

## Common Diseases of Soybean in the Mid-Atlantic Region

*Pat Phipps, Professor of Plant Pathology, Tidewater AREC\**; *Steve Koenning, Extension Plant Pathologist, North Carolina State University*; *Steve Rideout, Extension Plant Pathologist, Eastern Shore AREC\**; *Erik Stromberg, Professor of Plant Pathology\**; *Elizabeth Bush, Extension Plant Pathologist\**  
\* Virginia Tech

Common diseases of soybean are caused by viruses, bacteria, fungi and nematodes. Some diseases are spread by insect vectors and nematodes while others are spread by wind, splashing rain, or movement in soil. The best way to determine if disease control would be profitable is to first identify the diseases that are capable of causing economic yield losses. Symptoms of disease include plant damage caused by a pathogen and the reaction of plants to infection. Signs are the visible evidence of the pathogen. Some diseases have characteristic symptoms and signs that are identifiable in the field. However, several soybean diseases can share common symptoms and are difficult to identify in the field even with a hand lens. Whenever in doubt, always contact your county Extension Agent for assistance in identifying the disease or collecting samples for submission to

a State University diagnostic clinic.

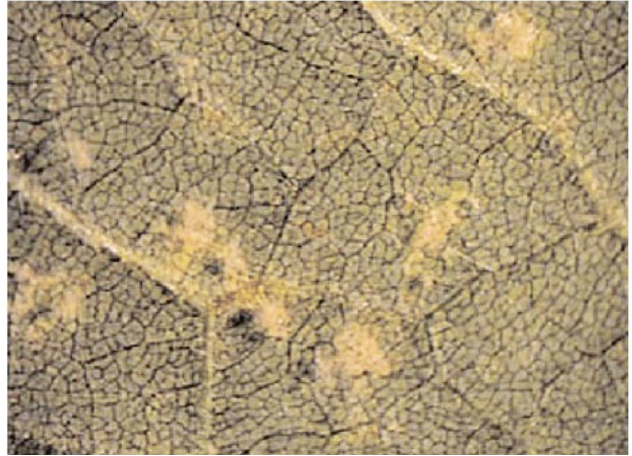
Most of the common diseases of soybean can be managed efficiently by adopting long-term production strategies. These strategies should include maintaining a favorable soil pH and fertility level for crop growth, effective weed and insect control, and cropping systems that offer disease suppression through crop rotation and variety selection. The following photographs were selected to illustrate frequently used diagnostic symptoms and signs for identification of specific soybean diseases. For simplicity, these pictures were taken where only one disease was present. When more than one disease is present, symptoms can be more complex and require microscopic examination of samples by a trained observer for disease identification.

## **Downy mildew (*Peronospora manshurica*)**

**Symptoms:** Pale green to yellow spots on upper leaf surface. Infected pods show no visible symptoms, but seed can be smaller.

**Signs:** Mold and spores of fungus are visible on underside of leaves in yellow spots (Figures 1 and 2). Seeds at harvest may be covered with crusty-appearing mold and spores.

**Control:** Use seed treatment, crop rotation, and less susceptible variety.



*Figure 1. Yellow spots with downy mildew.*



*Figure 2. Mildew on lower leaf surface.*

## **Brown spot (*Septoria glycines*)**

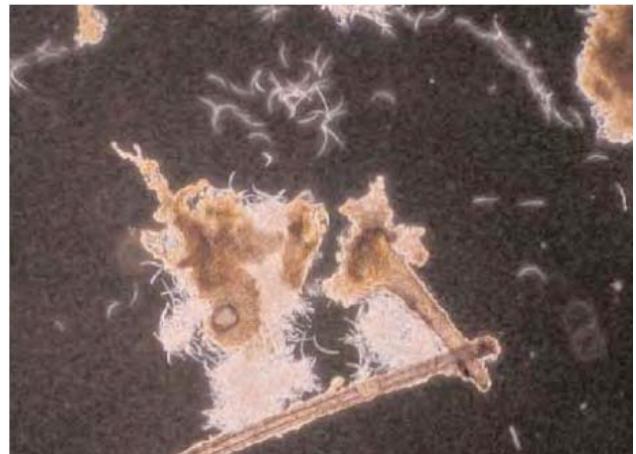
**Symptoms:** Lesions are not distinctly different from similar diseases. Spots begin as irregular minute specks that expand into larger brown spots. Appears first on lower-most leaves and may spread to upper leaves (Figure 3). Disease is usually not of economic importance.

