

Phytophthora Root Rot of Soybean

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Phytophthora root rot has been reported in all major soybean producing areas of the U.S. and is common in Arkansas. This disease is most severe in poorly drained soils that remain wet for several days. Plant stand losses and 100% yield reductions can occur on highly susceptible soybean cultivars.

Symptoms may be found at any stage of soybean development and severity is dependent on soybean susceptibility. Pre- and post-emergence damping-off occurs when soils remain saturated for several days after planting. On susceptible, intolerant cultivars, stems of older seedlings may appear water soaked and leaves may become chlorotic (Fig. 1). Generally, these plants wilt and die rapidly. Where Phytophthora rot is present, soybean plants may die throughout the season (Fig. 2). Symptoms include yellowing between leaf veins and margins and chlorosis of upper leaves followed by wilting. Leaves often remain attached to the dead plant. Because this is a soilborne pathogen, foliar symptoms are the result of a compromised root system. Root symptoms include discolored and rotted lateral roots. Severe infection results in a girdling stem lesion (Fig. 3) that may progress up the stem as high as ten nodes, before the plant wilts and dies on highly susceptible cultivars. On less susceptible cultivars, stem lesions may not girdle the stem thus the plant does not wilt. Some cultivars may be susceptible, but highly tolerant, and although root systems are discolored and rotted, plants may remain alive. These plants can be stunted and slightly chlorotic, with stem lesions that develop along only one side of the stem.



Figure 1. Soybean seedlings infected with *Phytophthora* root rot. Photo by J. Rupe.



Figure 2. *Phytophthora* root rot in soybean field. Photo by J. Rupe.



Figure 3. Lesion caused by *Phytophthora* root rot on soybean stem. Photo by J. Rupe.

The causal agent, *Phytophthora sojae*, overwinters in the soil or on crop residue as oospores (thick walled resting spores). Oospores can remain viable for several years in the soil in the absence of soybean. Oospores germinate at cool temperatures (< 60°F) and infect soybeans directly, or they can produce zoospores that are motile. Zoospores cause the primary infection in the spring. Flooding rains shortly after planting result in the most severe disease development. Increased disease severity has been observed with reduced tillage practices (especially no-till) and continuous cropping of soybean.

Resistance is the most economical management tactic, but resistant genes in soybean are only effective on specific races of the pathogen. Few soybean cultivars are resistant to all know races. An alternative to race-specific resistance, are tolerant cultivars, which are effective against all

racess. Tolerant cultivars tend to sustain growth and yield even after infection, although the level of tolerance that is expressed in a cultivar is highly dependent on both the amount of inoculum (pathogen) that is present and the favorability of the environment for disease development. Tolerant cultivars also contribute to a higher level of inoculum (oospores) for the following season, thus soybean monoculture should be avoided where Phytophthora rot is known to occur. Seed treated with the fungicide metalaxyl is effective in suppressing seedling infection. No foliar fungicide provides good suppression of Phytophthora root rot after the plants have emerged.