

## Brown Stem Rot of Soybeans

### Key Points:

- Brown stem rot infects roots early in the season, but symptoms of vascular system damage usually appear in mid-summer.
- Development is favored by moderate temperatures (60 to 80 °F) and soil moisture is near field capacity.
- Infection causes vascular and pith tissues to turn brown to reddish-brown.
- Pioneer® brand soybean varieties are rated for genetic resistance to brown stem rot.

### Disease Facts

- Caused by *Phialophora gregata*, a fungus that survives in soybean residue.
- Widely established throughout the North Central U.S., where soybeans are its only host.
- There are two known strains – strain A is highly aggressive, and strain B is mild.
- Fungus infects roots early in the season, but symptoms of vascular system damage usually appear in mid-summer, during reproductive development.
- Fungus is not carried with seed, and minimal amounts of inoculum are carried with soil adhering to farm equipment.



Mature soybean stem infected by brown stem rot

### Conditions Favoring Disease Development

- Brown stem rot (BSR) development is greatest between 60 and 80 °F (16-27 °C).
  - Higher temperatures inhibit BSR – little or no disease develops above 90 °F (32 °C).
- Severity and incidence of BSR is greatest when soil moisture is near field capacity, which is also optimal for crop development.

- Symptoms worsen if disease development is followed by drought stress during pod fill.
- Severity increases when soil pH is near 6.0 and is less severe at pH of 7.0 or greater.
- BSR may be more severe in fields where SCN is also a problem.



Susceptible variety on left, resistant variety on right

### *Phialophora gregata* Disease Cycle:

- Survives in infected soybean residue left on soil surface.
- Pathogen does not produce survival structures – survival is totally dependent on soybean residue.
- Fungus can continue to reproduce throughout the winter, influencing inoculum levels in the spring.
- Conidia (spores) are produced in the spring.
- Infection of new soybean crop occurs through roots (by growth stage V3) and progresses to stems.
- Infected stems become inoculum source for next disease cycle.

### Impact on Crop

- BSR infection progresses from roots to vascular system (water and food-conducting system) of soybean plants.
- Infection causes a gradual disruption of the vascular system.
- Premature plant death may occur, especially if heat and drought stress impacts badly diseased plants.

## Impact on Crop (Cont.)

- Degree of yield loss depends on environmental conditions, variety, and fungal strain.
  - BSR strain A causes more damage and may reduce yields up to 40% when severe.



Foliar symptoms of brown stem rot

## Stem Symptoms

- BSR infection causes vascular and pith tissues to turn brown to reddish-brown (pith discoloration is a characteristic/distinguishing symptom).
  - Split stems longitudinally to inspect for BSR.
  - Check at and between nodes near the soil line.
- The height of internal stem discoloration is a measure of BSR severity.
  - When disease is severe, discoloration is continuous from the base of the plant upwards.
  - When disease is less severe, discoloration only occurs at nodes, with healthy, white tissue between nodes.



Split soybean stem showing BSR infection

## Management

- **Select Resistant Varieties:** Pioneer® brand soybean varieties have been continually improved for resistance to brown stem rot.
  - Screening potential new varieties in areas of high BSR incidence is key to variety improvement.
  - Corteva Agriscience rates its varieties and makes ratings available to customers.
  - For fields with a history of BSR problems, use a variety with a rating of 6 or higher.
  - Your Pioneer sales representative can help you select varieties with appropriate BSR resistance and other important traits.
- **Crop Rotation:** Effective in reducing disease inoculum – two years away from soybeans is more effective than one.
- **Tillage:** Some tillage may be necessary to bury infected residue – the rate of inoculum decline is directly related to the rate of soybean residue decomposition.
- **Manage SCN:** Plant varieties resistant to both sudden death syndrome and soybean cyst nematode.
- **Sanitation is not needed:** Minimal amounts of inoculum are carried with soil adhering to farm equipment.



Left: Variety susceptible to BSR  
Right: BSR-resistant variety