Effect of pea stunt disease on flowering, podding, grain setting and yield

A.T. KHAN and R.N. SINGH

Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Faizabad 224 229

ABSTRACT: Pea stunt incited by red clover vein mosaic virus, caused 70.4, 7, 87.7, 76.7 and 87.8% reduction, respectively, in the number of flowers, pods, grains, per cent normal grains and grain weight per plant produced by moderately diseased plants. Reduction in these yield contributory characters increased progressively with the increasing severity of the disease and reached 100% in case of severely diseased plants. Differences between healthy and diseased plants belonging to different disease - severity grades, and amongst the latter themselves, except in case of flowers and pods per plant produced by moderately and heavily diseased plants, were statistically significant.

Keywords: Pisum sativum, red clover vein mosaic virus, pea stunt, crop losses

Red clover vein mosaic virus (RCVMV) incites a stunt disease in peas (Pisum sativum L.) in India and abroad (Smith, 1972; Singh and Khan, 1993). The disease in India is sporadic in nature and has no resistant cultivars. Host-response ranges between production of moderate to severe symptoms, adverse effect on the apparent growth and development of the plant increasing with the increase in the disease-severity (Khan, 1991). Studies were, therefore, undertaken to quantify the effect of the disease, in different severity grades, on a number of yield-contributory characters of reproductive phase. Results obtained are presented in the following paragraphs.

MATERIALS AND METHODS

Untreated pea seeds, obtained from healthy parents of pea cv Rachna, were sown in a well levelled field having uniform fertility status at the University Experiment Station, Masodha, Faizabad during 1985-86, 1986-87 and 1987-88 rabi seasons. Every fifth row, treated as an infector row, was artificially inoculated using viruliferous pea aphids, Acyrthosiphon pisum (Harris) originally fed on RCVMV infected pea plants of the same variety. Later, healthy and diseased pea plants at different growth stages — flowering, podding and maturity — were tagged dividing them into three disease severity grades — moderately diseased, heavily diseased and severely diseased — as per host response to the viral infection (Moderately diseased: Symptoms express late. Only upper 1/3rd portion rosetted having shorter internodes, vein clearing, followed by browning, present. Flowering and podding mostly restricted to lower branches only. Heavily diseased: Symptoms express early and cover the whole plant. Vein-clearing, browning and rosetting of the leaves prominent. Flowering and podding sparse. Severely diseased: Symptoms express just after the emergence of the plants. Severe stunting, profuse branching, vein clearing, browning and death of the plants occur in quick succession. No flowering. Effect of the
Table 1. Effect of pea stunt disease on flowering, podding grain setting and yield in pea1, 2

<table>
<thead>
<tr>
<th>Disease severity grades</th>
<th>Number of flowers per plant</th>
<th>Number of pod per plant</th>
<th>Number of grains per plant</th>
<th>Per cent normal grain</th>
<th>Grain weight per plant in g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy</td>
<td>17.6a</td>
<td>16.8a</td>
<td>64.4a</td>
<td>91.7a</td>
<td>23.10a</td>
</tr>
<tr>
<td>Moderately diseased</td>
<td>5.2b</td>
<td>3.6b</td>
<td>7.9b</td>
<td>21.4b</td>
<td>2.82b</td>
</tr>
<tr>
<td>Heavily diseased</td>
<td>4.4b</td>
<td>4.1b</td>
<td>4.7c</td>
<td>14.8c</td>
<td>2.17c</td>
</tr>
<tr>
<td>Severely diseased</td>
<td>0.0c</td>
<td>0.0c</td>
<td>0.0d</td>
<td>0.0d</td>
<td>0.0d</td>
</tr>
</tbody>
</table>

1. Mean of 10 plants.
2. Values having differing letters are significantly different at P<0.05 based on two sample t-test.

disease on number of flowers and pods produced per plant was studied by counting their numbers. For studying the number of grains per plant, pods were harvested, threshed, counted and average per plant computed. The grains, thus obtained, were weighed and finally graded into normal and abnormal and again, amount of normal grains weighed to obtain their percentage over total grain weight. Ten plants, randomly selected from a sample population of 100 diseased plants, for an individual disease — severity grade, formed the sample size.

RESULTS AND DISCUSSION

The disease caused severe reduction in the number of flowers, pods and grains as also in the per cent normal grains produced and grain weight per plant. The reduction was greater with the increasing severity of the disease.

The reduction in the number of flowers per plant was 70.4 per cent in case of moderately diseased, 75 per cent in case of heavily diseased and 100 per cent in case of severely diseased plants (Table 1). Likewise, reduction in the number of pods per plant was 75 per cent in case of moderately diseased, 75.7 per cent in case of heavily diseased and 100 per cent in case of severely diseased plants. The reduction in the number of grains per plant was 87.7 per cent in case of moderately diseased, 92.7 per cent in case of heavily diseased and 100 per cent in case of severely diseased plants.

The reduction in the per cent normal grain production was 76.7 per cent in case of moderately diseased, 83.9 per cent in case of heavily diseased and 100 per cent in case of severely diseased plants (Table 1). The reduction in grain weight was 87.8 per cent in case of moderately diseased, 90.6 per cent in case of heavily diseased and 100 per cent in case of the severely diseased plants.

Number of flowers and pods produced by moderately diseased, heavily diseased and severely diseased plants were significantly lower than those produced by healthy ones. Likewise, number of flowers and pods produced by severely diseased plants were significantly lower than those produced by moderately diseased and heavily diseased, the latter two being statistically at par among themselves. In case of number of grains, per cent normal grain produced and grain weight per plant, healthy, moderately diseased, heavily diseased and severely diseased, all the three plant categories, differed significantly among themselves.

Viral infections in other legumes, like urd bean and mung bean, have also been reported to cause severe yield losses by way of reduced number of flowers, pods, grains and per cent normal grains (Nene, 1972; Singh et al., 1983).
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REFERENCES


