Neocosmospora Stem Rot of Soybeans in Alabama

FRED A. GRAY, Extension Plant Pathologist-Nematologist, Alabama Cooperative Extension Service, Auburn University; RODRIGO RODRIGUEZ-KABANA, Professor, Department of Botany and Microbiology, Auburn University; and J. RICHARD ADAMS, Extension Associate-Plant Pathology, Alabama Cooperative Extension Service, Auburn University, Auburn, AL 36830

ABSTRACT

GRAY, F. A., R. RODRIGUEZ-KABANA, and J. R. ADAMS. 1980. Neocosmospora stem rot of soybeans in Alabama. Plant Disease 64:321-322.

Neocosmospora vasinfecta was consistently isolated from field-grown soybean plants showing symptoms of premature senescence, defoliation, root and basal stem rot, and vascular and pith discoloration. Stem injection of greenhouse-grown soybean plants with *N. vasinfecta* produced a reddish-brown discoloration of the pith. Pith lesions ranged in length from 8 to 52 mm, with a mean of 22 mm. Reddish-brown lesions on the outer stem surfaces of several plants did not exceed 20 mm in length. Pith discoloration was the most frequently observed symptom after 4 wk.

In his review of the genus *Neocosmospora,* Udagawa (4) referred to *N. vasinfecta* E. F. Smith as a mild parasite on a wide range of host plants. He indicated that the frequent occurrence of this fungus in the rhizosphere suggests wide distribution as a root-infecting fungus.

N. vasinfecta was first reported on soybeans (*Glycine max*) from Japan in 1960; Kurata (1) described the disease as a root and basal stem rot. In 1972, the first report of this fungus as a pathogen on soybeans in the United States was made by Phillips (2) from Georgia. He described *N. vasinfecta* as causing an internal stem browning of the pith. Phillips indicated that the low percentage of infected plants resulting from injured root inoculation suggests that *N. vasinfecta* is probably not an aggressive root invader. A description of the disease is also given in the "Compendium of Soybean Diseases" (3), where it is referred to as Neocosmospora stem rot.

Accepted for publication 13 November 1979.

00191-2917/80/03032102/$03.00/0

In September 1978, a soybean field near Summerdale, Alabama, was found to have a diseased area approximately 50 m in diameter. Plants in the center of the area were dead and those in marginal areas were intermediately affected. Although parasitic nematodes (*Heterodera glycines* Ichinohe and *Meloidogyne arenaria* [Neal] Chitwood) were present, plants showed symptoms unlike those previously associated with nematode injury. Individual plants had root and basal stem rot and brown to black discoloration of the vascular and pith tissue. Stem lesions extended 20–25 cm upward from the soil surface and usually affected only one side of the plant. Root galling was not present. Plants also showed signs of premature senescence and leaf defoliation. Interveinal areas in leaves were brown with chlorotic margins. Orange to red perithecia were on the lower stems of dead plants. Except for the perithecia, symptoms were similar to those described for brown stem rot caused by *Phialophora gregata* (Allington and Chamberl).

Isolations of diseased stem tissue in a 15% water agar medium resulted in the recovery of a fungus identified as *Cylindrocarpon* sp. After 2–3 wk, perithecia of *N. vasinfecta* developed on the medium surface and on stem tissue pieces.

MATERIALS AND METHODS

Seed of Bragg soybean were planted in 10-cm plastic pots (5 seeds per pot) containing a Norfolk sandy loam soil that had been fumigated with methyl bromide. Plants were maintained in the glasshouse at 27 C (± 3 C) for 21 days before inoculation. Treatments consisted of 1) stem injection with sterile distilled water plus *N. vasinfecta*, 2) stem injection with sterile distilled water alone, 3) stem injection with needle only, and 4) no stem injection. All treatments were replicated five times and placed in a randomized complete block design.

