CHEMICAL CONTROL OF BLACKLEG, DRY ROT AND VERTICILLIUM WILT OF POTATO

D. B. ROBINSON, G. W. AYERS AND J. E. CAMPBELL

INTRODUCTION

Serious losses in seed potato production in Prince Edward Island occur annually from the diseases blackleg, dry rot and Verticillium wilt. Blackleg (Erwinia atroseptica) (van Hall) Jennison) is by far the most important disease of the three. It caused the rejection for seed purposes of more than 5500 acres in the period 1954-1958. Smaller, but consistent, losses are caused each year by dry rot (Fusarium sambucinum f.6 Wr. and Fusarium coeruleum (Lib.) Sacc.) and by wilt (Verticillium albo-atrum R. & B.).

Individual control measures for each of these diseases have been reported previously (1, 8, 9). This paper presents further results obtained over the past four years with various chemicals. In these trials the incitants of the three diseases were present both singly and in combination with each other.

MATERIALS AND METHODS

The pathogens used in the trials were isolated from diseased material. The fungi were maintained on potato dextrose agar and the bacteria on nutrient agar. Inocula consisted of a conidal or bacterial suspension made from freshly growing cultures, except that in a few cases dry rot inoculum consisted of a suspension of macerated diseased tuber tissue.

All field trials were planted in randomized block designs on land where adjacent plantings had been relatively free of the dry rot, wilt and blackleg pathogens. In most of the trials each treatment comprised 200 plants in a four-replicated block. Seed tubers were obtained from crops known to be free of the diseases under study. The varieties Sebago, Keswick and Irish Cobbler were used. These varieties were chosen because of their differing susceptibility to the pathogens in the tests, as follows:

<table>
<thead>
<tr>
<th>Variety</th>
<th>V. albo-atrum</th>
<th>E. atroseptica</th>
<th>F. sambucinum f.6 Wr.</th>
<th>F. coeruleum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irish Cobbler</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Sebago</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Keswick</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Unless otherwise noted, the seed pieces were sprayed with a suspension of inoculum or were immersed in it; then they were air dried and treated with the desired chemical. Where inocula or chemicals were used in combination, they were kept at the same concentration as when used singly.

Data on the incidence of wilt and blackleg were obtained by counts of infected plants during the growing season. Data on dry rot, unless otherwise noted.
otherwise noted, was obtained by examination of tubers after two to six months in storage. Such tubers were harvested with an elevator digger, bruised on a specially designed platform, and stored in jute sacks at 40-44°F. Dry rot severity was recorded by rating tubers in each treatment lot for number and extent of lesions, weighting and summing the figures and converting to a percentage datum. Percentage data referring to the incidence of any of the diseases under study are presented as an index obtained by the conversion of percentage figures to degrees of an angle as given by Snedecor (10).

A number of the chemicals used were tested for effectiveness in vitro. Filter paper discs were saturated with a solution of the chemical and placed on agar media that had been seeded with one of the pathogens. When the test organism was bacteria, streptomycin assay agar was used, otherwise the assay medium was clarified potato dextrose agar. The comparative effectiveness of chemicals tested in this way was measured by comparing the inhibition zones produced after 12 to 48 hours incubation at 24°C.

The chemical preparations used in these trials, and their active ingredients, were as follows:

Agristrep: streptomycin sulfate 26.7%.


Agristrep dust: streptomycin sulfate 0.24%.

Agri-mycin 500, 10%: streptomycin sulfate 10%, copper 10%, oxytetracycline 1%.

Agri-mycin 500, 42.4%: streptomycin sulfate 1.755%, copper 42.4%, oxytetracycline 0.176%.

Arasan dust: tetramethyl thiruamdisulphide 50%.

Captan: n-trichloromethylmercapto-4-cyclohexene-1,2 dicarboximide 50% and 75% wettable.

Dithane Z78: zinc ethylene bisdithiocarbamate 65%.

Karathane: dinitro-phenylcrotonate 22.5%, other nitro phenols and derivatives, chiefly dinitrophenol, 2.5%.

Kolo 100: sulfur 75.4%, 2,3 dichloro-1, 4-naphthoquinone 3.5%.

Phygon XL: 2,3-dichloro-1, 4 naphthoquinone 50%.

Spergon: tetrachloro-para-benzoquinone 97%.

Semesan Bel: hydroxymercurinitrophenol 12.5% and hydroxymercuri-chlorophenol 3.8%.

Sulfuron: sulfur 97%.

Terramine: phenol, coefficient 20.

Lime: equivalent CaO, 74.1%.

RESULTS

Blackleg

Several field trials were carried out with this disease using the variety Sebago. The treatments used and the blackleg control obtained in two such trials are presented in Tables 1 and 2.