EFFICACY OF SOME BOTANICALS AGAINST LEAF SPOT OF MUNG BEAN (VIGNA RADIATA L.) CAUSED BY CERCOSPORA CANESCENS

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ABSTRACT
Mung bean is an important pulses crop worldwide and one of the most important pulses in India. It is known to suffer from many types of diseases, Cercospora leaf spot is one of them. Cercospora leaf spot causes Cercospora canescens much damage to the production of mung bean. To manage the disease an investigation at research laboratory in the Department of Plant Pathology, SHIATS-DU, Allahabad was carried out to evaluate the efficacy of plant extracts viz. Neem leaf extract, Dhatura leaf extract, Garlic clove extract, Arjun leaf extract, Aswagandha leaf extract and Alovera leaf extract @ 10% against Cercospora canescens. In-Situ (field) experiments were also carried out in randomized block design with six treatments and three replications. Neem leaf was found to be the most effective treatment and recorded minimum disease intensity (25.69%), Maximum No of pod per plant, maximum weight of pod (g) and yield (q/ha) followed by Arjun leaf extract, Alovera leaf extract, Aswagandha leaf extract, Dhatura leaf extract and Garlic clove extract.

KEY WORDS: Cercospora canescens, botanical products, mungbean.

INTRODUCTION
Mungbean (Vigna radiate L.), belongs to the family leguminosae and sub family Papilionaceae. Pulses are major sources of proteins among the vegetarians in India, and complement the staple cereals in the diets with proteins, essential amino acids, vitamins and minerals. They contain 22-24% protein, which is almost twice the protein in wheat and thrice that of rice. Pulses provide significant nutritional and health benefits, and are known to reduce several non-communicable diseases such as colon cancer and cardio-vascular diseases. Production followed by pigeon pea (18-20%), mungbean (11%), urdbbean (10-12%), lentil (8-9%) and other legumes (20%) (Laxmipathi et al., 2013). Presently, the per capita share of pulses in nutrition supply in India with respect to energy, protein and fat is 117.4 K cal, 6.9 g and 1.0 g per day respectively. An adult male and female requires 80 and 70 g per capita per day, respectively for balanced diet (Anonymous, 2004). The crop is generally grown during kharif as rained crop. It has the yield potential of 11 to 12 q ha⁻¹ (Anonymous, 2004), as against the national average of 4.17 q ha⁻¹ (Anonymous, 2012). Among various factors responsible for low yields, biotic and abiotic stress take a heavy toll of the crop, out of which diseases cause an estimated yield loss of 21.93 to 68.77% (Sharma et al., 2008). Mung bean crop covers a total world area of 5 m ha with a total production of 3 m ton (John, 1991). India’s contributing 23% global pulses in world production from an area of about 12.08% (Anonymous, 2012). Mung bean suffers from many diseases caused by fungi, bacteria, viruses, nematodes and also abiotic stresses. In green gram, considerable losses in the production occur as a result of cercospora leaf spot (Cercospora canescens), anthracnose (Colletotrichum lindenmuthianum), powdery mildew (Erysiphe polygoni), bacterial blight (Xanthomonas phaseoli), rust (Uromyces appendiculatus), leaf crinkle and yellow mosaic virus. Among these, cercospora leaf spot is a serious problem in all the areas having rice based cropping systems of the country (Abbaiah, 1993). Grain yield losses have been reported up to 23% due to cercospora leaf spot in mung bean (Quebral and Cagampang, 1970). Maximum loss of 61% was observed in case of grain yield (Iqbal et al., 1995). The disease starts appearing about 30 days after sowing (Grewal et al., 1980).

