Cole Crops

Club Root

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**Identification and Life Cycle**

Club root is caused by the fungus *Plasmodiophora brassicae*; and can be a destructive disease of cabbage, cauliflower, broccoli, brussel sprouts, kohlrabi, Chinese cabbage, radish, turnip, and rutabaga. It may also infect many wild mustards and cultivated ornamentals such as column stock and wallflower. Infection is most severe in acid soils, and does not occur above pH 7.0. Disease develops when soilborne spores germinate and infect young roots. The fungus spreads from cell to cell in roots, and causes a rapid growth of large cells. The pathogen is disseminated among fields in infected transplants, contaminated soil on equipment, and irrigation water. Resting spores of the pathogen survive for years in soil.

**Plant Response and Damage**

Disease symptoms first appear as slight wilting or flagging of leaves during the warmest part of the day. The wilting becomes progressively worse, until permanent wilting occurs. Roots of infected plants are enlarged and misshaped. If infection occurs at a single site, roots are spindle-shaped, but multiple infections result in extreme swelling and distortion.

**Management Approaches**

**Biological Control**

No biological control strategies have been developed for club root.
Cultural Control

Plant transplants free from club root. Prevent the introduction of the pathogen into new fields by pressure-washing equipment after working in fields with the disease. Practice a three-year or longer crop rotation to non-hosts such as small grains. Avoid reuse of irrigation tail water. Club root is not a problem in alkaline soils, and liming acid soils can provide an effective control strategy. Tolerant varieties should be planted where available, but many strains of the pathogen exist that may overcome resistance in some varieties.

Chemical Control

PCNB (pentachloronitrobenzene) incorporation into soil at planting can delay root decay from secondary pathogens, but is most effective when used in combination with cultural practices such as liming.

Product List for Club Root:

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Product per Acre</th>
<th>Application Frequency</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCNB</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Terraclor 15G</td>
<td>125 lb</td>
<td>Preplant incorporate</td>
<td>Apply and incorporate 4 to 6” deep in a 12 to 16” band immediately prior to planting</td>
</tr>
<tr>
<td>Terraclor 75%WP</td>
<td>30-40lbs</td>
<td>Preplant incorporate</td>
<td>Apply and incorporate 4 to 6” deep in a 12 to 16” band immediately prior to planting</td>
</tr>
<tr>
<td>Terraclor Flowable</td>
<td>5.6-7.5 gal</td>
<td>Preplant incorporate</td>
<td>Apply and incorporate 4 to 6” deep in a 12 to 16” band immediately prior to planting</td>
</tr>
</tbody>
</table>

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Categories: Cole Crops, Disease, Club Root

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