

Charcoal Rot of Soybean

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Charcoal rot is a root and stem disease that commonly occurs in hot, dry weather conditions. This disease is most severe when plants are stressed from lack of moisture or nutrients, at excessive plant populations, or where soil compaction, other diseases or nematodes, or improperly applied pesticides impair root development.

Charcoal rot symptoms typically appear as soybeans approach maturity. The earliest symptoms are smaller than normal sized leaves, which become chlorotic, then turn brown, but remain attached to the petiole giving the entire plant a dull greenish-yellow appearance. In many cases, these plants wilt and die. At early reproductive stages, a light gray to silver discoloration of the sub-epidermal tissue develops on taproot and lower part of the stem (Fig. 1).

At advanced states of disease development, near soybean maturity (R6-R7), the lower stem epidermal tissue is often shredded in appearance and exhibits an ashy-gray discoloration. Removal of epidermal tissue reveals numerous small, charcoal-black fruiting bodies (microsclerotia) embedded in the lower stem and taproot (Fig. 2). Microsclerotia are often so numerous they resemble charcoal dust, hence the name of the disease.



Figure 1. Discoloration of a lower soybean stem by charcoal rot.

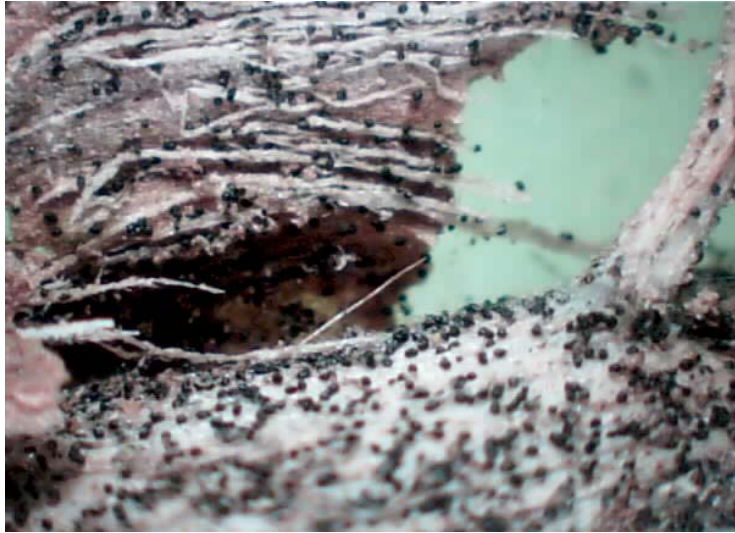


Figure 2. Numerous black microsclerotia of *Macrophomina phaseolina* on soybean. Photo by A. Greer.

The disease is caused by the soilborne fungus, *Macrophomina phaseolina*, which can infect more than 500 plant species. The pathogen overwinters as sclerotia in soil or in crop debris, and these sclerotia can remain viable for at least 2 years. Infection can occur at seedling stage of development (2 to 3 wks. after planting), but symptoms remain latent unless the plants undergo environmental stress during reproductive stages of growth. The optimal growth of the fungus is 82 to 93°F. Planting late-season or double-crop soybeans may encourage greater charcoal rot severity.

Currently, there are no commercially available resistant cultivars or fungal practices that effectively suppress charcoal rot. Fields with a history of severe charcoal rot should be rotated for 1 to 2 years with non-host crops (cereals). Avoiding excessive seed rates and maintaining adequate soil fertility to maintain healthy, vigorous plants reduces losses by this disease. The best way to avoid issues with charcoal rot is to limit drought stress during the reproductive stages of growth. Production systems like no-till that conserve soil moisture may also reduce losses by charcoal rot.