CONTROL OF ROOT AND COLLAR ROT DISEASE, A SERIOUS THREAT TO CHILLIES PRODUCTION IN NWFP

Ishrat Naz*, Musharraf Ahmad**, Shah Alam**, Muhammad Tahir* and Fazli Raziq**

ABSTRACT
Studies involving the control of root and collar rot of chillies through resistant varieties and optimum ridge height were conducted at Agricultural Research Institute (ARI), Tarnab, Peshawar during 2005. Five chilli varieties viz. Bejo, Fengla, Peshawar Local, Rajisthani Green and Rama Karishma were evaluated for their resistance against root and collar rot disease. Except Fengla, all other varieties were found susceptible to the disease. Fengla showed better performance under natural epiphytotic conditions. It reduced the plant mortality (10.0%) and increased the yield (676.8 g/plant), number of fruits/plant (299.8), plant height (106.8 cm), fresh shoot weight (306.8 g) and dry shoot weight (206.8 g). Moreover, proper ridge height (33.0 cm) was found to be effective in reducing the % disease incidence from 40.5 to 8.7%.

INTRODUCTION
Chilli (Capsicum annum L.) is an important vegetable crop of Pakistan, covering an area of about 48.7 thousand hectares with a total production of 93.3 thousand tons, per annum. North West Frontier Province (NWFP) having 300 hectares produced 400 tons (Anonymous, 2002). The root and collar rot disease, caused by Phytophthora capsici L., is of great importance in different parts of the world (Sherf and Macnab, 1986; Stamps, 1985), including the main chilli growing areas of Pakistan and NWFP (Hassan et al., 1997; Mehoob et al., 1998). The disease caused severe losses in yield ranging from $1,700.00 to $3,200.00 per ha (Matthew et al., 2006). Effective control of the disease could be obtained through the use of timely application of fungicides (Muchovej et al., 1980; Bruin and Edgington, 1981; Lucas et al., 1990; Hwang et al., 1990 and Palazon et al., 1990). However, effective fungicides are expensive and may not be easily available. Further, the use of fungicides causes several problems such as hazards to human and plant health and development of resistance by pathogens to these chemicals. Cultural control is one of the few options available (Mehboob et al., 1998; Saleem et al., 1998). The cheapest and effective control, no doubt, lies in the development and use of resistance varieties (Saleem et al., 1998). Resistance in Pepper (Capsicum annum) to the root rot fungus P. capsici is governed by two distinct genes acting independently without additive effect. These genes give a high level of resistance to chillies but not immunity since resistant plant can become infected after prolonged exposure to the fungus (Saleem et al., 1992). Five sources of resistance to P. capsici were found in the Capsicum collection of the vegetable crops germplasm bank, all five being pungent types of Capsicum annum with varying fruit shapes, size and colour on maturity. Resistance has been shown to be coöyrolled by twyý recessive genes and a dominant modifier (Matsuoka, 1984). The Crown blight caused by P. capsici can be controlled by planting the plants on ridges than in furrows (Baris et al., 1986). The present study was an attempt to search for varietal resistance against chillies root and crown rot and find out if the disease could be controlled through optimum ridge height.

MATERIALS AND METHODS
Five different varieties (collected from local sources) were tested for their resistance against root and collar rot of chillies at Agricultural Research Institute (ARI), Tarnab, Peshawar. No inoculation was done as the field was naturally infested and was selected on the basis of previous crop history. The previous chilli crop was completely destroyed by the disease. The six week old nursery plants were transplanted on 3rd March, 2005. Each treatment comprised of two rows and was replicated four times in a Randomized Complete Block Design (RCBD). The plot size was kept as 3 x 0.75 m². The plant to plant and row to row distance was maintained as 30 cm and 75 cm respectively. Data were recorded on % mortality and yield/plant, number of fruits/plant, plant height, fresh shoot weight and dry shoot weight. Periodically the dead plants were tested to confirm the cause of disease.

To find out the effect of different height of ridges (0, 17.0, 25.0 and 33.0 cm), a known susceptible variety “Peshawar Local” was transplanted in naturally infested field. All other experimental details were as described before. The plot was well irrigated to have proper soil infestation. The bed with 0 cm height served as check. Data were recorded on % disease incidence. All the data were statistically analyzed, interpreted and properly tabulated, using DMR test.

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RESULTS AND DISCUSSIONS

Results in the Table I indicated that there were significant differences (P<0.05) among the five varieties in terms of mortality (%) and mean yield. Out of 5 varieties tested, “Fengla” showed better performance and proved to be resistant against root and collar rot of chillies. The least average mortality (10.0%) was recorded for Fengla followed by Bejo (20.5%) and Rajistani Green (65.5 %). The highest mortality (90.9%) was recorded for Peshawar Local followed by Rama Karishma (81.6%).

