

Rhizoctonia Web Blight of Soybeans in Puerto Rico

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ABSTRACT

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Web blight caused by *Rhizoctonia solani* is reported for the first time in Puerto Rico. Disease development was followed in two 0.1-ha fields of Davis soybeans (*Glycine max*), one sprayed weekly with benomyl (0.25 kg/ha) and the other not sprayed. Symptoms appeared before the full-green stage (R₅) in the unsprayed field and after the full-green pod stage (R₆) in the sprayed plot. The number of disease foci and their size increased with increasing soybean maturity, particularly between the yellow-pod (R₇) and the mature-pod (R₈) stages. In the unsprayed field, *R. solani* was isolated from 5% of the seeds harvested from web-blighted plants but was not recovered from seeds of adjacent plants without web blight.

Additional key words: aerial blight, seed quality

Rhizoctonia leaf rot (7-9,11,13) and aerial or web blight (1,3) of soybean (*Glycine max* (L.) Merr.), caused by *Rhizoctonia solani* Kuehn, has been reported from many parts of the world (1-3,7-13). Several workers (1,7-9,11) consider web blight of soybeans a disease of economic importance. In India, incidence of web blight was 80-90% in unsprayed plots, while in benomyl-sprayed plots the disease was controlled and yields increased significantly (10). When soybean plants were inoculated with *R. solani* in Louisiana, yields were reduced 35%; when benomyl sprays were used at twice the recommended rate, yield

losses were prevented (5). Atkins and Lewis (1) reported on the host range of the pathogen.

Rhizoctonia web blight of soybean was first found in Puerto Rico in 1979.

MATERIALS AND METHODS

Experiments were conducted in fields at the Corozal substation of the University of Puerto Rico Agricultural Experiment Station in 1979. In mid-June, soybean cultivar Davis was planted in two 0.1-ha plots separated by 200 m on Ultisol-type soil with a pH of 4.3-5.3. Twenty seeds were planted per meter of row in rows 60 cm apart. Benomyl (50 WP) was applied weekly beginning 2 wk after emergence (V₂ stage) at 0.25 kg a.i./ha to one plot but not the other.

Symptoms of Rhizoctonia web blight on leaves were first observed and samples collected on 14 September from plants in the unsprayed plot when plots were in the pod-filling stage (R₅) (4). At weekly intervals thereafter, the number of

disease foci and area of the largest foci were recorded. Isolations were made using mycelium or sclerotia picked from infected leaves. These were plated on 9-cm culture plates containing potato-dextrose agar (PDA; Difco) and incubated at 25 C. Culture characteristics and growth rates were recorded daily.

Four plants with and four plants without web blight were collected in pairs from each of five different disease foci in the unsprayed plot. Seeds from two plants at each focus were surface sterilized with 0.5% sodium hypochlorite (10% Clorox) for 4 min and then plated on PDA in 9-cm culture plates for 7 days at 25 C. Seeds from one plant at each focus were placed on moist cellulose pads (Kimpac) for 1 wk in an incubator programmed for 95% relative humidity and 25 C. The germination and occurrence of *R. solani* were recorded for each seed sample.

RESULTS

Laminae with symptoms of web blight first appeared water-soaked, then chlorotic, followed by a gray necrosis of the lamina. Gray to tan hyphae typical of *R. solani* were found on the dead laminae. Severely infected leaves collapsed, with the petioles remaining attached to stems. The collapsed leaves covered the stems and pods below them at nodes three, four, and five. Petioles of infected leaves remained green after the leaflets became necrotic. Dark brown sclerotia between 0.25 and 0.05 mm in length, typical of *R. solani*, were visible on petioles and leaves. Irregularly shaped,

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Table 1. Germination and recovery of fungi from soybean (cultivar Davis) seeds from plants with or without symptoms of *Rhizoctonia* web blight at Corozal, PR^a

	Plants with symptoms	Plants without symptoms
Germination (%)	53.2	32.6* ^b
Recovery (%) ^c		
Total fungi	30.0	68.5*
<i>Botrydiploidia theobromae</i>	0.0	3.2*
<i>Colletotrichum dematium</i> var. <i>truncatum</i>	0.0	3.2*
<i>Curvularia lunata</i>	0.0	2.6*
<i>Phomopsis</i> sp.	9.5	17.5*
<i>Rhizoctonia solani</i> ^d	5.0	0.0*

^aBased on paired samples taken from three symptomless and three adjacent plants with symptoms from each of five areas within a naturally infected field plot.

