

Disease Facts

- Caused by the soil-borne fungus *Phytophthora sojae* (also known as *Phytophthora megasperma* f. sp. *glycinea*)
- Pathogen has many races, and multiple races occur in each field
- Disease is favored by extended wet field conditions
- May attack soybeans at any time during the growing season
- Displays seed rot, seedling blight and root/stem rot phases
- Above-ground symptoms may not be evident for several weeks after initial infection



Conditions Favoring Disease Development

- Associated with wet soil conditions
 - Commonly occurs on heavy, poorly-drained or compacted soils
 - May occur on any soil saturated for an extended period of time
- The ideal temperature for infection is 60 to 80°F
- Successive years of soybeans on the same fields may increase damage potential
- Application of high levels of potash, manure or municipal sludge immediately before planting may increase disease severity

Disease Cycle

- Disease-causing fungus is a water mold, or Oomycete, characterized by oospores and zoospores
- Oospores act as survival mechanism of the fungus
 - May persist in soybean residue and soil for years
- Zoospores are produced when oospores germinate in the presence of a soybean crop
 - Zoospores also produced from infected soybean tissue during the growing season
 - Swim through films of water to the root
 - Fungus infects root and grows into and among the root cells of the plant
- Disease survives in soybean residue and in the soil



Plants wilting among healthy plants is often a symptom of Phytophthora

Impact on Crop

- The Phytophthora fungus can kill plants at all stages of growth
- Stand reduction may result in replanting or yield loss
- Replanting is common when early infection results in severe seed rot and damping off of seedlings
- In some cases, infected stands survive but are less productive than healthy stands
- Yield reductions can range from as little as 5% to more than 50% depending on severity



Phytophthora Symptoms

Seed Rot Phase – may begin at imbibition

- Infected seeds become dark brown and soft to mushy
- Complete deterioration of the seed may occur

Seedling Blight Phase – occurs at emergence or soon after

- “Damping off” – rapid decay, wilting and plant death
- Symptoms include a dark brown to black discoloration of the stem, usually beginning at the soil line
- Diseased tissues quickly become soft and water-soaked, and wilting and plant death may soon follow

Root and Stem Rot Phase -- symptoms begin in the root

- Brown, discolored tap root and secondary roots and less root mass
- Nodulation is often minimal, leading to chlorotic, N-deficient plants
- Affected plants may be stunted, so fields have an uneven appearance

Root and Stem Rot Phase – symptoms may spread to the stem

- Brown discoloration develops at the soil line
- Dark-brown to red-brown lesion may progress up the stem (key diagnostic feature of the stem rot phase)
- Diseased tissues quickly become soft and water-soaked, and wilting and plant death may soon follow, especially during stress periods



Note dark-brown lesion extending upward from soil line

Management

Variety Selection – most effective means of managing Phytophthora

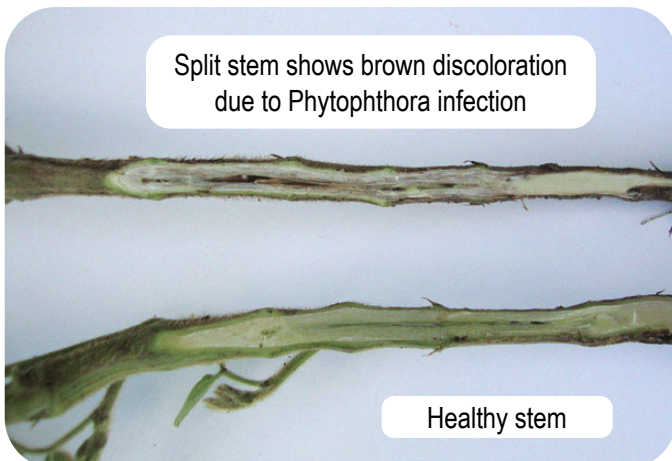
- Pioneer researchers are developing varieties with resistance genes and field tolerance to Phytophthora
 - Rps 1C and Rps 1K are the most common race-specific resistance genes used today
 - Race-specific resistance is most effective during the seed and seedling growth stages
 - Field tolerance is effective against all races of Phytophthora, more enduring than race-specific genes
 - Field tolerance is not as effective in the seed and seedling growth stages
 - Varieties containing both genetic resistance and field tolerance have two mechanisms of protection
- Pioneer rates its varieties for tolerance and provides ratings to customers -- ratings range from 4 to 6 (9=tolerant)

Field Drainage and Soil Structure – improve field drainage and remediate compaction and hardpan layers if possible

Planting Date – on heavy soils or in no-till systems, early planting may not be an option

Seed Treatments – use seed-applied fungicides in fields with a history of Phytophthora damage

- Metalaxyl and mefenoxam have specific activity against Phytophthora and Pythium
 - Provide protection for up to three weeks
 - Especially useful when cool, wet soil conditions develop after planting



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