

Charcoal Rot A Hot Disease In Soybeans



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In the central part of Illinois, the soybeans that have so far survived the extreme temperatures and drought are showing symptoms and signs of charcoal rot. Numerous samples of declining soybeans submitted to the University of Illinois Plant Clinic in the past 2 weeks have been diagnosed with the disease. We have had greater than a 95 percent isolation rate from the declining soybeans, even when the characteristic signs and symptoms of charcoal rot were not yet present. Our findings are distressing news regarding fields already under extreme environmental stress.

Charcoal rot is a fungal disease that acts opposite the normal lifestyle of a field crop fungal disease. Rather than infecting the crop when there is moisture present and temperatures are warm, it goes to the extreme of being most prevalent when it is dry and blazing hot. Charcoal rot, caused by the fungus *Macrophomina phaseolina*, is widely distributed and has a very wide host range of over 500 crop and weed species. Of particular note is that corn and wheat are hosts of the fungus as well.

Symptoms of charcoal rot advance through the season. Curtis Hill, principal research specialist in agriculture, notes that soybeans infected as seedlings may show a reddish-brown discoloration at the emerging portion of the hypocotyl. If infection occurs through the roots, discoloration is evident at the soil line and above. The discolored area turns dark brown to black, and infected seedlings may die, particularly under hot, dry conditions. After midseason during soybean reproductive stages, we begin to see the diagnostic signs of infection in the field – specifically, the development of tiny black “microsclerotia” (a small, resistant, resting form of the fungus). The disease gets its name from

these microsclerotia, which under a hand lens look like tiny charcoal briquettes.

Infected plants produce leaflets that are smaller than normal and show a subtle loss of vigor. As the disease develops, the leaflets become chlorotic, then wilt; they become necrotic but remain attached to the plant. When flowering is complete they will start to be visible in the stem's vascular tissue – if you split open the stem you will see the microsclerotia. Sometimes they appear in wavy lines as if someone were drawing on the vascular tissue with black ink, and sometimes they form in streaks – split the lower stem and crown to see this sign of the disease. Reddish-brown discoloration can also form in the pith and vascular tissues of the root and stem.

The charcoal rot fungus is a very good survivor. In dry soils, microsclerotia survive in soil or embedded in host residue for 2 or more years; in wet soils they cannot survive more than 7 or 8 weeks. For infection to occur, microsclerotia must germinate either on the surface of or in close proximity to roots. Pathogen growth and infection of soybean can occur at emergence and when cotyledons are still present, with 80 percent to 100 percent of seedlings infected 2 to 3 weeks after planting.

Management of charcoal rot can be challenging because of the wide host range and because we have no control over the weather. Dr. Glen Hartman, USDA-ARS soybean plant pathologist, and Curtis Hill have been actively screening soybean lines for resistance to charcoal rot through a program funded by the United Soybean Board. While there is not specific major gene resistance, a germplasm release from Stoneville USDA-ARS DT97-1290 has shown promise. In fields that have been severely affected, select early maturing cultivars that lack late reproductive growth stages that might coincide with periods of drought stress and high temperatures. Δ

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Lab culture of charcoal rot (*Macrophomina phaseolina*) from soybean not yet showing field symptoms characteristic of the disease.



Charcoal rot microsclerotia sometimes appear as wavy black lines when the stem is split.



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