

Original Research Article

<https://doi.org/10.20546/ijcmas.2021.1003.059>

Efficacy of Botanicals and *Trichoderma viride* against *Alternaria* Leaf Blight (*Alternaria brassicicola*) of Mustard (*Brassica juncea* L.)

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ABSTRACT

Keywords

Alternaria blight, Datura leaf extract, Eucalyptus leaf extract, Garlic bulb extract, Neem leaf extract, Neem oil, *Trichoderma viride*

Article Info

Accepted:
07 February 2021
Available Online:
10 March 2021

Field experiment was conducted at the research plot of the Department of Plant Pathology, SHUATS, Prayagraj, U.P. during the *rabi* season of 2018-19 to test, “Efficacy of botanicals and *Trichoderma viride* against *alternaria* leaf blight (*Alternaria brassicicola*) of Mustard (*Brassica juncea* L.)” By foliar spray of certain plant extracts, bioagent and fungicide. The per cent disease intensity on leaves at 45, 60 and 75 DAS was recorded. Results showed that the *Trichoderma viride* @ 2% (fs) significantly reduced *Alternaria* blight, increased yield and cost/benefit ratio and was most effective treatment, followed by Garlic bulb extract 5% (fs), Neem leaf extract 15% (fs), Neem oil 2% (fs), Eucalyptus leaf extract 10% (fs), Datura leaf extract 10% (fs). However seed treatment with foliar spray of *Trichoderma viride* @ 2% most effective treatment have shown results at par with the foliar spray of *Trichoderma viride* in increasing the yield. The maximum plant height (cm) was recorded at *Trichoderma viride* (fs) @ 2% as compared to treated and untreated check.

Introduction

Indian mustard (*Brassica juncea* L.) commonly known as raya, rai or lahi is an important oilseed crop among the *Brassica* group of oilseed in India. It possesses a higher potential of production per unit area than other members of the family *Cruciferae*. India and China are the two major consumers of Rape/Mustard seed. In India, consumption of Rapeseed/Mustard seed and its oil is generally high in northern states wherein it is used as a

cooking medium. The oilseed crops play a vital role in Indian Agricultural economy. A good number of oilseed crops like mustard, sesame, groundnut, linseed, niger, safflower, sunflower and soybean are being cultivated in India. The first three are considered as the major oil crops. Indian mustard (*Brassica juncea*) is important oilseed crop which occupies almost 80 percent of the million hectares cropped under oilseed Brassica crops in India. Indian mustard occupy an area of 6.70 million hectare with a production of 7.96

million tonnes and productivity of 1188 kg / ha during 2013-14 (Anonymous, 2014).

Europe is the leading producer of mustard seed in the world accounting for (34%) of the world production followed by China (23%), Canada (19%) and India (14%). Uttar Pradesh (UP) is the second major mustard producing state in the country after Rajasthan and followed by Haryana, Madhya Pradesh, Gujarat and West Bengal. UP contributes to about 11% to the country's total mustard production and around 4% to the net sown area in the state (Jha *et al.*, 2013). Mustard is cultivated in mostly under temperate climates. It is also grown in certain tropical and subtropical regions as cold weather crop. Indian mustard is reported to tolerate annual precipitation of 500 to 4200 mm, annual temperature of 6 to 27°C, and pH of 4.3 to 8.3 (Shekhawat *et al.*, 2012). Mustard is rich in minerals like calcium, manganese, copper, iron, selenium, zinc, vitamin A, B, C and proteins. 100g mustard seed contains 508 kcal energy, 28.09g carbohydrate, 26.08g proteins, 36.24g total fat, 12.2g dietary fiber (USDA, 2010). A wide gap exists between the potential yield and the yield realized at the farmer's field which is largely because of number of foliar diseases, viz., *Alternaria* blight, white rust, downy mildew and powdery mildew. These diseases cause severe losses, both, qualitative and quantitative in north-western India (Kolte, 1985).

