New Physiologic Race of Phytophthora megasperma f. sp. glycinea

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ABSTRACT


A new physiologic race of Phytophthora megasperma f. sp. glycinea has been identified after hypocotyl inoculation of the differential soybean (Glycine max) cultivars Harosoy, Harosoy 63, Sanga, Mack, Altona, PI 171442, and PI 103091. The new race was proposed as number 25. Race 25 is compatible with or virulent to those cultivars with the following genes at the rps locus: Rps₉, Rps₁₀, Rps₁₁, and Rps₁₄, but incompatible with or avirulent to those cultivars with the genes Rps₁₂, Rps₁₃, Rps₁₅, and Rps₁₆.

Twenty-four physiologic races of Phytophthora megasperma Drechs. f. sp. glycinea Kuan & Erwin (13) (P. m. f. sp. glycinea) (syn. P. megasperma Drechs. var. sojae Hildeb.), the causal fungus of Phytophthora root rot of soybean (Glycine max (L.) Merr.), have been identified since the disease was first reported in 1955 (12). Race 2 was reported in 1965 (17), race 3 in 1972 (18), race 4 in 1974 (19), races 5 and 6 in 1976 (9), races 7-9 in 1977 (14), races 10-16 in 1980 (10), races 17-20 in 1982 (11), races 21 and 22 in 1983 (15), race 23 in 1983 (20), and race 24 in 1984 (12).

In 1984, we collected 62 new isolates of P. m. f. sp. glycinea to investigate the variation in pathogenicity among isolates within a given physiologic race. All isolates but one (84-1-2) were identified as known races of P. m. f. sp. glycinea on the differential soybean cultivars Harosoy, Harosoy 63, Sanga, Mack, Altona, PI 171442, and PI 103091. The reactions of the differentials to isolate 84-1-2 are reported, and the isolate is proposed as physiologic race 25.

MATERIALS AND METHODS

Dying plants symptomatic of Phytophthora root rot caused by P. m. f. sp. glycinea were collected in seven commercial soybean fields in west central Indiana. A portion (10-12 cm) of the basal stem consisting of diseased and healthy tissue was placed in a plastic bag and kept on ice until sectioned. After removing the epidermis, four or five cross sections were removed from the transition area between diseased and healthy tissue and aseptically transferred to a selective medium in petri plates. The medium consisted of 0.6 g of Bacto yeast extract, 1 g of sucrose, 0.01 g of cholesterol, 0.001 g of benomyl, 0.027 g of PCNB, 0.2 g of vancomycin (hydrochloride), 20 g of agar, 40 ml of V-8 juice, and 1,000 ml of water. One isolate from each plate was transferred and maintained on potatodextrose agar slants at 20-24 C in an unlighted cabinet.

Inoculum was prepared by growing the isolates on oatmeal agar in petri plates in an unlighted cabinet for 2-3 wk at 24 C. Inoculations were made by the hypocotyl method, which consists of inserting a piece of mycelium (2 x 2 mm) into a longitudinal slit in the hypocotyl and covering with petrolatum to prevent desiccation of the inoculum and host tissue. Ten 10-day-old seedlings of the seven differential cultivars were inoculated with each isolate and grown in the greenhouse at 24-27 C with supplemental fluorescent and incandescent light. Six days after inoculation, the seedlings were classified as susceptible (dead) or resistant (no external symptoms) to the isolates. Inoculation with isolate 84-1-2 was repeated at three different times.

RESULTS AND DISCUSSION

The reactions of the differential cultivars indicated that 21 isolates were race 1, 34 were race 3, five were race 4, one was race 7, and one (race 25) was different from the previously described races 1-24. Harosoy, Harosoy 63, Sanga, and Mack were susceptible and Altona, PI 171442, and PI 103091 were resistant to race 25. Race 25 differed from race 4 only by its reaction on Sanga and from race 20 only by its reaction on PI 171442.

Each differential susceptible to race 25 has a gene at the rps₉ locus (16): Harosoy (rps₉), Harosoy 63 (rps₉₃), Sanga (rps₉₃), and Mack (rps₉). The cultivar Williams 82, which has the gene...
was also susceptible to race 25. However, PI 171442 (Rps5) (3), PI 86050 (Rps4) (2), L62-904 (Rps5) (8), and Altona (Rps3) (1) were resistant to race 25.

The recently released resistant cultivars Keller (4) and Miami (5) (Rps7, Rps5) and Winchester (6) (Rps5, Rps3) are resistant to race 25 because each has the gene Rps3 in addition to Rps7 or Rps5. Also, the germ plasm strains with the genotypes Rps1, Rps3, Rps6, Rps5, Rps3, Rps4, Rps1, Rps3, Rps6, Rps4, and Rps1, Rps5, Rps4, which we have developed for release to soybean breeders, are resistant to race 25 and to most or all other known races of the pathogen.

LITERATURE CITED