Plants were inoculated using a technique similar to that described by Phillips (2). A hole was made through the hypocotyl with a hypodermic needle 2–3 cm below the cotyledonary node. The inoculum suspension was then injected into the hole until it ran out both sides of the hypocotyl. The inoculum was prepared by scraping approximately 1 mm of the upper agar surface of eight 2-wk-old petri dish cultures of *N. vasinfecta* into 250 ml of sterile distilled water, then mincing it in a Waring Blendor. Cultures were grown at room temperature (22–27 C) on both potato-dextrose agar and water agar. Inoculum consisted of microconidia, ascospores, and mycelial fragments of two isolates of *N. vasinfecta* obtained from the original soybean stem isolations. Spore counts (ascospores and microconidia) made with a Neubauer hemacytometer indicated an inoculum spore density of 1.8×10^5 per milliliter.

The degree of internal stem discolora-

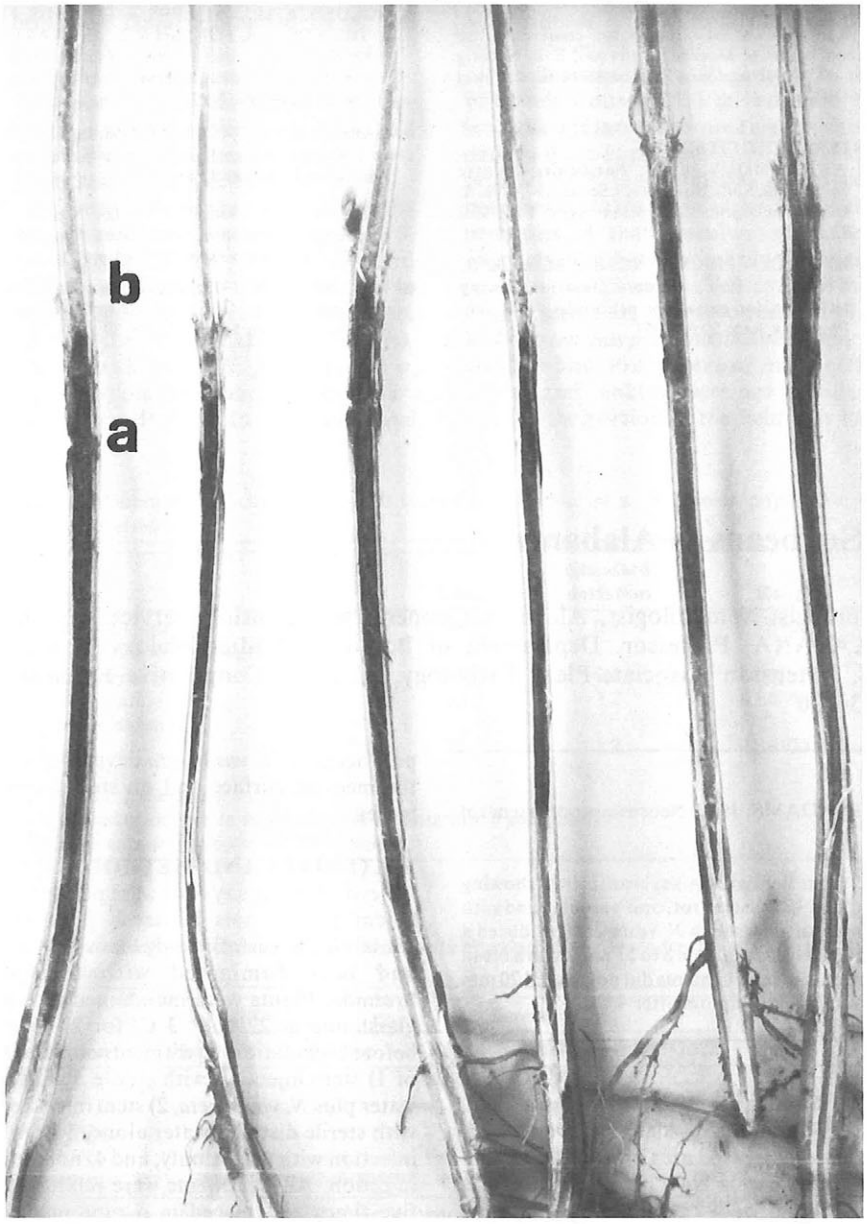

Fig. 1. Pith discoloration of soybean stems caused by injection of aqueous suspension of *Neocosmospora vasinfecta*; a = point of injection, b = cotyledonary node.

tion was determined 4 wk after inoculation by splitting the stems longitudinally and measuring the length of pith discoloration.