Table I  Screening of different varieties against root and collar rot of chillies

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Mortality (%) in Fields</th>
<th>Yield (g/plant)</th>
<th>Number of fruits/plant</th>
<th>Plant height (cm)</th>
<th>Fresh shoot weight (g)</th>
<th>Dry shoot weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fengla</td>
<td>10.0 e</td>
<td>676.8 a</td>
<td>299.8 a</td>
<td>106.8 a</td>
<td>306.8 a</td>
<td>206.8 a</td>
</tr>
<tr>
<td>Bejo (Hybrid)</td>
<td>20.5 d</td>
<td>612.05 b</td>
<td>283.5 b</td>
<td>99.3 ab</td>
<td>288.3 b</td>
<td>202.5 a</td>
</tr>
<tr>
<td>Rajistani Green</td>
<td>65.5 c</td>
<td>600.0 b</td>
<td>257.0 c</td>
<td>94.0 bc</td>
<td>277.5 b</td>
<td>194.8 a</td>
</tr>
<tr>
<td>Rama Karishma</td>
<td>81.6 b</td>
<td>540.0 c</td>
<td>246.3 c</td>
<td>91.0 c</td>
<td>258.8 c</td>
<td>177.8 ab</td>
</tr>
<tr>
<td>Peshawar Local</td>
<td>90.9 a</td>
<td>517.5 c</td>
<td>217.8 d</td>
<td>89.8 c</td>
<td>248.8 c</td>
<td>152.5 b</td>
</tr>
<tr>
<td>LSD (P&lt;0.05)</td>
<td>1.50</td>
<td>43.3</td>
<td>15.7</td>
<td>7.9</td>
<td>15.6</td>
<td>32.4</td>
</tr>
</tbody>
</table>

Means followed by different letter(s) in the same column are significantly different from one another at 5% level of significance. (DMR Test)

Likewise, significant differences in yield were recorded for all five varieties. Fengla gave the highest (676.8 g/plant) yield followed by Bejo (612.0 g/plant) and Rajistani Green (600.0 g/plant). Cultivars Peshawar Local and Rama Karishma gave very poor yield because of their susceptibility to Phytophthora Root rot, which resulted in the lowest yields of 517.5 and 540.0 g/plant respectively. Treatments were significantly different from one another in terms of number of fruits. The highest (299.8) number of fruits/plant was obtained by Fengla followed by Bejo (283.5) and Rajistani Green (257.0). Peshawar Local gave the lowest (217.8) of all. Similarly the largest (106.8 cm) plant height was obtained by Fengla followed by Bejo (99.3 cm) and Rajistani Green (94.0 cm). No significant difference was found between Rama Karishma (91.0 cm) and Peshawar Local (89.8 cm). Likewise, the highest fresh shoot weight (306.8 g) was recorded in Fengla. No significant difference was recorded between Bejo (288.3 g) and Rajistani Green (277.5 g). Likewise, Rama Karishma (258.8 g) and Peshawar Local (248.8 g) showed no significant difference in fresh shoot weight. Dry shoot weight was the highest (206.8 g) in Fengla the lowest (152.5 g) in Peshawar Local.

Table II  Effect of ridge height on Root and Collar Rot of Chillies (P.capsici)

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Treatments Ridge Height (cm)</th>
<th>% Disease Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>40.5 a</td>
</tr>
<tr>
<td>2</td>
<td>17.0</td>
<td>28.0 b</td>
</tr>
<tr>
<td>3</td>
<td>25.0</td>
<td>16.3 c</td>
</tr>
<tr>
<td>4</td>
<td>33.0</td>
<td>8.7 d</td>
</tr>
<tr>
<td>LSD (P&lt;0.05)</td>
<td></td>
<td>1.2</td>
</tr>
</tbody>
</table>

Means followed by different letter(s) in the same column are significantly different from one another at 5% level of significance.

It is obvious from data in Table II that increase in the height of ridges, resulted in the decrease in incidence. Minimum disease incidence (8.7%) was recorded on the highest ridge (33.0 cm) as compared to other heights. The highest disease incidence (40.5 %) was recorded for the plants in the check plot (0 cm).

Resistance to root rot disease in chillies has been observed by many research workers (Matsuoka et al., 1984; Saleem et al., 1992). Planting resistant variety is an easy, economical and applicable method to control the losses due to the disease. In this study out of 5 varieties tested, “Fengla” was selected for resistance to P. capsici as it showed the lowest mortality and gave the best yield. Our results are encouraging and suggest that more varieties, if can be made available, should be tested against the pathogen. Hopefully more resistant germplasm will be found to broaden the base for developing disease-resistant varieties. Root rot disease was successfully controlled by sowing chillies on ridges; the idea was only to avoid direct contact of irrigation water with stems. In lower portion of the fields (0 cm), irrigation water was in contact with the plant stem for longer
time than in upper portion (33.0 cm) of the field. This increased disease incidence by promoting the discharge and dispersal of zoospores of *P. capsici*. The results are in agreement with Baris et al. (1986) and Saleem et al. (1992).

**CONCLUSION AND RECOMMENDATIONS**

As variety ‘Fengla’ gave the best yield (676.8 g/plant) even under very high disease pressure, it is recommended for sowing especially in areas of high plant mortality. However, under environmental conditions highly favourable for the disease, the resistance of the variety ‘Fengla’ must be complemented with one or two Ridomil sprays.

**REFERENCES**


