Phytophthora Root Rot of Soybean

Phytophthora root rot (PRR) is common in soybean fields and causes a wet, soft rot of the seed or seedling tissue. There are several specific races of the soilborne fungus *Phytophthora sojae*, and fields with tolerant soybean products may maintain yield potential when PRR is present. Correct identification of PRR is key to management, and soybean products have Rps genes that offer protection from this disease.

**What to Watch For**

The disease can affect soybean from the seedling stage to near maturity. Stands may be reduced when the pathogen, *Phytophthora sojae*, infects plants at the seedling stage and causes seed rot and damping off. Infection of older plants causes wilting and browning of leaves and eventual death (Figure 1). Rapid development can occur when soil is high in moisture or there is a periodic rainfall pattern with continued availability of moisture. Soil temperatures above 60°F, and air temperatures between 70 and 77°F favor the disease.\(^1,2\) It is common in soils that are -

- low lying,
- poorly drained,
- compacted, and/or
- high in clay content.

The chocolate brown discoloration of the stem starts below the ground and extends up the plant. Roots are highly degraded. Later in the season, infected plants yellow and have wilting leaves that remain attached.\(^3\) Close attention to symptom development helps distinguish PRR from other diseases such as sudden death syndrome or effects of saturated soils.

**Impact on Your Crop**

Incidence of PRR has become more common with increased use of no-tillage and reduced tillage residue management systems. There are several specific races of the soilborne fungus *P. sojae*, and fields with tolerant soybean products may maintain yield potential when uPRR is present. Some growing seasons present high disease pressure with conditions favoring PRR. The disease may cause an 8 to 11 percent yield loss depending on spring precipitation.\(^1\) Soybeans infected with *P. sojae* are not curable, and management of PRR depends on preventing infections.\(^3\)
Phytophthora Root Rot of Soybean

Tips to Manage

Genes conferring race-specific resistance to PRR are called Rps genes. In some cases, soybean products have more than one Rps gene (race specific) and good field tolerance (race non-specific), which provides the highest levels of protection from PRR. In order for these products to become susceptible to PRR, a novel variant of *Phytophthora* would have to become present and widespread. Resistance genes (Rps genes) can help protect against specific races of *Phytophthora* throughout the entire season. Field tolerance is an important tool when there are multiple races of *P. sojae* in a field. However, field tolerance does not become highly active until plants are at the V1 to V3 growth stages.

Phytophthora outbreaks can occur in wet conditions early in the season. However, upon a closer look at the weather, field conditions, plant symptoms, and genetics, the symptoms may be caused by flooding, another disease such as sudden death syndrome, or other environmental sources and not PRR.

Determining if you have PRR:
- Phytophthora-infected plants are more often found as circular patches in low spots or scattered within fields (Figure 3).
- The stem is chocolate-brown colored from the roots and up past the soil line through the lower stem.
- Infection of older plants causes wilting and browning of leaves with drooping petioles.
- Plants have missing lateral roots and the tap root, if present, is rotted with dark brown to black discoloration throughout and soft, wet tissues that collapse easily when pinched. This is different than plants with flooding injury. The outside cortical tissue of roots can be easily stripped in flooded soybean plants. Rhizobium nodules of flooded soybean plants are usually dead instead of displaying a pink ‘functioning’ color. Soybean plants infected with *P. sojae* are not curable, and management of PRR depends on preventing infections.
- Seed treatments can help protect against early-season infections of PRR for two to three weeks after planting and reduce the risk of a replant situation.

In summary, fields should be scouted for PRR and other seedling diseases. Correct identification of this disease is key to management as there are several specific races of *P. sojae*, and some soybean products are identified as having Rps genes that offer protection from this disease.

**Figure 3. Phytophthora affects patches of soybeans fields.**

**Sources:**