RESULTS

Symptoms of Neocosmospora stem rot were present in all inoculated plants. The most obvious symptom was a reddish-brown discoloration of the pith ranging from 8 to 52 mm in length, with a mean of 22 mm. Pith discoloration always extended downward from the point of fungal injection (Fig. 1). Reddish-brown lesions on the outer stem surfaces of several plants did not exceed 20 mm in length. *N. vasinfecta* was easily isolated from diseased stem sections. Perithecia readily developed on split stem sections of greenhouse inoculated plants after 2–3 wk of incubation in a moist chamber placed at room temperature (22–27 C). Perithecia that developed on stem sections closely resembled those observed on field-infected plants and those produced on culture medium.

DISCUSSION

In the glasshouse study, stem infections of *N. vasinfecta* progressed downward and never upward from the point of inoculation. Because stems were injected right below the cotyledonary node, the node apparently served as a physical barrier against upward movement of the fungus within the pith tissue.

The field from which the original isolates of *N. vasinfecta* were obtained was planted with the cultivar Centennial. Soil collected beneath the diseased plants contained several parasitic nematodes, including the soybean cyst nematode race 3 (*H. glycines*) and the peanut root-knot nematode (*M. arenaria*). The diseased area in the field was circular in shape as would be expected with a nematode infestation. However, because the cultivar Centennial is resistant to race 3 of the soybean cyst nematode and because root galling, normally expected from *M. arenaria,* was not present, the diseased area could not be attributed to nematodes alone.

Phillips (2) reported a low percentage of infected plants resulting from injured-root inoculations and indicated that *N. vasinfecta* was probably not an aggressive root invader. We did not attempt root inoculation of *N. vasinfecta.* In August 1979, plants of Ransom soybean collected from a field near Florala, Alabama, showed symptoms of manganese deficiency. Although stems appeared healthy, roots were discolored and smaller than those of healthy plants from the same field. Microscopic examination revealed both *H. glycines* and perithecia of *N. vasinfecta* attached to small rootlets. *N. vasinfecta* was readily isolated from these discolored rootlets, indicating active colonization. It appears likely, therefore, that parasitic nematodes play an active role in invasion of soybean roots by *N. vasinfecta.*

This is the first report of Neocosmospora stem rot on soybeans in Alabama and the second report of this disease in the United States. Neocosmospora stem rot has now been identified from several additional fields in South Alabama. Although Phillips (2) indicated that the frequency of this disease is probably limited, our report suggests it may be more widespread than originally thought and could be related to soil nematode infestations.

ACKNOWLEDGMENT

We thank Gareth Morgan-Jones, Associate Professor, Department of Botany and Microbiology, Auburn University, for assistance in identification of the causal organism.

LITERATURE CITED

1. KURATA, H. 1960. Bull. Natl. Inst. Agric. Sci. Jpn. Ser. C. 12:1. (Cited in Udagawa, S. [4]).
2. PHILLIPS, D. V. 1972. A soybean disease caused by *Neocosmospora vasinfecta.* Phytopathology 62:612-615.
3. SINCLAIR, J. B., and M. C. SHURTLEFF, eds. 1975. Compendium of Soybean Diseases. The American Phytopathological Society, Inc., St. Paul, MN. 69 pp.
4. UDAGAWA, S. 1963. *Neocosmospora* in Japan. Trans. Mycol. Soc. Jpn. 4(5):121-125.