Efficacy of Trichoderma spp. and garlic extract against Alternarial leaf blight of mustard (Brassica juncea L.)

Yogita Thakur and Sunil Zacharia

Abstract
Field experiment was conducted at the research plot of the Department of Plant Pathology, SHIATS, Allahabad, U. P. during the rabi season of 2014-15 to test, “Efficacy of Trichoderma spp. and garlic extract against Alternarial leaf blight of mustard (Brassica juncea L.”) by seed treatment and foliar spray of certain fungicides, plant extract and bioagents. Per cent disease intensity on leaves at 45, 60 and 75 DAS were recorded. Results showed that the foliar spray of Mancozeb63%+carbendazim12% (fs) significantly reduced Alternaria blight, increased yield and cost/benefit ratio and was most effective treatment, followed by seed treatment with Mancozeb63%+carbendazim12% 3g/kg, foliar sprays of Tricoderma viride (fs) 2%, Trichoderma harzianum (fs) 2%, seed treatment Trichoderma harzianum @ 2%, foliar spray of Allium sativum 10%. However seed treatment and foliar spray of Mancozeb63%+carbendazim12% most effective treatment have shown results at par with the foliar spray of Mancozeb63%+carbendazim12% in increasing the yield. The maximum plant height (cm) was recorded at Trichoderma viride (foliar spray) @ 2%

Keywords: Alternaria blight, Trichoderma spp., fungicides, Allium sativum.

Introduction
Mustard is extensively used in cooking and also this like whole seeds ground or powdered form, prepared pastes, and sauces. Mustard seeds and its oil have been traditionally used to relieve muscle pain, rheumatism and arthritic pain. In India, mustard oil is applied over scalp as it is believed to stimulate hair growth. A wide gap exists between the potential yield and the yield realized at the farmer’s field which is largely because of number of biotic and abiotic stresses to which the rapeseed- mustard crop is exposed. Among the biotic stress Alternaria blight disease caused by Alternaria brassicae (Berk.) Sacc. and Alternaria brassicicola (Schw.) is one of the important diseases of Indian mustard which has been reported from all continents of the world, causing 10-70% yield losses depending on the crop species, Average yield losses in the range of 32-3 per cent due to Alternaria blight have been reported from Nepal. Alternaria affects most cruciferous crops, including broccoli and cauliflower (Brassica oleracea var. botrytis L.), field mustard and turnip (Brassica rapa L.), leaf or Chinese mustard (Brassica juncea), Chinese or celery cabbage (Brassica pekinensis), cabbage (Brassica olerace var. capitata), rape (Brassica campestris) and radish (Raphnus sativus). Alternaria brassicae and Alternaria brassicicola are cosmopolitan in their distribution. Alternaria blight disease appears usually in December and reaches its maximum towards the end of January and beginning of February in the northern part of country. When infection is severe and the symptoms appear abundantly, the yield is badly affected (Shrestha et al., 2005) [10].

Alternaria blight of mustard is both soil and seed borne disease. The conidia and mycelium may become attached with seeds and perennate there upon, or they come into soil via diseased plants debris and survive there in. They serve as the source of primary infection in next growing season. With the growing awareness of harmful effects of pesticides integrated use of bioagent (Trihoderma viride, Trihoderma harzianum) + phytoextract (Allium sativum, ) + Chemical [ carbendazin + mancozeb] are used in this study. The concept of integrated disease management seeks to minimize the advantages in the use of fungicide. In present study different bioagents, plant extracts and fungicides are used as seed treatments and foliar spray against Alternaria blight in India mustard to find out effective and economical control (Chattopadhyay, 2008) [2].
Materials and Methods

Preparations of media

The culture media used in experiment were prepared according to the standard formula given by For isolating and growing of pathogen Alternaria spp. Potato dextrose agar (PDA) medium was used the composition of PDA is as follows

Ingredients

- Peeled potato tuber – 200 g
- Dextrose – 20.0 g
- Agar – 20.0 g
- Distilled water – 1000 ml

pH – 6.0- 6.5

Procedures

The potatoes were peeled and cut into small pieces and boiled in 500 ml of distilled water till they become soft. The extract obtained was filtered through muslin cloth and all the liquid was squeezed in beaker. 20 g of agar was added bit by bit to the rest of 500 ml. Hot water to dissolve. Then 20 g of dextrose was added. Volume of broth was made up to 1000 ml by adding more distilled water. Then 200 ml of this solution was dispensed to each of five conical flasks and sterilized at 121°C at 15 lbs pressure /square inch for 15 minutes in an autoclave.

