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Charcoal Rot of Soybean

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Several cases of charcoal rot of soybeans have been recently diagnosed this year. Charcoal rot is a root and lower stem disease caused by the fungus *Macrophomina phaseolina* which attacks a wide range of crops including corn, grain sorghum, beans, peanuts, and cucurbit vegetable crops. Charcoal rot along with nematode diseases are probably the most damaging diseases of soybeans in Oklahoma. Most plant diseases are favored by wet weather, but charcoal rot becomes apparent when hot and dry conditions prevail like we experienced this year in late July and early August. Symptoms appear after flowering, most often during the pod-fill stage of development and when plants are stressed by high temperatures and low soil moisture. The fungus is considered a weak plant parasite in that it probably infects plants earlier in the season and produces symptoms when plants are stressed. Irrigated soybeans and those that fill pods during periods of weather and soil moisture favorable for soybean growth rarely are affected.

Symptoms of charcoal rot appear in patches of up to an acre or more in size where plants turn yellow and wilt with their leaves remaining attached (Figures 1 and 2). In some years plants on high spots of the field may be affected while in other years those in low spots and along terraces develop symptoms. A brownish discoloration is sometimes evident in the pith of wilted



Fig 1. Large patch of charcoal rot in soybean field.

plants and microsclerotinia can be found by scraping away the surface bark of lower stems near the soil line. Plants are eventually killed and the disease is easiest to diagnose on dead plants that have dried down. A charcoal gray colored discoloration of the internal lower stem and tap root is visible after scraping off the surface bark or splitting the lower and tap roots (Figure 3). The gray discoloration is a result of the production of numerous microsclerotia imbedded in the woody stem and root. A hand-lens is useful for viewing the microsclerotia. The microsclerotia are the resistant survival structures (seeds) of the fungus which survive in the soil.



Fig 2. Yellowing and wilting of soybeans due to charcoal rot.



Fig 3. Soybean roots showing charcoal gray colored discoloration and imbedded microsclerotia.

Except where adequate irrigation is available to prevent moisture stress, management strategies are aimed at escaping the disease or lessening its impacts. Crop rotation is of limited value because the fungus reproduces on most summer crops grown in Oklahoma and survives for years in the soil as microsclerotia. Tillage practices appear to have little impact on the disease. Charcoal rot can often be minimized by planting full-season varieties adapted to the area (Maturity group 5 and 6's) at the proper planting time so that pod set and pod fill periods escape stressful periods by occurring later in the season. Maintaining adequate but not excessive seeding rates and soil fertility levels are also recommended practices for reducing charcoal rot.

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