

Phytophthora Root Rot of Soybeans in Maryland

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ABSTRACT

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Root rot of soybean, caused by race I of *Phytophthora megasperma* f. sp. *glycinea*, is reported for the first time in Maryland. Isolation, pathogenicity, cultural characteristics, and race identification of two isolates are described. Susceptibility of several Maryland-grown soybean cultivars to these isolates is shown.

Soybean root rot, caused by *Phytophthora megasperma* (Drechs.) f. sp. *glycinea* (Kuan & Erwin) (Pmg) (5), has been reported from several states and Canada (8). Soybean (*Glycine max* (L.)

Merr. 'Essex') plants with symptoms of root rot were collected from poorly drained areas in two fields in Worcester County on Maryland's eastern shore in August 1980. Symptoms included dark-brown internal discoloration of the taproot with external discoloration extending in some cases 10–20 cm up the stem. The numbers of lateral and branch roots were markedly reduced and few root nodules remained. In this paper, we report the occurrence, isolation, pathogenicity, cultural characteristics, and race identification of Pmg in Maryland.

MATERIALS AND METHODS

Diseased stem and root sections were

either immersed in 95% ethanol and flamed or exposed to running tap water for 18 hr and then placed on a selective antibiotic cornmeal agar medium (2). Pathogenicity was determined by inoculating hypocotyls of thirty 2-wk-old Essex seedlings with mycelium grown in a hempseed and distilled water solution. Diseased hypocotyl sections were surface disinfested and placed on the selective antibiotic medium for reisolation of the fungus. The pathogenicity test was repeated once.

Morphological and cultural characteristics of the isolates were determined. Sporangia production and zoospore cleavage and release were observed by the methods of Ho and Hickman (4). Oogonia and oospore diameters were measured by using a calibrated ocular micrometer with the bright field optics of a Leitz Dialux 20 Research Microscope. Growth rates were determined by measuring radial growth of mycelium after 3–5 days on cornmeal agar, lima bean agar, and V-8 juice agar media at 17, 20, 25, 28, and 31 C. Each treatment was

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Table 1. Reaction^a of soybean cultivars to hypocotyl inoculations with two Maryland isolates of *Phytophthora megasperma* f. sp. *glycinea*

Cultivars	Isolate	
	1	2
Differential		
Harosoy	S	S
Sanga	R	R
Harosoy 63	R	R
Mack	R	R
Altona	R	R
PI 103.091	R	R
Tracy	R	R
Maryland-grown		
Essex	S	S
Delmar	S	S
Kent	S	S
Miles	S	S
Union	R	R
Williams	S	S

^aS = susceptible, hypocotyl collapsed within 5 days; R = resistant, hypocotyl not collapsed.

replicated five times and the experiment was repeated once.

To determine the race of each isolate, mycelium from V-8 juice broth culture was placed in a vertical slit in the hypocotyls of each of fifty 2-wk-old plants of soybean cultivars used for race identification of Pmg (1,6,7). Seedlings were maintained under greenhouse conditions and were rated several days after inoculation as either resistant (hypocotyl not collapsed) or susceptible (hypocotyl collapsed). The race identification test was repeated once.

RESULTS AND DISCUSSION

Results of pathogenicity tests and observations of cultural and morphological features showed that the causal agent of this root rot of soybeans was Pmg. The same fungus was consistently isolated from field-grown diseased soybeans. Two isolates were obtained from several plants in two fields. Ninety-

five percent of the inoculated Essex seedlings were susceptible to the isolates. The same fungus was reisolated from 72% of the diseased hypocotyls placed on the selective antibiotic medium.

Morphological characteristics similar to those reported for Pmg (3) were coenocytic mycelium with right-angle branching and constrictions at the base of hyphae; obpyriform sporangia produced on simple sporangiophores; sporangia proliferating internally through a single apical pore after cleavage within the sporangium wall; smooth-walled, globular, yellow oogonia with an average diameter of 33.9 μm (range, 32.4–36.5 μm); smooth-walled, spherical oospores with an average diameter of 33.0 μm (range, 29.3–37.3 μm); and intercalary spherical hyphal swellings or chlamydospores as large as oogonia.

Cultural characteristics similar to those reported for Pmg (3) were abundant aerial mycelium on V-8 juice agar medium at 28 C, mycelium typically submerged and hyphal strands curled to form loops on cornmeal agar, optimum temperatures for growth at 28 C on V-8 juice and lima bean agar media, and maximum growth at 25 C and markedly reduced growth at 31 C on cornmeal agar. Growth rates at all five temperatures were significantly higher on V-8 juice agar than on lima bean or cornmeal agar.

Hypocotyls of susceptible soybean cultivars typically became necrotic and collapsed within several days after inoculation whereas resistant hypocotyls developed small, localized lesions and remained intact. The results (Table 1) showing that Harosoy was susceptible and Sanga, Harosoy 63, Mack, Altona, PI 103.091, and Tracy were resistant support the contention that the isolates are race 1 of Pmg. Five soybean cultivars commonly grown in Maryland (Essex, Delmar, Kent, Miles, and Williams) were susceptible to both isolates. Union was

the only Maryland-grown cultivar examined that was resistant to these isolates.

Maryland is a relatively new soybean-growing area. Most of the 385,000 acres of soybeans planted in 1980 were planted with cultivars susceptible to Pmg. *Phytophthora* root rot could become a problem in Maryland in plantings in poorly drained soils.

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