EFFICACY OF TRICHODERMA SPP., PSEUDOMonas FLUORESCENS AND NEEM LEAF EXTRACT AGAINST ALTERNARIA SOLANI CAUSES EARLY BLIGHT OF TOMATO

Bhupendra Kumar Jaiswal*, Shafaat Ahmad† and Abhilasha A. Lal‡

Received 11-08-2015
Accepted 17-10-2016

ABSTRACT

Tomato, Lycopersicon esculentum (Miller), is one of the most popular and nutritive vegetable crops grown all over the world. Early blight or fruit rot disease caused by Alternaria solani (Ellis and Martin) Jones and Grout, is one of the most destructive diseases of tomato. For eco-friendly management of this disease five treatments with two controls (treated and untreated) were taken. Treatment first (T₁) Trichoderma harzianum @ 5g/l, second (T₂) Trichoderma viride @ 3g/l, third (T₃) Pseudomonas fluorescens @ 5g/l, fourth (T₄) neem leaf extract @ 20ml/l, fifth (T₅) Mancozeb @ 2g/l (Treated control) and (T₆) untreated Control. All treatments significantly decrease disease severity of early blight as compared to control. Minimum disease intensity was recorded in treatment Trichoderma viride 3g/l (31.44%) as compared to control which recorded maximum disease intensity (49.16%). Maximum plant height, fresh shoot weight, dry shoot weight, fresh root weight and dry root weight was also recorded in Trichoderma viride @ 3g/l.

Keywords: Alternaria solani, management, Pseudomonas fluorescens, Trichoderma.

INTRODUCTION

Tomato (Lycopersicon esculentum Mill.) is the second most important remunerable solanaceous vegetable crop after potato. Tomato is commonly consumed in our daily life and it is a good source of antioxidants. Tomato crop is vulnerable to infect by bacterial, viral, nematode and fungal diseases. Among the fungal diseases, Alternaria leaf blight of tomato caused by Alternaria solani is the worst damaging one and cause reduction in quantity and quality of the tomato crop. Early blight is usually characterized by the appearance of brown to dark brown necrotic spots having concentric rings on foliage, stem and fruits. Concentric rings inside the spots produced target board effect (Singh, 1987). Alternaria is a dematiaceous fungus commonly isolated from plants, soil, food, and indoor air environment. The production of melanin-like pigment on target host is one of its distinguishing characters (Bell and Wheeler, 1986). It is one of the most catastrophic diseases incurring loss both at pre and post-harvest stages causing 35 to 78 percent reduction in yield (Jones et al., 1993). The plants are more susceptible to infection by the disease during fruiter period (Cerkauskas, 2005; Momel and Pemezny, 2006). Considering the economic importance and serious nature of the disease and in the absence of suitable resistance genotypes of the crop, chemicals and biological methods were used to manage the disease.

Fungicides and botanicals application can increase the genetic potential and yield reduction due to disease can be minimized. Preventive fungicides and botanicals inhibit the spore germination and penetration but pathogen can derive resistance against fungicide application so repeated application of fungicides at proper dose and interval of time is mandatory. Application of fungicides and botanicals against early blight has been reported in India. Unplanned and wide use of fungicides often leads to serious environmental problems besides affecting the health of users and consumers. So, it is necessary to minimize the use of chemicals for controlling disease.

MATERIALS AND METHODS

The experiment was conducted during 2014-15 in central research experimental field, Department of Plant Pathology, Sam Higginbottom University of Agriculture Technology And Sciences, Allahabad. ‘Kanchan 360’ disease susceptible local variety of tomato was sown in the 14 September. The experiment was laid out in randomized block design with three replications. The symptoms of early blight of tomato appeared 30 days after transplanting.

On the basis of symptoms disease was identified as early blight of tomato and it was confirmed by slide preparation, the conidia of Alternaria solani causes early leaf blight of tomato was identified. The treatment was taken as foliar spray of Trichoderma harzianum (5g/l), Trichoderma viride (3g/l), Pseudomonas fluorescens (5g/l), Neem leaf extract (20ml) compared treatment (Inoculated and uninoculated). The tomato crop was sprayed at 50, 65 and 80 days after transplanting. The disease intensity was recorded after 10 days of spray. The disease intensity was recorded on 0 - 9 scale. Five infected plants were selected randomly from each plot and five leaves were selected from each selected plant for scoring the disease intensity data.

