Controlling *Botrytis* Gray Mould on Container-Grown Conifer Seedlings - FRDA Project 1.06

Gray mould, caused by the fungus *Botrytis cinerea* is a major disease of container-grown conifer seedlings, killing thousands annually. There are few products registered for controlling *Botrytis* on container seedlings. Also, the mould has shown tolerance to the products that have been used, Captan®, Benomyl® and Chlorothalonil®. Project 1.06 has tested six fungicides, including Captan®, to collect data on phytotoxicity and efficacy. This information will help in obtaining label extensions for these chemicals so they can be used operationally in forest nurseries.

The study, which involved both lab and greenhouse tests, was carried out at Pacific Forestry Centre in Victoria under the direction of Dr. Jack Sutherland. The research team tested Anilazine®, Captan®, Dichloran®, Folpet®, Iprodione® and Thiram® at half, double and recommended label rate on the following 1+0 container-grown conifers: Douglas-fir, Sitka spruce, western hemlock, western redcedar and white spruce. The lab tests were used to determine the level of *Botrytis* resistance to each chemical.

Results of the lab and greenhouse tests showed:

1. **Iprodione®**

   Although Iprodione® caused some reduction in growth for all except Douglas-fir, it provided excellent disease control for all species. Growth losses would likely be compensated by the protection provided by Iprodione®. The lab tests suggest there is no *Botrytis* tolerance to Iprodione®, however, experience has shown that tolerance can develop quickly with the continuous use of a fungicide.

   Label extension for *Botrytis* control on western hemlock, western redcedar, Sitka spruce, white spruce, and Douglas-fir is recommended for Iprodione®.

2. **Thiram®**

   Thiram® gave excellent control of *Botrytis* on western redcedar and Douglas-fir and good control on the other tree species except western hemlock and Sitka spruce. Seedling growth of western hemlock and Sitka spruce was reduced by Thiram® application. The lab tests suggest that *Botrytis* is tolerant to Thiram® so that this fungicide should be used only in rotation with other products.

   Label extension is recommended for the control of *Botrytis* on western redcedar, Douglas-fir, Sitka spruce, and white spruce.

3. **Folpet®**

   Folpet® provided good gray mould control on Sitka spruce, white spruce, and western hemlock. Folpet® reduced seedling growth of all species except Douglas-fir. The lab tests suggest that tolerance to Folpet® exists or could develop rapidly. Therefore, this fungicide should only be used in rotation with other products.

**TABLE 1.** Composite fungicide efficacy and severity rankings

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Douglas-fir</th>
<th>Western hemlock</th>
<th>Sitka spruce</th>
<th>White spruce</th>
<th>Western redcedar</th>
<th>Overall composite rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analazine®</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Captan®</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Dichloran®</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Folpet®</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Iprodione®</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Thiram®</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: The lower ranking, the better the control of *Botrytis*. See FRDA Report 012 for the data on which this table is based.

**ECONOMIC DEVELOPMENT AGREEMENT**

Canada

BC
Label extension of Folpet® for control of *Botrytis* on Sitka spruce, white spruce, western redcedar, and perhaps Douglas-fir should be pursued.

4. Analazine®

Analazine® provided adequate *Botrytis* control on all tree species except Douglas-fir and western redcedar, where it was slightly less effective. Reduced seedling growth of western redcedar, Sitka spruce, and white spruce would be offset by the great number of disease-free seedlings, but further studies may be needed to determine the degree to which Analazine® is toxic to Sitka and white spruce, particularly on 0-to-15-week-old seedlings. The lab tests demonstrated that *Botrytis* is already tolerant of this chemical. Analazine® could, at best, be used in a long rotation with other fungicides.

Label extension of Analazine® for control of *Botrytis* on western hemlock, Douglas-fir, and western redcedar is desirable.

5. Dichloran®

Dichloran® gave excellent control of *Botrytis* on western hemlock, very good control on Sitka spruce, and adequate control on the remaining tree species. Growth inhibition of western hemlock, Sitka spruce, and western redcedar would be offset by improved disease control. The lab tests suggest that *Botrytis* is not tolerant to Dichloran®.

Label extension for control of *Botrytis* on western hemlock and Sitka spruce should be pursued.

6. Captan®

Captan® provided good control of *Botrytis* on Douglas-fir and adequate control on western redcedar. Control on the other species was adequate to poor. Growth of western hemlock, Sitka spruce, and western redcedar seedlings was inhibited by this fungicide. Tolerance to Captan® was evident in the lab tests, particularly at the lower dosages.

As Captan® is already used extensively for the control of *Botrytis* on all tree species tested, label extension should be pursued for this fungicide.

In evaluating fungicides, it is important to balance phytotoxic effects with the degree of control provided, while also considering the possibility that the pest might develop tolerance to the fungicide. As *Botrytis* showed tolerance to most of the fungicides tested, these chemicals must be used in rotation with other products.

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