EFFICACY OF INDIGENOUS PRODUCTS AND CARBENDAZIM ON ALTERNARIA BLIGHT [(ALTERNARIA LINI) DEY] OF LINSEED (LINUM USITATISSIMUM L.) UNDER ALLAHABAD CONDITIONS

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ABSTRACT
The effect of indigenous products, namely mushroom compost, farm yard manure, poultry manure and vermicompost; chemical fungicide i.e. carbendazim (50 WP) were evaluated in a field experiment conducted at the research plot of the Department of Plant Protection, SHIATS, Allahabad, Uttar Pradesh, India, during the 2012-13 rabi seasons for the management of alternaria blight of linseed caused by Alternaria lini. The significantly increased of plant height (52.70 cm), capsules/plant (90.50), seeds/capsule (12.30), yield (13.18 q/ha), oil content (8.05 ml/20g) and fibre content (27.50g/100g) were observed in poultry manure as compared with other treatments. However significantly decreased percentage of disease intensity of Alternaria lini was observed at 90 days after sowing in carbendazim (24.21) as compared with poultry manure (27.43), vermicomp (30.99), spent mushroom compost (36.66) and FYM (41.72) including control (42.66). Whereas, control plot and farm yard manure were not significantly differ from each other.

KEYWORDS: Linum usitatissimum L., Alternaria lini, FYM, Poultry Manure, Mushroom Compost, Vermicompost and Carbendazim (50 WP)

INTRODUCTION
Linseed (Linum usitatissium L.) (2n=30) belong to family Linaceae and genus Linum. Oilseed crops occupy an important place in Indian Agriculture. Linseed has numerous medicinal uses. Its fiber is used in the manufacturing of canvas, cloth, water resistant pipes, paper and strawboard. Linseed oil is used in the manufacturing of paints and varnish, oil cloth and linoleum [5]. India is a fourth largest producer of linseed crops. In world, biggest producer of linseed is followed by Canada (40.51%), China (18.68%) and USA (10.89%). In India, it is grown in 4.36 lakh hectares with productivity of 1.68 lakh tone [2]. Generally linseed contains 40% oil, 30% diet fiber, 20% protein, 4% ash and 6% moisture [15, 14]. The crop is affected by following diseases Alternaria blight, powdery mildew, rust and wilt. [9, 11]. Alternaria blight caused by Alternaria lini is one of the major limiting factors of linseed (Linum usitatissimum L.) cultivation in Uttar Pradesh.

The disease appear on all the aerial parts of the plant, resulting a leaf and bud blight and ultimately causes substantial losses in yield from 18 to 43.9% [13]. During the routine field and as nearby village’s survey, the infection of Alternaria blight disease was noticed on the flowering stage plants of linseed under field conditions of Allahabad. Application of chemical fungicide (carbendazim) against alternaria blight of linseed caused by Alternaria linicola has been reported from Kanpur [12]. But the fungicides often lead to serious environmental problems besides affecting the health hazards. So, it is necessary to minimize the use of chemicals for controlling disease. Present experiment was aimed to
determine the comparative efficacy of indigenous products and carbedazim on Alternaria leaf blight and plant growth parameters of linseed under Allahabad Agro climatic condition.

MATERIALS AND METHODS

The present study was conducted in the central field of Plant Protection, SHIATS, Allahabad. The selected field area was well prepared and plots were marked as per the layout of plan. The selected field was dug up, weeded, channeled and the soil was pulverized after which the total area was divided into sub-plots. After that spent mushroom compost @ 2 t/ha, Farm yard manure @ 5 t/ha, poultry manure @ 2 t/ha, vermicompost @ 2 t/ha were amended in the soil at thirty days before of the sowing of seeds. Carbendazim-50 WP @ 2 kg a.i./ha was amended in soil at sowing time. Control plots were kept without any chemicals and composts.

