Effect of Auxin Precursor (L-Tryptophan) on the Growth and Yield of Tomato 
(Lycopersicon esculentum)

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Abstract: Studies were conducted to observe the effect of L-tryptophan on growth and yield of tomato. It has been concluded that L-tryptophan improved the vegetative and reproductive growth of tomato. Higher concentrations of L-tryptophan i.e., $10^{-4}$ ML$^{-1}$ and $10^{-5}$ ML$^{-1}$ were found much suitable to boost up stem height, number of leaves per plant. Lower concentrations of L-tryptophan i.e., $10^{-6}$ ML$^{-1}$ and $10^{-7}$ were found favourable to improve reproductive characters i.e., number of trusses, fruits per truss and per plant, weight of fruit and number of seeds. TSS was lowered with the application of the chemical and ascorbic acid was enhanced with $10^{-4}$ ML$^{-1}$ concentration of L-tryptophan.

Key words: Auxin, L-tryptophan, vegetative growth, trusses, flowers, fruits, TSS and ascorbic acid

Introduction

Tomato (Lycopersicon wulautum) is an important vegetable crop in Pakistan and all over the world. Total area under this crop in Pakistan is 28880 hectares with a production of 313072 tonnes annually (Anonymous, 1998). It is highly prized for its monitory gain and nutritional values especially for its richness in vitamin-C and minerals. It is commonly used in various forms such as processed like ketchup, paste etc. Yield of tomato crop is far low in Pakistan as compared to other advanced countries. Various techniques such as fertilizer application, cultural practices have been tried in past to improve the production of tomatoes in the country, but still the yield has not been increased progressively. A new biological technique for improving the yield of crops by use of growth regulators are being advocated in Agriculture and has become popular in vegetable growers all over the world.

Wu et al. (1994) reported that one month old transplanted tomato plants, when sprayed with IAA at 2500, 5000 and 10000 ppm, inhibited plant height, stem fresh and dry weight and increased number of leaves per plant. Sumiati (1997) reported that fruit setting as compared with control was hastened by 4-5 days in tomatoes by the application of 100 ppm IAA. Fruit number per plant and total fruit weight ha$^{-1}$ was significantly increased. Shahan et al. (1987) reported that 500 ppm L-tryptophan gave the highest number of pods per plant in Vicia faba. Pod dry weight and yield per plant was also increased. Frankenbenger and Arshad (1991) reported that the application of L-tryptophan on the yield of two watermelon and one muskmelon cultivars were studied and it was observed that application of L-tryptophan increased the cumulative weight of water melon from 42 to 50 percent over control.

Frankenbenger and Arshad (1991) in an experiment on pepper plants revealed that 60 ppm L-tryptophan applied through foliage spray resulted in maximum fresh fruit weight per plant. Edison (1991) reported the effect of IAA on the development of tomato fruit cv. Rana by applying one drop of 0.0, 0.1, 0.2, 0.3, 0.4, and 0.5 percent IAA on pistil of young tomato flowers and repeated 10 days afterwards. The result showed that IAA significantly affected the development of reproductive organs of tomato flower, increased fruit size. Concentration of 0.4 and 0.5% of IAA was able to increase tomato yield due to the increasing of fruit weight and fruit size. However, concentration at 0.1 and 0.3%, IAA gave better results than the control. Azam (1994) reported in an experiment on potted potato plants that application of $10^{-3}$ g L-tryptophan/kg enhanced plant height by 7.83 percent over control. Akhtar (1994) had reported that maximum yield was obtained where L-tryptophan $10^{-3}$g kg$^{-1}$ was applied on potted tomato plants. Keeping in view the above facts, present project was envisaged to evoke into the wonderful effects of L-tryptophan (precursor of IAA) on growth and yield of tomatoes.

Materials and Methods

The studies were carried out in the Vegetable Area, Department of Horticulture, University of Agriculture, Faisalabad during the year 1998. The experimental materials were comprised of tomato cv. Nagina, and a growth regulator, L-tryptophan, a precursor of IAA. After 40 days of seed sowing, the seedlings were dipped for half an hour in one beaker of water as a control and four beakers of different concentrations of L-tryptophan. These seedlings, after treatment, were transplanted in the field and irrigated immediately after transplanting. There were four replications for each treatment and various treatments were as:

- $T1 = Control$
- $T2 = 10^{-4}$ M L-TRP L$^{-1}$
- $T3 = 10^{-5}$ M L-TRP L$^{-1}$
- $T4 = 10^{-6}$ M L-TRP
- $T5 = 10^{-7}$ M L-TRPL$^{-1}$

The experiment was laid out according to the RCB design. Data were analyzed statistically and the difference among treatment means was evaluated in view of DMR test (Steel and Torrie, 1980).

