not suitable for better yield. Medium aged seedlings result in greater leaf area, high yield and number of fruits per plant and greater average fruit weight [4]. The present study was undertaken in view to determine the optimum age of tomato seedlings for transplanting in the main field in order to achieve higher yield.

2. Materials and Methods

The field experiment was conducted in the Horticulture farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka -1207 during the period from October 2010 to March 2011 to find out the effect of seedling ages on the growth and yield of tomato. Soil of the study site was silty clay loam in texture. The area represents the Agro-Ecological Zone of Madhupur tract (AEZ-28) with pH 5.8-6.5, ECE 25.28 Haider, 1991 [5]. The experiment was laid out in Randomized Complete Block Design (RCBD) having with three replications. The tomato variety BARI Tomato-14 was used in the experiment. The size of the seedbed was 3 m x 1 m. The seeds were sown on the seedbed at three
different dates on 27th October, 2nd November and 5th November, 2010 to get 30, 25 and 20 days old seedlings, respectively.

<table>
<thead>
<tr>
<th>Manure/Fertilizer</th>
<th>Dose per hectare</th>
<th>Applied during land preparation</th>
<th>Applied in pit a week before transplanting</th>
<th>1st installment at 3 weeks of transplanting</th>
<th>2nd installment at 5 weeks of transplanting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowdung</td>
<td>10 ton</td>
<td>10 ton</td>
<td>-</td>
<td>175 kg</td>
<td>175 kg</td>
</tr>
<tr>
<td>Urea</td>
<td>550 kg</td>
<td>-</td>
<td>200kg</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TSP</td>
<td>450 kg</td>
<td>-</td>
<td>450kg</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MOP</td>
<td>250 kg</td>
<td>-</td>
<td>100kg</td>
<td>75 kg</td>
<td>75 kg</td>
</tr>
</tbody>
</table>

Healthy and uniform 20, 25 and 30 days old seedlings were uprooted separately from the seed bed and were transplanted in the experimental plots. The size of each plot was 2 m x 1.8 m. The distance between two blocks and two plots were 1 m and 0.5m. Seedlings were transplanted on the plots with 60 cm x 40 cm spacing. Gap filling, plant protection, irrigation, weeding and mulching was done respectively as and when necessary. Data recorded on Plant height, Number of branches per plant at harvest, Number of clusters per plant, Number of flowers per plant, Number of fruits per plant, Length of fruit, Diameter of fruit, Dry matter content, Yield per plant, Yield per hectare, Yield of fruits per plot. Fruits were harvested at 3-days interval during early ripe stage when they developed slightly red color. Harvesting was started from 15 February, 2011 and was continued up to March, 2011. The means of all the treatments were calculated and the analysis of variance for each of the characters under study was performed by F test. The difference among the treatment means was evaluated by Least Significant Difference (LSD) test Gomez and Gomez, 1984 [6] at 5% level of probability.

3. Results and Discussion

3.1 Plant height

Different seedling ages showed significant variation on plant height at different days after transplanting (DAT) except 90 DAT. The longest plant (42.20 cm) was observed in S3 (30 days old seedling) and the shortest (29.88 cm) was found for S1 (20 days old seedling) at 30 DAT (Table 1). At 50 DAT the longest plant (63.02 cm) was obtained from S3, while the shortest (59.47 cm) was recorded from S1, which was statistically similar to S2 (25 days old seedling). At 70 DAT longest plant (68.48 cm) was obtained from S3 and the shortest (64.75 cm) was recorded from S1. At 90 DAT the longest plant (72.93 cm) was observed in S3 and the minimum (68.64 cm) was found from S1 (Figure 1).

![Figure 1. Effect of seedling age on plant height of tomato](image)

3.2 Number of leaves per plant

Seedling at different ages showed significant variation on number of leaves per plant at different days after transplanting (DAT). The highest number of leaves per plant (42.20) was observed in S3 (30 days old seedling) and the lowest number (29.88) was found from S1 (20 days old seedling) at 30 DAT. At 50 DAT the maximum leaves per plant (63.02) was obtained from S3, while the minimum (59.47) was recorded from S1. At 70 DAT the maximum number of leaves (71.06) was observed in S3 and the minimum (62.09) was found from S1. At 90 DAT the maximum...
number of leaves (81.07) was observed in S3 and the minimum (67.89) was found from S1. The tomato seedlings of 30 days old were easily established in the field with minimum time of shocking period (Figure 2).

![Figure 2. Effect of seedling age on number of leaves per plant of tomato](image)

### 3.3 Number of branches per plant

Different seedling ages showed significant variation on branches per plant. The highest number of branches per plant (10.33) was observed in S3 (30 days old seedling) and the lowest number (8.33) was found from S1 (20 days old seedling) (Table 1).

### 3.4 Dry matter content of leaves

The highest dry matter content of leaves (13.64%) was observed in S3 whereas, the lowest (12.30%) was from S1 (Table 1).

### 3.5 Dry matter content of stem

The highest dry matter content of stem (10.55%) was observed in S3 (30 days old seedling) whereas, the lowest (9.33%) was from S1 (20 days old seedling) (Table 1).

### 3.6 Dry matter content of root

The highest dry matter content of root (27.83%) was observed in S3 whereas, the lowest (21.38%) was from S1 (Table 1).