The seed Garima variety @ 25 kg/ha of linseed were sown in line spacing as per treatments. Plants were maintained distances of 5 cm row to row and 30 cm plant to plant spacing and the seeds were drilled at 3-4 cm depth. Observations were recorded at plant growth on various parameters such as plant height (cm), number of capsules/plant, number of seeds/capsule, (%) disease intensity, yield (kg/ha), oil content and fibre content of each treatment were taken at different days of intervals.

\( \text{Disease intensity (\%)} = \frac{\text{Sum of all disease rating}}{\text{Total no rating} \times \text{Max disease grade}} \times 100 \)

Collection of Infected Plant Symptoms of Linseed

Leaves were collected from infected linseed plants bearing characteristics (figure 1) symptoms of concentric rings of alternaria blight. The first symptom being the failure of the flowers to open during the day. The minute, dark brown spots appear near the base of the calyx, over which they gradually extend, passing into the pedicel and causing the decay of the inflorescence. Older leaves were usually infected at the tips. In severe cases, associated with very humid condition, the whole plant shriveled.

Isolation and Identification of Fungal Pathogen (Alternaria lini)

Fungal pathogen was isolated from infected linseed leaves. The infected bits of leaves were surface sterilized with 0.1 per cent mercuric chloride (HgCl\(_2\)) solution, thrice rinsed with sterilized distilled water, transferred aseptically into petri plates containing melted lukewarm (45°C) PDA medium and then small pieces of infected leaf were kept aseptically on media inside petri plates. These petri plates were inverted position for incubated at 25 ± 2°C in incubator. On 2\(^{nd}\) day whitish mycelial colony observed in petri plates and this colony gradually change into blackish in colour. Some parts of colony were taken and slide was prepared by using the method of [1]. After that slide was observed under the microscope. Conidiophores were branched, septate, dark in colour and produced muriform conidia.

Pathogenecity Test

The Pathogenecity of the isolated fungus was tested following Koch postulates in a plot experiment on linseed which were found most susceptible to Alternaria blight under field condition [1].
On the basis of symptoms and conidial characteristics (figure 2) of the fungus was identified as *Alternaria lini* causative agent of leaf blight of linseed.

**Oil Extraction from Linseed**

Twenty gram sample of linseed was taken after threshing and grind them. The powder form sample was taken in a cellulose thimble and place it over the soxhlet funnel. After that 180–200 ml of petroleum ether was placed in a flat bottom and kept at 40°C. The vapors of petroleum ether ascend upward and cold upper part of instruments by continuous running water and down in extraction thimble. When extraction thimble full with ether, it down in flask through capillary system by siphon. This process took 4-5 hours after that the oil content separate from ether and this process followed by [7].

**Fibre Extraction from Linseed through Retting Process**

Metalic tank was used for the retting of dry linseed plants. It consisted of placing the flax in a tank which would not evaporate. It placed in a shallow tank which warmed up dramatically in the sun; the process may take from only a couple days to a couple of week.

**Cost Benefit Ratio**

The cost benefit ratio was calculated using the following formula by [10].

\[
\text{CBR} = \frac{\text{Grass Return (Rs/ha)}}{\text{Total cost of cultivation (Rs/ha)}}
\]

**Statistical Analysis**

The data was subjected to statistical scrutiny following the method of [4].
RESULTS AND DISCUSSIONS

Plant Height (cm) of Linseed

Results indicate that the amended soil with poultry manure was significantly increased the plant height (cm) at 45, 60, 75 and 90 days after sowing as compared with other treatments including control. At 45 days after sowing, the treated plot with T3 - poultry manure (19.80), T4 - Vermicompost (15.12) and T2 - FYM (13.50) was significantly increased the plant height as compared with T1 - spent mushroom compost (12.90), T3 - carbendazim (12.37) and T0 - Control (11.42). However, treatments (T1, T2) and (T4, T0) were non-significant among themselves. At 60 days after sowing, plant height was significantly increased in the treated plots with T3 (37.82) and T4 (31.90) as compared with T2 (28.25), T1 (27.01) and T3 (25.58) including with control T0 (24.12). Whereas, the treatments (T2, T1, T3) and (T4, T3, T0) were non-significant among themselves. At 75 days after sowing, plant height was significantly increased in T4 - poultry manure (49.50) as compared with T4 - vermicompost (40.37), T2 - FYM (37.22), T1 - spent mushroom compost (34.90) and T3 - carbendazim (33.9) including with control T0 (31.4). Whereas, the treatments (T4, T2), (T2, T1, T4) and (T3, T0) were non-significant among themselves. At 90 DAS, the plant height was significantly increased in T3 (52.7) followed by T4 - vermicompost (43.65), T2 - FYM (40.22), T1 - spent mushroom compost (37.7) and T3 - carbendazim (37.07) including with control T0 (34.76). Whereas, the treatments (T4, T2) and (T5, T1, T5, T0) were non-significant among themselves.