Results

The data recorded on various parameters is given in Table 1 and is discussed as under:-

- **Main Stem Height:** It is clear from the Table 1 that highly significant results were obtained on main stem height. $10^{-3}$ M LTRP L$^{-1}$ produced maximum height, although it was statistically at par with $10^{-2}$ M L-TRP L$^{-1}$, $10^{-3}$ M L-TRP L$^{-1}$ and $10^{-4}$ M LTRP L$^{-1}$ while control gave the lowest plant height.

- **Number of Leaves/plant:** It is interesting to note that $10^{-4}$ M LTRP L$^{-1}$ gave maximum number of leaves per plant, although plant height was maximum in $10^{-3}$ M L-TRP L$^{-1}$ but it came on fourth number for number of leaves per plant. $10^{-3}$ M L-TRP L$^{-1}$ was similar to $10^{-4}$ M L-TRP L$^{-1}$ statistically, next best treatment was $10^{-2}$ M L-TRP L$^{-1}$ which was at par statistically with $10^{-5}$ M L-TRP L$^{-1}$. Control produced the lowest number.

- **Number of Trusses per plant:** Table 1 indicates significant supremacy of $10^{-2}$ M L-TRP L$^{-1}$ over $10^{-4}$ M L-TRP L$^{-1}$ and
control. While it stood at par with $10^{-3}$ M L-TRP L$^{-1}$ and $10^{-5}$ M L-TRP L$^{-1}$ lowest number of trusses were observed in control. While it stood at par with $10^{-3}$ M L-TRP L$^{-1}$ and $10^{-5}$ M L-TRP L$^{-1}$. Lowest number f trusses use observed in control.

Table 1: Effect of Auxin precursor (L-tryptophan) on the Growth and Yield of Tomato (*Lycopersicon esculentum*).

<table>
<thead>
<tr>
<th>Treatments</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>75.49b</td>
<td>285.8c</td>
<td>33.00b</td>
<td>1.164ab</td>
<td>38.38b</td>
<td>22.88b</td>
<td>1.909bc</td>
<td>85.10bc</td>
<td>1944.00b</td>
<td>5.460a</td>
<td>15.77d</td>
</tr>
<tr>
<td>T2</td>
<td>85.19a</td>
<td>356.0ab</td>
<td>42.50a</td>
<td>0.864c</td>
<td>36.75b</td>
<td>34.13a</td>
<td>2.243ab</td>
<td>91.88a</td>
<td>3281.00a</td>
<td>5.375ab</td>
<td>15.40d</td>
</tr>
<tr>
<td>T3</td>
<td>83.10a</td>
<td>373.4a</td>
<td>40.63a</td>
<td>1.084ab</td>
<td>43.25a</td>
<td>22.38b</td>
<td>2.461a</td>
<td>90.75ab</td>
<td>2033.00b</td>
<td>5.063c</td>
<td>19.09b</td>
</tr>
<tr>
<td>T4</td>
<td>84.29b</td>
<td>385.1ab</td>
<td>37.75ab</td>
<td>0.969bc</td>
<td>36.13b</td>
<td>24.50b</td>
<td>2.236ab</td>
<td>83.63c</td>
<td>2105.00b</td>
<td>5.175bc</td>
<td>20.44a</td>
</tr>
<tr>
<td>T5</td>
<td>88.25a</td>
<td>339.1b</td>
<td>38.75a</td>
<td>1.229a</td>
<td>46.50a</td>
<td>25.50b</td>
<td>2.089bc</td>
<td>82.75c</td>
<td>2127.00b</td>
<td>5.125c</td>
<td>17.99c</td>
</tr>
</tbody>
</table>

1 = Main Stem Height (cm); 2 = No. of leaves per plant; 3 = No. of Trusses per plant; 4 = No. of Flowers per truss; 5 = No. of Flowers per plant; 6 = No. of Fruits per plant; 7 = Weight of Fruits per plant (Kg); 8 = No. of Seeds per fruit; 9 = No. of Seeds per plant; 10 = Total Soluble Solids; 11 = Ascorbic Acid Contents (mg per 100 gm); Values sharing same letters don’t differ at 0.05 probability level.

Ascorbic Acid contents (mg/100 fruit): $10^{-4}$ M L-TRP L$^{-1}$ was found more effective than other treatments in producing ascorbic acid contents in fruit. Next best treatment was $10^{-3}$ M L-TRP L$^{-1}$. $10^{-4}$ M L-TRP L$^{-1}$ produced only 17.99 mg/100 g ascorbic acid yet it was found better than control and $10^{-3}$ M L-TRP L$^{-1}$. Non significant results were obtained for height of seedlings, number of branches per plant, number of fruits per truss and fruit size, hence no need of discussion about these characters.

Discussion

L-tryptophan (precursor of IAA) was found much effective to improve various vegetative and reproductive growth characters. The endogenous level of hormones may be activated with the exogenous applications, thus growth and yield was improved. Results of our project are similar to the findings of Akhtar (1994), Azam (1994) and Edison (1991).

References


