THE USE OF PYTHIUM PERIPLOCUM TO CONTROL DAMPING-OFF OF CUCUMBER

SEEDLINGS CAUSED BY PYTHIUM APHANIDERMATUM

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INTRODUCTION

Pythium periplocum Drechsler is a necrotrophic mycoparasite that has been recorded infrequently (Plaats-Niterink, 1986) and little studied. There is some evidence that it has a different distribution than-and, thus, probably differs physiologically and ecologically from- the better known mycoparasite, \textit{P. oligandrum} Drechsler (Hendrix and Campbell, 1970). Some aspects of the use of \textit{P. periplocum} as biological control agent are presented in connection with experiments aimed at the control of damping-off of cucumber seedlings caused by \textit{P. aphanidermatum} (Edson) Fitzp.

MATERIALS AND METHODS

Isolation and Identification of Pythium species

The isolates of \textit{P. periplocum} and \textit{P. aphanidermatum} used in this study were isolated in Indonesian soil and identified at the Centraalbureau voor Schimmelcultures (CBS), Baarn, The Netherlands. \textit{P. oligandrum} was obtained from CBS (No 149.84).

Inoculum of \textit{P. periplocum} and \textit{P. aphanidermatum}

Inoculum was produced by culturing the isolates on a sterile mixture of 110 g vermiculite, 180 ml V8 juice and 380 ml glass distilled water for 1 week at 25 °C after which the mixture was air dried. The dried inoculum contained oospores. The concentrations of inocula tested were in g per pot, 0.001, 0.01, 0.1, 0.25 and 0.5 for \textit{P. aphanidermatum} and 2 and 4 for \textit{P. periplocum}.

Biological Control Experiments

The inoculum and rooting medium (vermiculite) were thoroughly mixed in a plastic bag before filling the pots. For some experiments, the rooting...
medium was infested with P. periplocum, watered, and incubated for 4 days at 25°C before adding P. aphanidermatum and sowing. The pots were without drainage holes and contained 400 ml (40 g dry weight) vermiculite. They were watered to "field" capacity with 194 g weak fertilizer solution and sown with six cucumber seeds (Cucumis sativus L. cv. Langelands Kaempe-Gigant). On alternate days, the pots were watered to their initial weight. After sowing, incubation was at 25°C with 14 hours light (100µ E/s m²) and 10 hours darkness and high humidity. After 7 days, pre- and post-emergence damping-off, dry weight and root length were recorded. Dry weight and root length data were analysed statistically by use of multiple range test of Waller and Duncan.

RESULTS AND DISCUSSION

Biological Control

The application of P. periplocum was not deleterious to the cucumber seedlings in any way and the roots of inoculated seedlings had the same dry weight and root length as in the noninoculated control (Table 1).

Application of P. periplocum at the same time as P. aphanidermatum greatly improved percentage of cucumber seedlings at three inoculum levels (Fig. 1). These results have been confirmed in a number of repeated experiments. Surviving seedlings from the pots inoculated with P. aphanidermatum had significantly lower (P = 0.05) dry weight and shorter roots than surviving seedlings in the pots inoculated with P. periplocum alone or in the pots inoculated simultaneously with both P. periplocum and P. aphanidermatum. Inoculation of the vermiculite with P. periplocum 4 days before inoculation with P. aphanidermatum resulted in an even better biological disease control (Fig. 1). These latter results have, however, not been consistently achieved in repeat experiments.

Table 1. Dry Weight and Root Length of Surviving Cucumber Seedlings Following Inoculation with P. aphanidermatum and/or P. periplocum

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Inoculum (g/pot)</th>
<th>Dry weight per plant (g)</th>
<th>Root length per plant (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uninoculated control</td>
<td>0</td>
<td>0.024 a³</td>
<td>8.5 a³</td>
</tr>
<tr>
<td>P. periplocum</td>
<td>4</td>
<td>0.026 a</td>
<td>8.6 a</td>
</tr>
<tr>
<td>P. aphanidermatum</td>
<td>0.5</td>
<td>0.018 b</td>
<td>6.4 b</td>
</tr>
<tr>
<td>P. periplocum</td>
<td>4¹</td>
<td>0.024 a</td>
<td>8.1 a</td>
</tr>
<tr>
<td>P. aphanidermatum</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. periplocum</td>
<td>4²</td>
<td>0.024 a</td>
<td>8.0 a</td>
</tr>
<tr>
<td>P. aphanidermatum</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ P. periplocum and P. aphanidermatum inoculated together.
² Vermiculite inoculated with P. periplocum and incubated for 4 days before inoculation with P. aphanidermatum.
³ Numbers followed by different letters are statistically significant (P = 0.05).