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Charcoal Rot of Soybean

Carol Groves and Damon Smith, UW-Madison Plant Pathology

What is charcoal rot? Charcoal rot, also known as summer wilt or dry weather wilt, is a fungal disease of soybean that most commonly occurs in plants that are under heat and water stress. Charcoal rot is most prevalent in the southern United States, but can occur in the North Central region when weather is hot and dry. In Wisconsin, charcoal rot is observed most often in fields with sandy soils.



A dusty, gray discoloration of stems and roots is characteristic of charcoal rot of soybean. (photo courtesy of Theresa Hughes)

What does charcoal rot look like?

Plants suffering from charcoal rot may display premature yellowing of their top leaves, as well as premature leaf drop that may be mistaken for normal plant maturity. Plants with charcoal rot often initially wilt in the midday heat and then recover at night. Eventually permanent wilting will occur. In some cases, the upper third of a plant may have unfilled, flat seedpods. At flowering, a light gray discoloration develops in the surface tissues of both tap and secondary roots, as well as lower stems. These tissues will appear as if they have been dipped in charcoal dust, hence the name of the disease. The dusty appearance is due to the presence of tiny survival structures (called microsclerotia) of the fungus that causes the disease.

Where does charcoal rot come from? Charcoal rot is caused by the fungus *Macrophomina phaseolina* which has an extensive distribution and is known to infect over 500 plant species including corn (where it causes charcoal stalk rot), alfalfa, and many ornamental and weed species. *M. phaseolina* can survive for two or more years in dry soils as microsclerotia embedded in plant residue. In wet soils however, sclerotia do not survive for more than seven to eight weeks. Hyphae (i.e., fungal threads) of the fungus typically do not survive in soil for more than seven days. Infections of *M. phaseolina* primarily occur in the spring when soil moisture is high. The fungus enters plants via roots and then grows very slowly until plants reach their reproductive stage (usually coinciding with the hottest, driest part of the growing season). Then more extensive colonization of plant tissue occurs. *M. phaseolina* is most active when soil temperatures are high (80 to 95°F), unlike many soilborne, disease-causing fungi which have reduced activity when soil temperatures are high.

How can I save a soybean crop with charcoal rot? By the time that typical symptoms of charcoal rot are evident, control of charcoal rot is difficult, and



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losses in yield are likely inevitable. Foliar fungicides and fungicide seed treatments have no effect on charcoal rot.

How can I avoid problems with charcoal rot in the future? Plant high quality, pathogen-free seed to prevent introduction of the charcoal rot pathogen into fields that are not currently infested. In fields where *M. phaseolina* is already present, any cultural practices that minimize plant stress will reduce the risk of charcoal rot. Use tillage practices (e.g., no-till) that maintain soil moisture, and irrigate where possible during dry periods to reduce drought stress. Lower plant populations and maintain good weed control to minimize stress from competition for soil nutrients. In addition, optimize soil fertility levels, particularly phosphorus. Rotations with wheat may provide some control of charcoal rot. However, because *M. phaseolina* has a wide host range (including corn), crop rotation may not provide sufficient control of charcoal rot. A moderate level of partial resistance is known in soybean varieties in maturity groups IV and higher. Unfortunately these varieties are not suitable for production in Wisconsin. Whether partial resistance is present in commercial varieties suitable to be grown in Wisconsin (maturity groups I and II) is not known.

For more information on charcoal rot of soybean: See UW-Extension Bulletin A4037 “Charcoal Rot Management in the North Central Region” (available at <http://learningstore.uwex.edu>) Contact your county Extension agent.

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A complete inventory of University of Wisconsin Farm Facts is available at the University of Wisconsin-Madison Division of Extension Plant Disease Diagnostics Clinic website: <https://pddc.wisc.edu>.