### Table 1. Effect of seedling age on different plant characteristics of tomato

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Branches/ plant</th>
<th>Dry matter Content (%) of Leaf</th>
<th>Dry matter content (%) of Stem</th>
<th>Dry matter content (%) of Root</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>8.33</td>
<td>12.30</td>
<td>9.90</td>
<td>21.38</td>
</tr>
<tr>
<td>S2</td>
<td>9.50</td>
<td>12.85</td>
<td>10.55</td>
<td>23.20</td>
</tr>
<tr>
<td>S3</td>
<td>10.33</td>
<td>13.64</td>
<td>11.64</td>
<td>27.83</td>
</tr>
<tr>
<td>CV (%)</td>
<td>7.04</td>
<td>0.96</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>LSD(0.05)</td>
<td>0.559</td>
<td>0.104</td>
<td>0.008</td>
<td>0.008</td>
</tr>
</tbody>
</table>

### 3.7 Dry matter content of fruit

The highest dry matter content of fruit (5.98%) was observed in S3 (30 days old seedling) whereas, the lowest (5.30%) was from S1 (20 days old seedling) (Table 2).

### 3.8 Number of flowers per plant

The highest number of flowers per plant (102.20) was observed from S3 (30 days old seedling) and the lowest number (74.43) was found in S1 (20 days old seedling) (Table 2).
3.9 Number of fruit clusters per plant

The highest number of fruit clusters per plant (10.92) was observed in S3 (30 days old seedling) and the lowest number (8.58) was found from S1 (20 days old seedling) which was statistically similar to S2 (Table 2). The 30 days old seedlings of tomato were easily established in the field and sets fruit in more number of flower clusters.

3.10 Number of fruits per plant

Different seedling ages showed significant variation for fruits per plant. The highest number of fruits per plant (56.23) was observed from S3 (30 days old seedling) and the lowest number (43.37) was found from S1 (20 days old seedling) (Table 2). The 30 days old seedlings of tomato were easily established in the field and set more number of fruits. Rahman et al. 1994 [7] found that numbers of fruit per plant and average fruit weight were greatest when seedlings were 30 days old at transplanting. Adelana, 1976 [8] reported that the earliest planting of tomato seedlings resulted in greater leaf area, higher yield and number of fruits per plant and greater average fruit weight than later planting.

3.11 Length of Fruit

Seedling ages showed significant variation on fruit length. The maximum fruit length (6.37 cm) was observed from S3 (30 days old seedling) which was statistically similar to S2 and the minimum (6.04 cm) was found in S1 (20 days old seedling) (Table 2)

3.12 Diameter of Fruit

Different seedling ages showed significant variation on fruit diameter. The maximum fruit diameter (4.85 cm) was observed from S3 (30 days old seedling) and the minimum (4.55 cm) was found from S1 (20 days old seedling) (Table 2). The tomato seedlings of 30 days old were easily established in the field and produced largest fruits.

Table 2. Effect of seedling age on different yield contributing characteristics of tomato

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Dry matter content in fruit (%)</th>
<th>Flowers/plant</th>
<th>Fruit clusters/plant</th>
<th>Fruits/plant</th>
<th>Fruit length (cm)</th>
<th>Fruit diameter (cm)</th>
<th>Yield/plant (kg)</th>
<th>Yield/plot (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>5.30</td>
<td>74.43</td>
<td>8.58</td>
<td>43.37</td>
<td>6.04</td>
<td>4.55</td>
<td>1.42</td>
<td>21.30</td>
</tr>
<tr>
<td>S2</td>
<td>5.45</td>
<td>81.95</td>
<td>9.67</td>
<td>46.10</td>
<td>6.30</td>
<td>4.78</td>
<td>1.70</td>
<td>25.50</td>
</tr>
<tr>
<td>S3</td>
<td>5.98</td>
<td>102.2</td>
<td>10.92</td>
<td>56.23</td>
<td>6.37</td>
<td>4.85</td>
<td>2.17</td>
<td>31.50</td>
</tr>
<tr>
<td>CV (%)</td>
<td>3.61</td>
<td>5.99</td>
<td>14.73</td>
<td>4.82</td>
<td>2.82</td>
<td>1.08</td>
<td>10.30</td>
<td>8.881</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td>0.171</td>
<td>4.369</td>
<td>1.213</td>
<td>1.980</td>
<td>0.149</td>
<td>0.046</td>
<td>0.154</td>
<td>3.378</td>
</tr>
</tbody>
</table>

3.13 Yield per plant (kg)

Yield per plant was significantly varied with different seedling age. The highest yield per plant (2.17 kg) was observed from S3 (30 days old seedling) and the lowest (1.42 kg) was found from S1 (Table 2). The 30 days old seedlings of tomato were easily established in the field and gave highest yield.

3.14 Yield per plot (kg)

The highest yield per plot (31.50 kg) was observed from S3 (40 days old seedling) and the lowest (21.30 kg) was found from S1 (30 days old seedling) (Table 2).

3.15 Yield per hectare

Significant variation was found at different seedling ages on yield per hectare. The highest yield per hectare (87.57 t/ha) was observed for S3 (30 days old seedling) and the lowest (59.21 t/ha) was found for S1 (20 days old seedling) (Fig.3.). Souma et al., 1976 [9] reported that seedlings transplanted 30 days after sowing grow the best and give more yield. Benedictos et al., 2000 [10] reported that 5 weeks old transplants of tomato had the highest fruit setting rate. Zhao et al., 2000 [11] noted that old seedlings of tomato (60 days old) had the worst quality, but produced the highest early yield and lowest total yield. Young seedlings (30 days old) produced the highest total yield, but a lower early yield
4. Conclusion

The maximum (2.17 kg) yield per plant was recorded from S3 (30 days old seedling) and the minimum (1.42 kg) was recorded from S1 (20 days old seedling). From above discussion it was concluded that S3 (30 days old seedling) is better than S1 (20 days old seedling) and S2 (25 days old seedling) for tomato cultivation.

5. References