Bacterial Wilt Resistance


Cheryl Fox and Judy Thies

**PLANT CULTURE**

**Greenhouse**

Container: Bench or flat deep enough to allow root development

Media: Sand or soil mixture

Temp/Light: 24 to 30°C; 16+ hour daylength

No. of Plants: 50 to 70 per replication

No. of Reps: 3 minimum

Other: Inoculate with *Rhizobium meliloti* Dang; promote good growth; spray and fertilize as necessary

**INOCULUM CULTURE**

Source: Infected root tissue

Storage: Ground up, washed roots

Temperature: -10°C

Storage Life: Up to several years if frozen

**INOCULATION PROCEDURE**

Age of Plant: 8 weeks old

Concentration: 50g ground root per L H2O

Inoc. Time: 20 to 30 min

Method: Bare root soak

Type of Inoc: Bacterial water suspension

**INCUBATION**

Location: Transplant to field (June)

Plant Counts: Count 2 to 4 weeks after establishment

Cultural: Maintain vigorous growth

Spacing: 0.15 x 1.0 m

Age at Rating: 5 months (3 months in field)

**RATING**

Plants are removed from the field and the tap root sectioned for rating.

0 Resistant: Root clean and white
1 Resistant: Very small yellow-brown spots visible in stele
2 Susceptible: Discoloration affecting up to one-third of stele
3 Susceptible: Nearly entire stele discolored, cortex white
4 Susceptible: Discoloration throughout stele and cortex, plant alive
5 Susceptible: Plant dead (based on plant count)

**CHECK CULTIVARS**

<table>
<thead>
<tr>
<th>Approximate Expected Resistance (%)</th>
<th>Acceptable Range of Reaction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resistant</strong></td>
<td></td>
</tr>
<tr>
<td>Vernal</td>
<td>42</td>
</tr>
<tr>
<td><strong>Susceptible</strong></td>
<td></td>
</tr>
<tr>
<td>Narragansett**</td>
<td>1</td>
</tr>
<tr>
<td>Sonora**</td>
<td>1</td>
</tr>
</tbody>
</table>

Values for resistant standards are totals of 0’s and 1’s.

**DISTRIBUTION AND SEVERITY OF BACTERIAL WILT**

Bacterial wilt, *Clavibacter michiganense* subsp. *insidiosum* (McCull) Davis *et al* (Click on the map above for a larger version. See also the key)

**SOURCE OF INOCULUM**

Name: Judy Thies

Address: Department of Plant Pathology
495 Borlaug Hall
1991 Buford Circle
University of MN
St. Paul, MN 55108

Phone: 612-625-8240

**SCIENTIST WITH EXPERTISE**

Name: Don Barnes

Address: University of Minnesota
USDA/ARS
411 Borlaug Hall
1991 Buford Circle
University of MN
RACES

There are no known races of *Clavibacter michiganense*.

CULTURE OPTIONS
AND RANGE OF CONDITIONS

Pure cultures of *Clavibacter michiganense* can be grown (2), however pure cultures often appear to be less virulent than ground root inoculum.

PLANT GROWTH OPTIONS
AND RANGE OF CONDITIONS

Best results are obtained when the plants are grown under optimum conditions in the field and in the greenhouse. It is important to transplant healthy plants with well developed roots to assure good transplant survival and un

HELPFUL INFORMATION

Plants may be stored in 1 to 2 cm water at 2 to 4°C for up to several days prior to transplanting. A tobacco transplanter or modified vegetable transplanter works well for transplanting. Plants are undercut at 15 cm and root sectioned for rating. A carrot or beet lifter also works well for removing the plants from the ground. Plants may be rated at any time between 12 to 16 weeks after transplanting. Ratings may be expressed as an Average Severity Index (ASI) or as a percentage adjusted to the long time average of Vernal (42%). The percentage of resistant plants adjusted to Vernal is very useful in comparing cultivars tested in different years.

INOCULATION CONDITIONS
AND RANGE OF CONDITIONS

Roots must not be allowed to dry out between pulling and inoculating. After inoculation, plant tops are trimmed to within 5 cm of the crown and roots to 10 to 12 cm. Several bundles can be wrapped together in paper or cloth towels to keep them moist until transplanting.

HELPFUL INFORMATION

Plants may be stored in 1 to 2 cm water at 2 to 4°C for up to several days prior to transplanting. A tobacco transplanter or modified vegetable transplanter works well for transplanting. Plants are undercut at 15 cm and root sectioned for rating. A carrot or beet lifter also works well for removing the plants from the ground. Plants may be rated at any time between 12 to 16 weeks after transplanting. Ratings may be expressed as an Average Severity Index (ASI) or as a percentage adjusted to the long time average of Vernal (42%). The percentage of resistant plants adjusted to Vernal is very useful in comparing cultivars tested in different years.

ALTERNATE METHODS

The root soak field evaluation method is most effective in determining resistance in alfalfa. However a combination of root soak and cotyledon wounding has proved effective for screening large numbers of seedlings in the greenhouse (1,2,3,5).

REFERENCES


5. Krietlow, K.W. Infecting seven-day-old alfalfa seedlings with wilt bacteria through wounded cotyledons. Phytopathology. 53:800-803