FIELD EVALUATION OF FUNGICIDES AGAINST WHITE RUST OF *BRASSICA JUNCEA*

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ABSTRACT

The efficacy of nine fungicides against white rust of *Brassica juncea* (cv. Pusa Raya-45), was compared at their scheduled dosages by spraying them twice at 15 days interval, starting from appearance of white spots. Among them, carbendazim was the most effective followed by mancozeb in controlling the disease and in effecting maximum protection of seed yield.

Brassicas are important, widely grown edible oil crops in India and Western countries. *Brassica juncea* (L.) Czern and Coss, the brown mustard of the Indian subcontinent and China, suffers from many diseases. But the white rust [c.o.- *Albugo candida* (Pers. ex. Lev.) Kuntze] is the most destructive and causes losses in yield from 17-32 per cent (Bains and Jhooty, 1979) to rapeseed mustard crop in the country, particularly when accompanied by the *Alternaria* blight [c.o.- *Alternaria brassicae* (Berk) Sacc.]. In view of its importance, an effective and inexpensive fungicidal management has been sought for.

The experiment was conducted with nine treatments and four replicates on mustard cultivar PR- 45 (Pusa Raya-45) in 5 x 4 m² plots at 40 x 15 cm spacing at IARI, Regional Station, Karnal during *rabi* 1995-96 and 1996-97.

Disease Score: In local infection, pustules or sori develop on leaves. These pustules or blisters are variable in size and shape and may merge to form larger patches. When young stems and inflorescence are infected, the fungus becomes systemic in tissues. At this stage the axis of the inflorescence and flower stalks are severely infected and the infected leaves on main stems mostly thicken, roll and defoliate. Therefore, the observations on disease incidence/score were recorded on systemically infected organs of the plant. For the expression of malformation on secondary and tertiary branches of diseased plants, disease score was calculated. Here all the secondary and tertiary branches on 40 healthy plants were counted and a ratio for transformation was calculated as follows:

\[
\text{Conversion of secondary branches into tertiary branches (T)} = \frac{\text{Number of tertiary branches}}{\text{No. of secondary branches}}
\]

\[
\text{Disease score} = \text{No. of malformed secondary branches x (T)} + \text{No. of malformed tertiary branches}
\]

Per cent disease control was calculated by following formula:

\[
\text{Per cent Disease Control} = \frac{\text{Disease score in control plot} - \text{Disease score in treated plot}}{\text{Disease score in control plot}} \times 100
\]

For seed yield, plants were picked up from 1m² plots from each replication. Carbendazim (C) and mancozeb (M) were the most effective fungicides followed by captan-50 % (Cf) and captan-75 % (D) (Table 1). The highest of 57.82 % disease control...
Table 1. Effect of chemicals on per cent disease infection, disease score and yield

<table>
<thead>
<tr>
<th>Chemicals</th>
<th>Dose (%)</th>
<th>Per cent branches infected (%)</th>
<th>Per cent infection control (%)</th>
<th>Disease score (%)</th>
<th>Per cent disease control (%)</th>
<th>Yield (g/m²)</th>
<th>Per cent yield increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbendazim (Bavistin 50%)</td>
<td>0.2</td>
<td>9.45</td>
<td>57.98</td>
<td>6.38</td>
<td>54.33</td>
<td>16.75</td>
<td>25.18</td>
</tr>
<tr>
<td>Captan (Deltan 75%)</td>
<td>0.2</td>
<td>15.45</td>
<td>31.30</td>
<td>9.70</td>
<td>30.57</td>
<td>139.50</td>
<td>12.96</td>
</tr>
<tr>
<td>Mancozeb (Dithane M-45 75%)</td>
<td>0.2</td>
<td>15.13</td>
<td>32.73</td>
<td>10.01</td>
<td>28.35</td>
<td>159.00</td>
<td>22.48</td>
</tr>
<tr>
<td>Thiophanate methyl (Topsin-M 70%)</td>
<td>0.2</td>
<td>18.29</td>
<td>18.67</td>
<td>12.78</td>
<td>8.52</td>
<td>134.25</td>
<td>8.70</td>
</tr>
<tr>
<td>Captalol (Foltal 80 %)</td>
<td>1.5</td>
<td>21.18</td>
<td>5.82</td>
<td>12.95</td>
<td>7.30</td>
<td>140.00</td>
<td>13.36</td>
</tr>
<tr>
<td>Captan (Captal 50 %)</td>
<td>3.0</td>
<td>15.22</td>
<td>32.33</td>
<td>9.49</td>
<td>32.07</td>
<td>138.25</td>
<td>11.94</td>
</tr>
<tr>
<td>Copper Oxy chloride (Fytolan 50%)</td>
<td>4.0</td>
<td>19.11</td>
<td>15.07</td>
<td>11.57</td>
<td>8.72</td>
<td>142.50</td>
<td>15.38</td>
</tr>
<tr>
<td>Foltal 80 % + Fytolan 50 %</td>
<td>0.2+0.2</td>
<td>18.76</td>
<td>16.59</td>
<td>10.74</td>
<td>23.12</td>
<td>134.70</td>
<td>9.07</td>
</tr>
<tr>
<td>Captal 50 % + Fytolan 50 %</td>
<td>0.2+0.2</td>
<td>20.29</td>
<td>9.78</td>
<td>10.92</td>
<td>21.83</td>
<td>130.75</td>
<td>5.87</td>
</tr>
<tr>
<td>Control H₂O</td>
<td></td>
<td>22.49</td>
<td></td>
<td>13.97</td>
<td></td>
<td>123.50</td>
<td></td>
</tr>
<tr>
<td>C.D. at 0.5%</td>
<td></td>
<td>5.575</td>
<td>2.885</td>
<td></td>
<td></td>
<td>18.305</td>
<td></td>
</tr>
</tbody>
</table>

was obtained by spraying (C) followed by 32.73 % in (M), while captalol was ineffective (5.82 %). Srivastava and Verma (1989) while spraying for the control of white rust of mustard found blitox-50 the most effective followed by fytolan (F), dithane Z-78 and (M), both in controlling the disease and increasing the yield. Singh and Singh (1990) recorded least disease and highest yield of mustard in (M) treatment followed by (F) and difolatan. Dubey and Misra (1994) found (C), wettable sulphur, thiophanate methyl and chlorothalonil significantly superior in the control of disease on leaves and inflorescences and increase in yield.

Minimum disease score (6.38) was recorded in (C) sprayed plots (Table 1) followed by (Cf) (9.49), (D) (9.70) and (M) (10.01).

Maximum yield was recorded in (C) sprayed plots followed by (M) and (F) (Table 1). The maximum per cent yield increase over control was recorded in (C) sprayed plots (25.18%) followed by (M) (22.48%) and (F) (15.38%). Captan-50 % and 75 % WP were good at disease control (32.33 % and 31.30 %) but not at yield production (11.94 % and 12.96 %). Interestingly, when combined with (F), it was not effective either way (9.78 % and 5.87 %).

White rust does not appear consistently every year since its establishment and spread depends on the amount of winter rains received during the months of active crop growing period (from 1994 to 1998 there was no major deviation in minimum and maximum temperature but rain fall varied between 19.2 mm to 187.6 mm recorded during December to February every year). In some seasons, the disease appears on leaves along with Alternaria blight spots and results in complete defoliation without exhibiting systemic infection in the inflorescence. In the course of these studies the infection intensity of the magnitude available during 1995-1996 was hardly seen. This disease, therefore, appears to be tricky where the studies can not be completed continuously in subsequent years in natural conditions.

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REFERENCES