Table 1: Detail of Treatments

<table>
<thead>
<tr>
<th>Treatment No.</th>
<th>Treatments</th>
<th>Concentration</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>Control</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>T1</td>
<td>Trichoderma viride (fs)</td>
<td>10g/l</td>
<td>Meena et al., (2010)</td>
</tr>
<tr>
<td>T2</td>
<td>Trichoderma harzianum (fs)</td>
<td>10g/l</td>
<td>Yadav et al. (2010) [14]</td>
</tr>
<tr>
<td>T3</td>
<td>Allium sativum(fs)</td>
<td>10%</td>
<td>Rathi and Singh (2009)</td>
</tr>
<tr>
<td>T4</td>
<td>Trichoderma harzianum (st)</td>
<td>10g/kg</td>
<td>Rai et al. (2014)</td>
</tr>
<tr>
<td>T5</td>
<td>Mancozeb63%+carbendazim12% (fs)</td>
<td>0.2%</td>
<td>Venkataramanamamma et al., (2014) [13]</td>
</tr>
<tr>
<td>T6</td>
<td>Mancozeb63%+carbendazim12%(st)</td>
<td>3g/kg</td>
<td>Venkataramanamamma et al., (2014) [13]</td>
</tr>
</tbody>
</table>

FS- Foliar spray, ST- Seed treatment

Application of mancozeb

Dithane M-45 (mancozeb) manufactured by Indofil chemicals, India Limited, Mumbai was used. It was used as foliar spray at 50 DAS @ 2.5g/l water and the subsequent spray at 15 days interval as suggested by Chattopadhyay et al., (2010).

Application of carbendazim (Bavistin 50 WP)

Bavistin (carbendazim) manufactured by Rallis India Limited, APJ house 7th floor, Church gate, Mumbai-400 020 was used. It was used as seed treatment @ 2gm/kg seed followed by foliar spray at 50 DAS @ 2gm/l of water the subsequent spray was given at 15 days interval as suggested by Meena et al., (2008) [4].

Application of bulb extract from garlic (Allium sativum)

For preparation of bulb extract from garlic, the cloves of garlic was washed in running tap water followed by washing in distilled water dried. The tissues were homogenized in distilled water(1:1w/v) using a blender. The mixture, air was filtered through a four layer of moistened muslin cloth and centrifuged. The supernatant thus obtained was designated as concentrated bulb extract. Garlic bulb extract was used as seed treatment and foliar spray @ 1%(w/v) (Rathi, 2009).

Results and Discussion

Plant height (cm) at 30 DAS

T1 - Trichoderma viride (foliar spray) 2% followed by T2 - T. harzianum (foliar spray) 2% (31.20 cm), T3 - T. harzianum (Seed treatment) 2% (29.93 cm), T4 - Mancozeb 63% + carbendazim 12% (fs) (29.37 cm), T5 - Mancozeb63%+carbendazim12% (st) 3g/kg (28.33 cm), T6 - Garlic extract 10% (28.33 cm) as compared to T0- control (26.33 cm). Among the treatments most effective was T1 - T. viride (fs) 2% (31.57 cm).

Plant height (cm) at 45 DAS

T1 - Trichoderma viride (foliar spray) 2% followed by T2 - T. harzianum (foliar spray) 2% (74.10 cm), T3 - T. harzianum (Seed treatment) 2% (73.30 cm), T4 - Mancozeb 63% + carbendazim12% (fs) (70.30 cm), T5 - Mancozeb63%+carbendazim12% (st) 3g/kg (68.70 cm), T6 - Garlic extract 10% (66.13 cm) as compared to T0- control (61.13 cm). Among the treatments most effective was T1 - T. viride (fs) 2% (75.73 cm).

Plant height (cm) at 60 DAS

T1 - Trichoderma viride (foliar spray) 2% followed by T2 - T. harzianum (foliar spray) 2% (102.60 cm), T3 - T. harzianum (Seed treatment) 2% (101.57 cm), T4 - Mancozeb 63% + carbendazim12% (fs) (100.50 cm), T5 - Mancozeb63%+carbendazim12% (st) 3g/kg (98.63 cm), T6 - Garlic extract 10% (95.87 cm) as compared to T0- control (91.97 cm). Among the treatments most effective was T1 - T. viride (fs) 2% (104.33 cm).

