Diaporthe-Phomopsis Disease Complex and Charcoal Rot in Soybean

- Phomopsis seed decay and pod and stem blight are two of the diseases that make up the Diaporthe—Phomopsis disease complex in soybean. In favorable environmental conditions, these diseases can reduce soybean yield potential.
- Charcoal rot is another disease that can reduce soybean yield potential.
- Proper identification of these diseases will help in making successful management decisions.

Phomopsis seed decay (Phomopsis longicolla) and pod and stem blight (Diporthe phaseolorum var. sojae) are two of the diseases that make up the Diaporthe-Phomopsis complex. All plant parts (roots, stems, petioles, pods, and seeds) are susceptible to infection.

Phomopsis Seed Decay
Seeds infected with P. longicolla may have a range of visible symptoms from none to severe. Severely infected seeds are shriveled, cracked, and may be partly or completely covered by a whitish mold growth (Figure 1). Severely infected seed will not germinate. Healthy-appearing seed can still harbor fungi beneath the seed coat and when infected seeds are planted, emergence may be low due to seed rot or seedling blight.

Pod and Stem Blight
The fungus that causes pod and stem blight initially infects the soybean plant early in the growing season without causing symptoms. The most characteristic sign of pod and stem blight is linear rows of black specks on mature stems of soybean (Figure 2). The specks, which are flask-shaped fruiting structures of the fungus known as pycnidia, can also be scattered on dry, poorly developed pods. Not all infected pods produce pycnidia, but mature pods with pycnidia will contain infected seed.

Phomopsis seed decay and pod and stem blight overwinter in soybean residue and infected seed. Disease is favored by warm, humid weather when soybean plants are maturing. Seed infection occurs only if pods become infected. Pod infection can occur from flowering onwards, but extensive seed infection doesn’t occur until plants have pods that are beginning to mature. Seed infection tends to be more severe when harvest is delayed.

Management Options
- **Soybean Product Selection**: Earlier maturing soybean products are at greater risk of Phomopsis seed decay and pod and stem blight than fuller-season varieties. Sources of resistance have been identified but soybean lines are not currently screened for these diseases and resistance in commercial lines is unknown.
- **Seed Selection**: High quality, disease-free seed should be planted.
- **Fungicide Seed Treatments**: Fungicide seed treatments can help control Phomopsis seed decay in low to moderately infected seeds; however, severely affected seed with less than 80 to 90 percent germination should not be planted as it may result in a stand reduction and potential yield loss.
- **Crop Rotation and Tillage**: Soybean should be rotated to corn or another non-legume crop. Tillage can be used to promote decay of pathogen-infested residue, but care should be taken to minimize soil erosion and maintain soil quality.
- **Harvest**: Mature soybeans should be harvested as soon as possible to lower incidence of seed rot.

![Figure 1. Soybean seed showing moldy and cracked seed coat symptoms of Phomopsis seed decay. Photo Courtesy of The Ohio State University](image1)

![Figure 2. Linear rows of pycnidia on soybean stem and pod caused by pod and stem blight on soybean. Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org.](image2)
Charcoal Rot
Charcoal rots are caused by the fungus Macrophomina phaseolina, which infects more than 500 host species including corn and soybean. The fungus survives in soil as microsclerotia (compact fungal tissue) but may also be seed borne. Charcoal rot can cause moderate to severe yield loss depending on the level of infection and environmental conditions. Charcoal rot symptoms are most prevalent during hot, dry weather, especially when it occurs during the reproductive growth stages.

Symptoms usually begin during soybean reproductive growth stages and are first evident in the driest areas of the field. Premature plant death with the leaves still attached is the most common symptom. A gray discoloration (like pencil shading) of root and stem tissue develops below the outer tissues. The diagnostic feature of charcoal rot is the presence of microsclerotia, which appear as black speckling on the lower stem. When viewed with a hand lens, individual microsclerotia can be seen within plant tissue (Figure 3).

Zone lines, or thin dark lines visible in soybean stem or root tissue (Figure 4) have previously been characterized as a symptom of charcoal rot. However, M. phaseolina has never been isolated from these lines. Recent studies within Monsanto and at the University of Arkansas have concluded that these zone lines are instead, associated with infection by the fungus D. phaseolorum var. sojae and/or P. longicolla.

Management
- Rotating with a non-host crop (i.e. wheat) for two or more years can help reduce inoculum levels in problematic fields.
- Soybean products with the highest level of resistance available within an appropriate maturity group for the growing region should be selected.
- No-till systems can increase soil microbial activity and help conserve soil moisture, which can reduce charcoal rot.
- Reduce plant stress. Irrigation, especially during reproduction, and/or reduced plant populations can reduce the severity of symptoms during drought conditions.

Summary
Depending on environmental conditions, phomopsis seed decay, pod and stem blight, and/or charcoal rot can reduce soybean yield potential. Proper identification of these diseases will help in making successful management decisions.

Sources:
2UArk: Southern Soybean Disease Workers. 2014. Pensacola Fl.

Figure 3. Charcoal rot microsclerotia in stem tissue.
Figure 4. Zone lines give soybean tissue that has been cut lengthwise or below the outer tissue layers a wood-grain appearance.