

# PHYTOPHTHORA ROOT ROT RESISTANCE

Test accepted: March 1991

Pathogen: *Phytophthora medicaginis* Hansen & Maxwell, sp. nov.

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## PLANT CULTURE

### Field Methods<sup>(3)</sup>

No. of Plants ..... 40 to 60 per replication

No. of Reps ..... 3 or 4 replications

Other ..... Plant in early May on a level area with relatively heavy soil, but with good internal drainage.

### Greenhouse Method

Container ..... 20 cm deep watertight tanks with drain holes and a 2.5 cm diameter pipe placed vertically in one corner to allow flooding sand from bottom of tank.

Medium ..... Washed, pasteurized sand

Temp/Light ..... 20 to 24°C (sand temperature); 16 hour daylength

No. of Plants ..... 25 per replication

No. of Reps ..... 4 minimum

Other ..... Inoculate with *Rhizobium meliloti* Dang and fertilize

## INOCULUM CULTURE

### Greenhouse Method

Source ..... Culture on V-8 juice agar in 9 cm petri dishes

Maintenance ..... Store cultures on V-8 juice agar at 4°C

## INOCULATION PROCEDURE

### Field Method

Type of Inoc. .... Select a field that is naturally infested; or spread infested soil from several geographic areas over the field, incorporate to a depth of about 15 cm and grow a susceptible variety for one year prior to using the area

### Greenhouse Method

Age of Plant ..... Plant seed into sand

Type of Inoc. .... Two week old cultures

Concentration.... Mix inoculum with sand before planting at a rate of one petri dish per 500 cm<sup>2</sup> surface area

## INCUBATION

### Field Method

Plant Counts ..... Count plants (alive + dead) when seedlings are in the unifoliolate stage.

Culture ..... About 4 weeks after planting, irrigate each day for 3 weeks to keep soil continuously saturated, allow soil to dry for 1 week, clip plants, and cultivate soil. Repeat the sequence two more times. Spray for insects as needed.

Row Spacing ..... Approximately 0.3 m

Age at Rating ..... 14 to 15 weeks after planting

### Greenhouse Method

Plant Counts ..... Same as field method

Culture ..... Water seedlings sparingly until they are well established (4 weeks), plug drain holes and water daily to raise water level surface; maintain flooded conditions for about 4 weeks.

Row Spacing ..... Approximately 3.5 cm

Age at Rating ..... 8 weeks after planting

## RATING

Dig all plants retaining 25 cm or more of the taproot. Spray roots to remove excess soil, bundle plants, and soak roots in a tub of water. Complete washing and rate plants indoors under uniform light.

1 Resistant ..... Roots clean no lesions; many small rootlets on taproot

2 Resistant ..... Small root lesions (2 mm); small rootlets absent

3 Susceptible ..... Large nongirdling root lesion(s) and/or branch root tips rotted off

4 Susceptible ..... Extensive lesions with ends of large tap or lateral roots rotted off 10 cm or more below the crown.

5 Susceptible ..... Tap and lateral roots almost destroyed; plant alive.

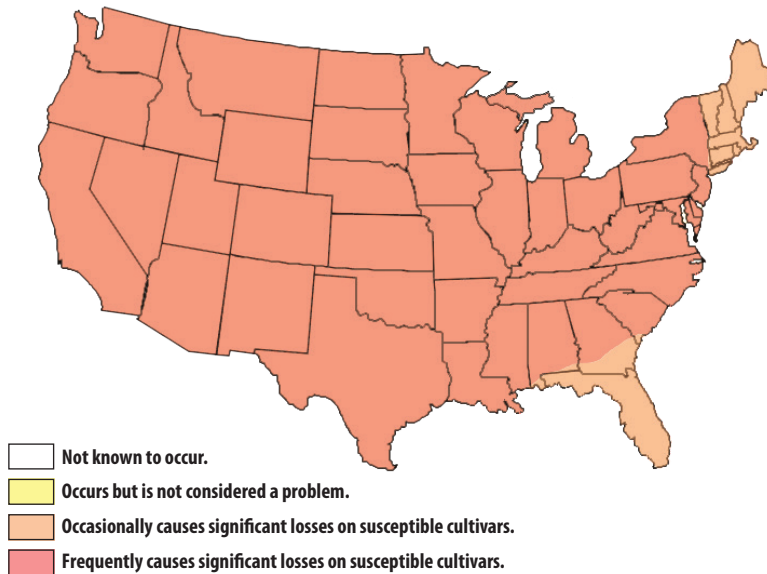
6 Susceptible ..... Plants dead (calculated as loss in stand)

## CHECK CULTIVARS

	Approximate Expected Reaction (%)	Acceptable Range of Resistance (%)
<b>Resistant</b>		
Agate**	43	25-55
<b>Susceptible</b>		
Saranac**	3	0-10

Values for resistant standards are totals of 1's and 2's

## DISTRIBUTION AND SEVERITY OF PHYTOPHTHORA ROOT ROT



Phytophthora root rot, *Phytophthora megasperma* Drechs. f. sp. *medicaginis*<sup>(3)</sup>  
(Click on the map above for a larger version.)

## SOURCES OF INOCULUM AND EXPERTISE

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## CORRELATION TO FIELD REACTION

Field and greenhouse evaluations were correlated ( $r = 0.99$  and  $0.95$ ) in two tests.<sup>(3)</sup> Field tests tend to be more precise, with greenhouse tests useful for screening.

## PATHOTYPES

Isolates of *Phytophthora megasperma* with different levels of pathogenicity on alfalfa cultivars exist.<sup>(2)</sup> Therefore, it is important to use a mixture of highly pathogenic isolates.

## PLANT GROWTH OPTIONS AND RANGE OF CONDITIONS

Monitor root rot development during the season. Symptoms can be increased or reduced by changing the frequency and/or amount of irrigation. Potato leafhopper control is very important in the Midwest.

## HELPFUL INFORMATION

Ratings may be expressed as an average severity index (A.S.I.) which is most precise, or percentage of resistant plants<sup>(3)</sup> which can be adjusted to a standard check to compare entries between tests. The percentage of plants adjusted to Agate is useful for comparing cultivars tested in different years.

## ALTERNATIVE METHODS

Greenhouse tests using zoospores<sup>(1)</sup> in a method analogous to that used for *Aphanomyces*<sup>(4)</sup> has been successfully used to rank lines although the percent resistant plants is somewhat lower than field test results.

## REFERENCES

1. Irwin, J.A.G., S.A. Miller, and D.P. Maxwell. 1979. Alfalfa seedling resistance to *Phytophthora megasperma*. *Phytopathology* 69:1051-1055.
2. Faris, M. A. 1985. Variability and interaction between alfalfa cultivars and isolates of *Phytophthora megasperma*. *Phytopathology* 75:390-394.
3. Frosheiser, F. I., and D. K. Barnes. 1984. *In* Standard tests to characterize pest resistance in alfalfa cultivars. USDA Misc. Pub. No. 1434.
4. Nygard, Sharie, and Craig Grau. 1991. *In* Standard tests to characterize alfalfa. NAAIC.