Number of Capsules/Plant

Number of capsules/plant was significantly increased in all the soil amendment of indigenous products as compared with control. Among the treatments T3 - poultry manure (90.5) increased no. of capsules/plant as compared with T4-vermicompost (64.7), T2- FYM (57.20), T1- spent mushroom compost (41.6), T5- carbendazim (37.0) and T0 (31.4). However, all the treatments significantly differ from each other.

Number of Seeds/Capsule

Results showed significantly increased number of capsule in T3-poultry manure (12.30) as compared with T4-vermicompost (10.85), T2-FYM (10.05), T1-spent mushroom compost (9.20), T3-carbendazim (8.75) and control T0 (8.0). Whereas, the treatments (T4, T2), (T2, T1), (T1, T3) and (T5, T0) were non-significant among themselves.

Yield q/ha

Yield was significantly increased in poultry manure treated plot T3 (13.18) as compared with T4-vermicompost (12.37), T2-FYM (11.58), T1-spent mushroom compost (10.94), T3-carbendazim (10.86) and control T0 (8.76). Whereas, treatments (T3, T0), (T4, T2) and (T2, T1, T3) were found non-significant among themselves.

Oil Content (ml) of Linseed

Oil content (ml) was significantly increased in poultry manure treated plots T3 (8.05) as compared with T4 - vermicompost (7.55), T2-FYM (7.37), T1-spent mushroom compost (7.05), T3-carbendazim (6.87) and control T0 (6.55). However all the treatments were found significantly differ among themselves.

Fibre Content (gm) of Linseed

Fibre content (Table 1) was significantly increased in poultry manure treated plots T3 (27.50) as compared with T4-vermicompost (24.50), T2-FYM (22.75), T1-spent mushroom compost (22.25) and T3-carbendazim (21.0) including control T0 (19.50). However, the treatments (T4, T2), (T2, T3, T1) and (T1, T0) were found non-significant among themselves.
Efficacy of Indigenous Products and Carbendazim on Alternaria Blight ([Alternaria lini] Dey) of Linseed (Linum usitatissimum L.) Under Allahabad Conditions

**Disease Intensity (%)**

At 60 DAS, the significantly reduced disease intensity (%) was recorded in carbendazim treated plots T3 (11.5), poultry manure (12.4) and vermicompost (12.9). Whereas, the treatments T4, T1, T2, T6 were non-significantly reduced disease intensity among themselves. At 75 DAS, result was recorded significantly reduced disease intensity in carbendazim treated plot T3 (18.33) and T4.poultry manure (21.44) as compared with T6.vermicompost (24.21).

T1 spent mushroom Compost (25.21), T2-FYM (28.91) and control T0 (29.05). However, the treatments (T4, T1) and (T2, T6) were found non-significant to each other. At 90 DAS, significantly reduced disease intensity in T3.carbendazim (24.21), T3.poultry manure (27.43), T6.vermicompost (30.99) and T1 spent mushroom compost (36.66) as compared with T2.FYM (41.72) and T0 (42.66). However, the treatments T2 and T6 were found non-significant to each other. These results are in agreement with [8] on linseed for alternaria blight.

The current study concludes that fungicide like carbendazim was found effective against Alternaria leaf blight disease.

**Cast Benefit Ratio of Linseed**

Poultry manure was found most indigenous product in successive growth of linseed at various stages. This compost also gave higher yield and was the most economical with 1:4.2.