MATERIALS & METHODS

In-situ experiment
In situ experiment (field) was laid out in randomized block design (RBD) with six treatments viz. Neem leaf extract @ 10%, Arjun leaf extract @ 10%, Alovera leaf extract @ 10%, Aswagandha leaf extract @ 10%, Dhatura leaf extract @ 10%, Garlic clove extract @ 10% and three replications including inoculated check in the experimental field of SHIATS, Allahabad in zaid season (Feb. 2015 to May 2015). Each replication consisted of 21 plots of 2x1m² each. The seeds cv. "Pant mung-1" was sown in February with a spacing of 10 x 45 cm. Botanicals were sprayed just after initiation of disease and repeated three at 15 days interval. Plots without sprays server as check the Observations were recorded in five selected tagged plants 3 days after last sprays of botanicals using 0 to 9 grade scale (Kapadiya and Dhruj, 1999). The data was subjected to the statistical analysis.
**TABLE 1. Treatment details**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Common name</th>
<th>Concentration</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;0&lt;/sub&gt;</td>
<td>Control (untreated)</td>
<td>Plain water</td>
<td></td>
</tr>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>Neem leaf extract</td>
<td>10%</td>
<td>Tunwari and Nahunnaro (2014a)</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt;</td>
<td>Garlic clove extract</td>
<td>10%</td>
<td>Tunwari and Nahunnaro (2014b)</td>
</tr>
<tr>
<td>T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>Arjun leaf extract</td>
<td>10%</td>
<td>Uddin et al., (2013)</td>
</tr>
<tr>
<td>T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>Dhatura leaf extract</td>
<td>10%</td>
<td>Hossain and Hossain (2013)</td>
</tr>
<tr>
<td>T&lt;sub&gt;5&lt;/sub&gt;</td>
<td>Aswagandha leaf extract</td>
<td>10%</td>
<td>Didvania et al., (2012)</td>
</tr>
<tr>
<td>T&lt;sub&gt;6&lt;/sub&gt;</td>
<td>Alovera leaf extract</td>
<td>10%</td>
<td>Devi et al., (2013)</td>
</tr>
</tbody>
</table>

FS = Foliage Spray

**Plant extracts preparation**

The plants viz., Neem, Garlic, Alovera, Dhatura, Arjun leaf extract and Aswagandha were selected for the study. Healthy non-infected leaves of the six plants were collected from the local area. Leaves/ rhizomes of the test botanicals were washed first in tap water, then in distilled water. Then 100 g of plant tissues + 100 ml distilled water were crushed (1:1 w/v) in mortar and pestle. The extract was filtered through double layered muslin cloth. The filtrate thus obtained was centrifuged at 5000 rpm for 15 min. The supernatant was collected and pellet was discarded. The supernatant obtained was strained through whatman No.1 filter paper and filtrate thus obtained was used as stock solution (100% conc.) Nene and Thapliyal, (1993).

**Disease intensity (%) was calculated by using the following formula:-**

\[
\text{Disease intensity (\%) = \frac{\text{Sum of all disease ratings}}{\text{Total number of leaves per plant}} \times 100}
\]

**RESULTS & DISCUSSION**

The result presented in table 2 revealed that all the treatments were statistically significant and minimum disease intensity as compared to control. Among the botanicals used the minimum disease intensity per cent was recorded in T<sub>1</sub> – Neem leaf extract @ 10% (25.69%) as compared to untreated control (44.24%). Neem leaf extract @ 10% treatment was followed by T<sub>5</sub> Arjun leaf extract @ 10% (30.39%), T<sub>6</sub> Alovera leaf extract @ 10% (31.87%), T<sub>7</sub> Aswagandha leaf extract @ 10% (31.69%), T<sub>8</sub> Dhatura leaf extract @ 10% (31.69%) and T<sub>2</sub> Garlic clove extract @ 10% (35.03%). Among the treatments lowest percent disease intensity was recorded in Neem leaf extract @ 10% (25.69%).

The botanicals used the maximum no. of pod per plant was recorded in in T<sub>1</sub> – Neem leaf extract @ 10% (7.49%) as compared to untreated control (4.52%). Neem leaf extract @ 10% treatment was followed by T<sub>5</sub> Arjun leaf extract @ 10% (7.16%), T<sub>6</sub> Alovera leaf extract @ 10% (6.51%), T<sub>7</sub> Aswagandha leaf extract @ 10% (6.05%), T<sub>8</sub> Dhatura leaf extract @ 10% (5.80%) and T<sub>2</sub> Garlic clove extract @ 10% (5.34%). Among the treatments No of pod per plant of mung bean was recorded in Neem leaf extract @ 10% (7.49%). The botanicals used the maximum Weight of pod (g) was recorded in in T<sub>1</sub> – Neem leaf extract @ 10% (4.92g) as compared to untreated control (2.47g). Neem leaf extract @ 10% treatment was followed by T<sub>5</sub> Arjun leaf extract @ 10% (4.76g), T<sub>6</sub> Alovera leaf extract @ 10% (4.12g), T<sub>7</sub> Aswagandha leaf extract @ 10% (3.97g), T<sub>8</sub> Dhatura leaf extract @ 10% (3.63g) and T<sub>2</sub> Garlic clove extract @ 10% (3.12g). Among the treatments maximum Weight of pod (g) was recorded in Neem leaf extract @ 10% (4.92g).