Table 1: Score of Disease Intensity of Tomato.

<table>
<thead>
<tr>
<th>Disease Score</th>
<th>Disease Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No infection</td>
</tr>
<tr>
<td>1</td>
<td>0.1 - 1.0 percent leaf area affected</td>
</tr>
<tr>
<td>3</td>
<td>1.1 - 10.0 percent leaf area affected</td>
</tr>
<tr>
<td>5</td>
<td>10.1 - 25.0 percent leaf area affected</td>
</tr>
<tr>
<td>7</td>
<td>25.1 - 50.0 percent leaf area affected</td>
</tr>
<tr>
<td>9</td>
<td>&lt; 50.1 percent leaf area affected</td>
</tr>
</tbody>
</table>

\[
PDI = \frac{\text{(Sum of all numerical grades)}}{\text{(Total number of leaves counted \times Maximum Grade)}} \times 100
\]

Percent disease incidence (PDI) was calculated by following formula (Ayyangar, 1928)

In the present experiment, randomized block design (RDB) was applied. The analysis of variance technique was applied for drawing conclusions from the data. The calculated value of F was compared with tabulated value at 5% level of probability for the appropriate degree of freedom (Fisher and Yates, 2004). The skeleton for analysis of variance is as follows.

* M.Sc. Student, † Professor, ‡ Assistant Professor

Department of Plant Pathology, Faculty of Agriculture, SHUATS, Allahabad – 211007 (U.P.)
RESULTS AND DISCUSSION

The data presented in Table 1 revealed that all the treatments were statistically significant decreased disease intensity as compare to control. Minimum disease intensity recorded among treatments was in T2 Trichoderma viride @ 3g/l (31.44%), followed by T4, Trichoderma harzianum @ 5g/l (34.00%), T4 Neem leaf extract @ 20ml/l (34.86%), T3 Pseudomonas fluorescens @ 5g/l (36.86%), as compared to treated control T0 Mancozeb @ 2g/l (29.76%), and untreated T0 (49.16%) controls.

In the present study, Trichoderma viride was found best among treatment tested showing least PDI. Trichoderma species due to its antagonistic activity are considered as potential biological control against numerous plant pathogenic fungi (Mohamed and Haggag, 2006).

The data presented in same table was also revealed that the maximum plant height (51.13 cm), shoot weight (50.43 g), dry shoot weight (10.40 g), root weight (13.46 g), dry root weight (6.73 g) were also recorded with the treatment of Trichoderma viride @ 3g/l, followed by another treatments as compared to control.

Ngoc et al. (2013) who found that the growth parameters of tomato plant were greatly improved when plant treated by biological agent. Similarly found by Shihab and Ahmad (2014) reported that all applied bio agents significantly increase the plant height, root weight and shoot weight and also reducing the disease intensity.

Trichoderma viride @ 3g/l as foliar spray treatment recorded maximum plant height (cm), fresh shoot weight (g), fresh root weight (g), dry shoot weight (g), dry root weight (g) and minimum disease incidence (%). The results of present experiments are limited to one season under Allahabad agro climatic conditions as such more trial should be carried out in future to validate the findings.

CONCLUSION

From the above findings it is concluded that Trichoderma viride @ 3g/l as foliar spray treatment recorded maximum plant height (cm), fresh shoot weight (g), fresh root weight (g), dry shoot weight (g), dry root weight (g) and minimum disease incidence (%). The results of present experiments are limited to one season under Allahabad agro climatic conditions as such more trial should be carried out in future to validate the findings.

ACKNOWLEDGEMENT

The authors are grateful to faculty members and seniors of Department of Plant Pathology, Faculty of Agriculture, Sam Higginbottom University of Agriculture, Technology And Sciences, Allahabad for providing necessary facilities and support to carry out the present investigation.

REFERENCES