**CONCLUSIONS**

Six treatments were evaluated against Alternaria blight of linseed caused by Alternaria lini. Based on the result it was observed that carbendazim proved to be most effective against Alternaria lini showed minimum disease intensity. The results showed, poultry manure was found maximum plant height, root length, number of capsules/plant, number of seed per capsule, yield (q/ha), oil content and fibre content. Poultry manure is a good source of plants nutrients and no health hazards for human beings. Poultry manure was found best results in vegetative growth. Therefore, poultry manure is best compare to chemical fertilizers.

**Table 1: Effect of Indigenous Products and Carbendazim on Different Parameters of Linseed**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Plant Height (cm)</th>
<th>Capsules/ Plant</th>
<th>Seed/ Capsule</th>
<th>Yield (q/ha)</th>
<th>Oil Content (ml)</th>
<th>Fibre Content (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>45 Dus</td>
<td>60 Dus</td>
<td>75 Dus</td>
<td>90 Dus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T0(Control)</td>
<td>11.42</td>
<td>24.12</td>
<td>31.4</td>
<td>34.76</td>
<td>31.4</td>
<td>8.0</td>
</tr>
<tr>
<td>T1(Mushroom Compost)</td>
<td>12.90</td>
<td>27.01</td>
<td>34.90</td>
<td>37.70</td>
<td>41.6</td>
<td>9.2</td>
</tr>
<tr>
<td>T2(Farm Yard Manure)</td>
<td>13.50</td>
<td>28.25</td>
<td>37.22</td>
<td>40.22</td>
<td>57.2</td>
<td>10.0</td>
</tr>
<tr>
<td>T3(Poultry Manure)</td>
<td>19.80</td>
<td>37.82</td>
<td>49.50</td>
<td>52.70</td>
<td>90.5</td>
<td>12.3</td>
</tr>
<tr>
<td>T4(Vermicompost)</td>
<td>15.12</td>
<td>31.90</td>
<td>40.37</td>
<td>43.65</td>
<td>64.7</td>
<td>10.8</td>
</tr>
<tr>
<td>T5(Carbendazim)</td>
<td>12.37</td>
<td>25.58</td>
<td>33.90</td>
<td>37.07</td>
<td>37.0</td>
<td>8.7</td>
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<tr>
<td>T6(control)</td>
<td>3.5944</td>
<td>1.2539</td>
<td>1.132</td>
<td>1.470</td>
<td>1.32</td>
<td>0.17</td>
</tr>
<tr>
<td>S.ED (±)</td>
<td>1.181</td>
<td>3.691</td>
<td>3.331</td>
<td>4.338</td>
<td>3.88</td>
<td>0.86</td>
</tr>
<tr>
<td>CD ( P = 0.05)</td>
<td>1.506</td>
<td>1.509</td>
<td>1.570</td>
<td>2.45</td>
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<td></td>
</tr>
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</table>

**Table 2: Effect of Indigenous Products and Carbendazim on Disease Intensity (%) of Linseed**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Disease Intensity</th>
<th>C:B Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0(Control)</td>
<td>14.545</td>
<td>29.055</td>
</tr>
<tr>
<td>T1(Mushroom Compost)</td>
<td>13.775</td>
<td>25.495</td>
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<tr>
<td>T2(Farm Yard Manure)</td>
<td>13.995</td>
<td>28.915</td>
</tr>
<tr>
<td>T3(Poultry Manure)</td>
<td>12.485</td>
<td>21.445</td>
</tr>
<tr>
<td>T4(Vermicompost)</td>
<td>12.955</td>
<td>24.215</td>
</tr>
<tr>
<td>T5(Carbendazim)</td>
<td>11.550</td>
<td>18.330</td>
</tr>
<tr>
<td>F-test</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>S.ED (±)</td>
<td>0.8944</td>
<td>0.7039</td>
</tr>
<tr>
<td>CD(P =0.05)</td>
<td>1.506</td>
<td>1.509</td>
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REFERENCES