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. *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). The incidence and severity of *Alternaria* blight in rapeseed-mustard fields is greatly influenced by temperature, relative humidity, soil condition at the time of planting, splashing rain, wind velocity, leaf wetness and inoculum density available in the soil (Meena *et al.*, 2004).

Materials and Methods

The experiment was conducted in the research field and laboratory of Department of Plant Pathology, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the year 2018-2019.

Preparation of the field

The field was dug up, weeds were cleaned and the soil was pulverized and the total area was divided into 24 plots.

Cleaning and sterilization of glassware

Glasswares to be used during experiment were dipped in the tap water overnight and then washed with detergent powder in running tap water and sun dried. The cleaned glassware's were wrapped with clean paper separately and sterilized in an electric hot air oven at 180°C temperature for 2 hours before further use.

Preparation of plant extract

Plant material are chopped in required quantity of water (1:1.w/v), boiled for 30 min. and then strain through cheese cloth to obtained standard plant extract solution (100%). The extract is centrifuge at 5000 rpm for 5 min. and the clear supernatant was used as stock solution.

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 washed the filter 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 and Singh, 2009).

Application of *Trichoderma viride*

Talcum based formulation of *Trichoderma viride* manufactured by Yash Biotech Pvt. Ltd; Prayagraj was used for field experiment. Before applying the talcum based formulation of *Trichoderma viride* in the field the c.f.u was checked in the laboratory. Seed treatment @ 10g/kg of *Trichoderma viride* was used. Foliar spray of *Trichoderma viride* was at 50 DAS @ 10g/l of water and the subsequent

spray was given at 15 days interval as suggested by Rathi and Singh (2009).

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.*, (2011).

Results and Discussion

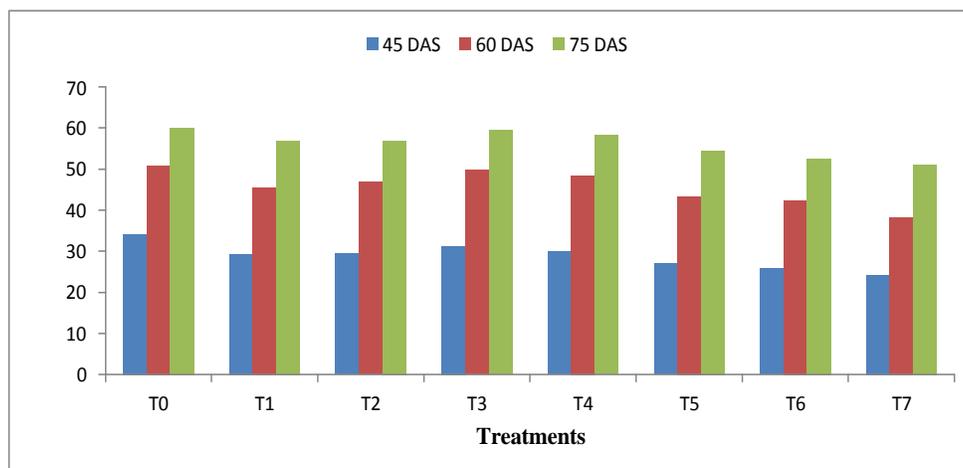
Effect of treatments on Disease intensity at different days interval

Disease intensity (%) at 45 DAS

The maximum disease intensity (25.84), was recorded at 45 DAS in T6-*Trichoderma viride* (25.84), T5- Garlic bulb extract (27.04), T1- Neem leaf extract (29.42), T2- Neem oil (29.47), T4- Eucalyptus leaf extract (30.05), T3- Dhatura leaf extract (31.24), as compared to T7-treated (24.33), T0- Untreated (34.21) (Fig. 1 and Table 1).