Plant height (cm) at 75 DAS

T1 - Trichoderma viride (foliar spray) 2% followed by T2 - T. harzianum (foliar spray) 2% (140.37 cm), T3 - T. harzianum (Seed treatment) 2% (144.07 cm), T4 - T. harzianum (Seed treatment) 2% (138.23 cm), T5 - Mancozeb 63% + carbendazim12% (fs) (139.17 cm), T6 - Mancozeb63%+carbendazim12% (st) 3g/kg (138.23 cm), T7 - Garlic extract 10% (136.30 cm) as compared to T0- control (131.07 cm). Among the treatments most effective was T1 - T. viride 2% (144.07 cm).
Table 2: Plant height (cm) of mustard (Brassica juncea L.) as affected by different treatments at 30, 45, 60, and 75 DAS

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Plant height (cm)</th>
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<tbody>
<tr>
<td></td>
<td>30 DAS</td>
</tr>
<tr>
<td>T0</td>
<td>Control</td>
</tr>
<tr>
<td>T1</td>
<td>Tricoderma viride (fs)</td>
</tr>
<tr>
<td>T2</td>
<td>Trichoderma harzianum (fs)</td>
</tr>
<tr>
<td>T3</td>
<td>Allium sativam (fs)</td>
</tr>
<tr>
<td>T4</td>
<td>Trichoderma harzianum (st)</td>
</tr>
<tr>
<td>T5</td>
<td>Mancozeb 63% + carbendazim 12% (fs)</td>
</tr>
<tr>
<td>T6</td>
<td>Mancozeb 63% + carbendazim 12% (st)</td>
</tr>
</tbody>
</table>

F-test S S S S
S. Ed. (±) 1.15 1.30 1.10 1.08
C. D. (P = 0.05) 2.51 2.92 2.40 2.35

Fig 2: Plant height (cm) of mustard (Brassica juncea L.) as affected by different treatments at 30, 45, 60, and 75 DAS

Disease intensity (%) at 45 DAS
T5 - Mancozeb 63% + carbendazim 12% (fs) followed by T6 - Mancozeb 63% + carbendazim 12% (st) (24.31%), T1 - Tricoderma viride (fs) (26.79%), T2 - Trichoderma harzianum (fs) 2% (27.58%), T3 - Allium sativam (fs) 10% (30.08%) as compared to T0 - control (32.63%). Among the treatments most effective was T5 - Mancozeb 63% + carbendazim 12% (fs) (23.15%).

Disease intensity (%) at 60 DAS
T5 - Mancozeb 63% + carbendazim 12% (fs) followed by T6 - Mancozeb 63% + carbendazim 12% (st) (40.23%), T1 - Tricoderma viride (fs) 2% (41.13%), T2 - Trichoderma harzianum (fs) 2% (42.46%), T3 - Trichoderma harzianum (st) 2% (44.81%), T4 - Allium sativam (fs) 10% (45.34%) as compared to T0 - control (47.51%). Among the treatments most effective was T3 - Allium sativam (fs) (38.91%).

Disease intensity (%) at 75 DAS
T5 - Mancozeb 63% + carbendazim 12% (fs) followed by T6 - Mancozeb 63% + carbendazim 12% (st) (53.85%), T1 - Tricoderma viride (fs) 2% (54.85%), T2 - Trichoderma harzianum (fs) 2% (55.78%), T3 - Allium sativam (fs) 10% (57.90%) as compared to T0 - control (60.62%). Among the treatments most effective was T3 - Allium sativam (fs) (51.87%).

Table 3: Effect of different treatments on the yield of mustard q/ha

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Yield q/ha.</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>Control</td>
</tr>
<tr>
<td>T1</td>
<td>Tricoderma viride (fs)</td>
</tr>
<tr>
<td>T2</td>
<td>Trichoderma harzianum (fs)</td>
</tr>
<tr>
<td>T3</td>
<td>Allium sativam (fs)</td>
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<td>T4</td>
<td>Trichoderma harzianum (st)</td>
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<tr>
<td>T5</td>
<td>Mancozeb 63% + carbendazim 12% (fs)</td>
</tr>
<tr>
<td>T6</td>
<td>Mancozeb 63% + carbendazim 12% (st)</td>
</tr>
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</table>

F-test S
S. Ed. (±) 0.45
C. D. (P = 0.05) 0.99

Fig 2: Effect of different treatments on the yield of mustard (q/ha)

Conclusion
Based on the result it was observed that seed treatment and foliar spray with mancozeb + carbendazim 3g/l proved to be most effective against early blight of mustard showing minimum disease intensity producing maximum yield, and benefit cost ratio. Trichoderma viride @ 2% as seedling root dip treatment recorded maximum plant height (cm). The use of macro nutrients increases the health problems and decreases the soil fertility as well as increases the resistance in pathogens. So, the fungicides are responsible for increasing soil fertility but are harmful for human health.

Acknowledgement
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References