^bStatistically significant at $P = 0.05$ using a paired *t*-test.

^cData transformed by square-root transformation.

^dCause of web blight.

tan, sunken lesions were found only at the points on pods that came in contact with dead, blighted leaf tissues. Infected seeds were found in the infected pods. Infected seeds had a tan discoloration, with mycelium of *R. solani* growing on the seed surface. In some cases, infected seeds germinated in the pods. When this occurred, the hypocotyl tip of the seedling was necrotic.

Web blight symptoms appeared on 21 September in the benomyl-sprayed plots when plants were in the full-green pod stage (R₆). The disease spread most rapidly between the yellow-pod (R₇) stage and harvest maturity (R₈) in both plots. The number and size of disease loci were less in the benomyl-sprayed plot than in the unsprayed plot.

The mycelium of the Puerto Rico web blight fungus was 5–6.5 mm in width and covered the PDA culture plates in 2 days. Branching was at right angles, with

constrictions at the base of the hyphal branches. Sclerotia on plant tissue were elongate and irregular, ranging from 200 to 266 × 300 to 480 μm. Sclerotia on PDA were 3–5 mm in diameter, cinnamon colored, and associated with droplets of an exudate. All sclerotia, regardless of source, were made up of moniloid cells.

Web-blighted plants that died 2–3 wk before harvest produced seeds with fewer internally seedborne fungi and had a higher germination than those from unblighted plants. From seeds of web-blighted plants on cellulose pads, the percentages of germination and recovery of *R. solani* were 65.5 and 4, respectively; from unblighted plants, the percentages were 37 and 0, respectively. The germination and recovery of *R. solani* from seeds plated on PDA were similar (Table 1). Seedborne infection was related to the clinging of infected leaves to pods at the middle nodes of infected plants. On PDA, there was a greater recovery of the following fungi from unblighted than from web-blighted plants: *Botrydiploidia theobromae*, *Colletotrichum dematium* var. *truncatum*, *Curvularia lunata*, *Phomopsis* spp., and total fungi (Table 1).

DISCUSSION

This is the first report of *Rhizoctonia* web blight of soybean in Puerto Rico. The disease developed during a period when 20 cm of rain fell in September and October 1979. The disease increase was most apparent on plants between the yellow-pod (R₇) stage and harvest maturity (R₈). The number of disease foci in the benomyl-sprayed plots was below that found in unsprayed plots, but it is doubtful that weekly sprays of benomyl to control the disease would be economical.

R. solani is a highly variable fungus causing a variety of symptoms on a large number of hosts over wide geographic areas (9). In mainland China and Taiwan, *Rhizoctonia* web blight of soybean and sheath blight of rice are caused by the same pathogen (6). In Malaysia, wild soybean (*Glycine javanica*) is a host of the

Rhizoctonia web blight fungus (13).

As the production of soybeans increases in the humid tropics and subtropics, care must be taken to incorporate resistance to pathogens that have not been reported for temperate regions, such as *Rhizoctonia* web blight. For example, Davis soybeans have yielded well in many temperate and tropical areas (6), and the cultivar is used as a parent for transferring high-yield traits to soybean cultivars with tropical adaptation (G. Bastida, ICA, Palmira, Colombia, *personal communication*). In using Davis as a parent, breeders should be aware of its susceptibility to *Rhizoctonia* web blight, a potential limiting factor for soybean production in the humid tropics and subtropics.

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