Table.1 Effect of bio-agents and plant extracts on disease intensity of mustard

| Treatments | | 45 DAS | 60 DAS | 75 DAS |
|-------------------------|---------------------------|--------------|--------------|--------------|
| T ₀ | Untreated | 34.21 | 50.96 | 60.10 |
| T ₁ | Neem leaf extract | 29.42 | 45.48 | 56.95 |
| T ₂ | Neem oil | 29.47 | 46.93 | 57.02 |
| T ₃ | Dhatura leaf extract | 31.24 | 49.75 | 59.45 |
| T ₄ | Eucalyptus leaf extract | 30.05 | 48.56 | 58.26 |
| T ₅ | Garlic bulb extract | 27.04 | 43.40 | 54.48 |
| T ₆ | <i>Trichoderma viride</i> | 25.84 | 42.49 | 52.55 |
| T ₇ | Check (Mancozeb) | 24.33 | 38.26 | 51.17 |
| Overall Mean | | 28.95 | 45.73 | 56.25 |
| S. Ed. (±) | | 1.555 | 2.079 | 1.616 |
| C. D. (P = 0.05) | | 3.296 | 4.407 | 3.426 |

Fig.1 Effect of bio-agents and plant extracts on disease intensity (%) of mustard

Disease intensity (%) at 60 DAS

The maximum intensity (42.49), was recorded at 60 DAS in T6- *Trichoderma viride* (42.49), T5- Garlic bulb extract (43.40), T1- Neem leaf extract (45.48), T2- Neem oil (46.93), T4- Eucalyptus leaf extract (48.56), T3- Datura leaf extract (49.75), as compared to T7-treated (38.26), T0- Untreated (50.96).

Disease intensity (%) at 75 DAS

The maximum disease intensity (52.55), was recorded at 75 DAS in T6- *Trichoderma viride* (52.55), T5- Garlic bulb extract (54.48), T1- Neem leaf extract (56.95), T2- Neem oil (57.02), T4- Eucalyptus leaf extract (58.26) T3- Datura leaf extract (59.45), as compared to T7- treated (51.17), T0- Untreated (60.10).

The success of *Alium sativum* extract and Neem leaf extract in lowest blight severity with both leaves and pods which are similar with earlier reports of Meena *et al.*, (2008) and Prasad and Lallu (2006) though they reported that Garlic bulb extract in reducing the *Alternaria* leaf blight of mustard. Whereas this experiment contradicts it that Neem leaf extract was best followed by Garlic bulb extract in reducing the *Alternaria* leaf blight

of mustard in leaf, siliqua and also confirmed the results of Chattopadhyay *et al.*, (2005).

Trichoderma is the most commonly used fungal biological control agent and have long been known as effective antagonists against plant pathogenic fungi (Chet (1981); Papavizas, 1985). The antagonists *Trichoderma viride*, effectively controlled seed borne pathogen *Alternaria brassicicola* (Vananacci and Harman, 1987). The extracts of *Alium sativum*, *Datura stramonium* completely inhibited the spore germination of *Alternaria brassicicola* isolates (Sheikh and Agnihotri, 1972)

From the above studies, it is concluded that *Alternaria* is a very destructive pathogen causing a widespread destruction in oilseeds, vegetables and other economically important crops. In the present investigation, seed treatment with *Trichoderma viride* @ 10g/kg with foliar spray @ 10g/l followed by Garlic bulb extract significantly reduced the *Alternaria* leaf blight and increased the seed yield in Indian mustard, recorded maximum disease incidence (%) and increased the seed yield. This present study confirms the *in vitro* antagonistic activity of *Trichoderma viride* towards *Alternaria brassicicola*. Among, Garlic bulb extract has shown strong

inhibitory effect on the development of *Alternaria brassicicola* compared to remain of the treatments.

Acknowledgement

The authors are thankful to department of plant pathology, Sam Higginbottom University of Agriculture, Technology and Sciences Prayagraj for providing laboratory facilities.

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How to cite this article:

Prashant Raghuvanshi, Sunil Zacharia, Shubham Singh and Hari Narain Singh. 2021. Efficacy of Botanicals and *Trichoderma viride* against *Alternaria* Leaf Blight (*Alternaria brassicicola*) of Mustard (*Brassica juncea* L.). *Int.J.Curr.Microbiol.App.Sci*. 10(03): 441-446.
doi: <https://doi.org/10.20546/ijcmas.2021.1003.059>