**TABLE 2: Percent disease intensity of Cercospora leaf spot No of pod/plant weight of pod and Yield as affected by different treatments**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Disease intensity</th>
<th>No. of pod per Plant</th>
<th>Weight of pod per plant</th>
<th>Yield q/ha</th>
<th>C:B ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;0&lt;/sub&gt;</td>
<td>44.24</td>
<td>4.52</td>
<td>2.47</td>
<td>3.69</td>
<td>1:1.14</td>
</tr>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>25.69</td>
<td>7.49</td>
<td>4.92</td>
<td>7.32</td>
<td>1:2.23</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt;</td>
<td>35.03</td>
<td>5.34</td>
<td>3.12</td>
<td>5.13</td>
<td>1:1.51</td>
</tr>
<tr>
<td>T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>29.37</td>
<td>7.16</td>
<td>4.76</td>
<td>7.01</td>
<td>1:2.13</td>
</tr>
<tr>
<td>T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>33.69</td>
<td>5.80</td>
<td>3.63</td>
<td>5.93</td>
<td>1:1.80</td>
</tr>
<tr>
<td>T&lt;sub&gt;5&lt;/sub&gt;</td>
<td>31.87</td>
<td>6.05</td>
<td>3.97</td>
<td>6.12</td>
<td>1:1.85</td>
</tr>
<tr>
<td>T&lt;sub&gt;6&lt;/sub&gt;</td>
<td>30.39</td>
<td>6.15</td>
<td>4.12</td>
<td>6.87</td>
<td>1:2.08</td>
</tr>
<tr>
<td>F-test</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>C. D. (± 0.05)</td>
<td>1.60</td>
<td>0.81</td>
<td>0.18</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td>S. C. D. (± 0.05)</td>
<td>3.49</td>
<td>1.76</td>
<td>0.08</td>
<td>0.91</td>
<td></td>
</tr>
</tbody>
</table>

The treatments the maximum grain yield (q/ha) was recorded in T<sub>1</sub> – Neem leaf extract @ 10% (7.32q/ha) as compared to untreated control (3.69q/ha). Neem leaf extract @ 10% treatment was followed by T<sub>5</sub> Arjun leaf extract @ 10% (7.01q/ha), T<sub>6</sub> Alovera leaf extract @ 10% (6.87q/ha), T<sub>7</sub> Aswagandha leaf extract @ 10% (6.12q/ha), T<sub>8</sub> Dhatura leaf extract @ 10% (5.93q/ha) and T<sub>2</sub> Garlic clove extract @ 10% (5.13q/ha). Among the treatments maximum grain yield (q/ha) was recorded in Neem leaf extract @ 10% (7.32q/ha). The best and most economical...
treatment was $T_1$ – Neem leaf extract @ 10% (1:2.23) as compared to untreated control (1: 1.14). Neem leaf extract @ 10% treatment was followed by $T_7$- Arjun leaf extract @ 10% (1:2.13), $T_5$- Alovera leaf extract @ 10% (1:2.08), $T_7$ Aswagandha leaf extract @ 10% (1: 1.85), $T_2$- Dhatura leaf extract @ 10% (1:1.80) and $T_7$- Garlic clove extract @ 10% (1:1.51). All the treatments were found statistically significant in accordance to the findings of the (Gholve et al., 2014; Singh et al., 2010). They reported that *Cercospora canescens* by neem leaf extract could probably be due to the botanicals inducers which have direct antimicrobial effect and showing minimum disease intensity, maximum No. of pod per plant, maximum weight of pod (g), maximum yield (q/ha). *Cercospora canescens* due to neem leaf extract may have been due to secretion of extracellular cell degrading enzymes such as tannin, limonoid, triterpenoid, azadiricin, which may have helped mycoparasites in the colonization of their host.

**CONCLUSION**

Foliar spray with Neem leaf extract @10% (botanical) proved to be most effective against cercospora leaf spot showing minimum disease intensity, maximum No. of pod per plant, maximum weight of pod (g), maximum yield (q/ha) and B:C ratio. The results of present experiments are limited to one season under Allahabad agro climatic conditions as such more trials should be carried out in future to validate the findings.

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**REFERENCES**