**Signs:** Tiny fruiting bodies of fungus (pycnidia) are immersed in necrotic tissue. Spores are curved, and exude from pycnidia in curled masses that are visible with stereomicroscope (Figure 4).

**Control:** Increase tillage to bury infested soybean debris, rotate crops, and plant disease-free seed. Fungicides are not recommended since disease has little or no impact on yield.



*Figure 3. Brown spot symptoms on upper/lower leaf surface.*



*Figure 4. Pycnidia and spores of fungus.*

## Frogeye leaf spot (*Cercospora sojina*)

**Symptoms:** Small spots with dark reddish-brown margin. Old lesions have papery tan to white center. Spots usually develop in mid-season in young, upper leaves of plant (Figure 5). Older, fully expanded leaves or leaves that develop in dry weather may escape disease.

**Signs:** Light gray to white spores of fungus are produced in moist, humid weather (Figure 6).

**Control:** Select less susceptible variety, increase tillage, use crop rotation, seed treatments, and apply fungicide spray at R2 or R3.



*Figure 5. Spots on upper/lower leaf surface.*



*Figure 6. Sporulation of fungus in lesion.*



## **Cercospora blight and purple seed stain (*Cercospora kikuchii*)**

**Symptoms:** Leaves have reddish-purple coloration and bronzing from beginning of and through seed development on upper leaves (Figure 7). Round reddish-purple lesions develop on pods which later become purplish black (Figure 8). Infected seeds have purple stain (Figure 9).

**Signs:** Sporulation occurs in minute lesions in humid, wet weather. Spores are long and filiform and distinguishable only under a microscope.

**Control:** Variety selection, seed treatment, crop rotation and fungicide application at early pod (R3).



*Figure 7. Cercospora blight of leaves.*



*Figure 8. Infected pods.*



*Figure 9. Purple seed stain.*

## Target spot (*Corynespora cassiicola*)

**Symptoms:** Round to irregular, reddish-brown lesions surrounded by dull green or yellowish green halo. Larger spots may contain light and dark rings, hence the name, target spot (Figures 10 and 11).

**Signs:** Spores of the fungus are not visible without a microscope.

**Control:** Some varieties have resistance. The benefit of a fungicide spray for control of target spot has not been demonstrated in the Mid-Atlantic region.



*Figure 10. Target spot lesions on lower leaves.*



*Figure 11. Lesions on upper leaves.*

## **Anthracnose (*Colletotrichum truncatum*)**

**Symptoms:** Brown lesions develop on stems, pods and leaves (Figure 12). Infected tissues turn brown and senesce early.

**Signs:** The fungus produces randomly distributed, black fruiting bodies with black hairs (setae) and numerous canoe-shaped spores (Figures 13 and 14). Pods infected early fail to produce seed; late infections result in shriveled or moldy seed with dark lesions on seed coat (Figure 15).

**Control:** Tillage to bury infested crop residues, crop rotation, seed treatment, fungicide application at beginning pod stage (R3), and avoid delays in harvest.



*Figure 12. Black fruiting bodies on stem.*



*Figure 13. Microscopic view of fruiting body and spores.*



*Figure 15. Seed infection.*



*Figure 14. Fruiting bodies of fungus on infected leaf.*



## Pod and stem blight (*Phomopsis longicolla*)

**Symptoms:** Causes blight of stems, pods and leaves (Figure 16). Infected seed are shriveled, have cracks on the surface and have a chalky appearance (Figure 17).

**Signs:** Black fruiting bodies of fungus (pycnidia) are in rows on blighted stems and scattered on blighted pods and leaves. Mold on seed colonized by the fungus appears chalky.

**Control:** Tillage to bury infested residues of previous soybean crop, crop rotation, seed treatment, foliar spray of fungicide at beginning pod (R3), and avoid delays in harvest.



*Figure 16. Black fruiting bodies of fungus in rows on stems.*



*Figure 17. Fungus on seed is white and chalky.*



## Bacterial blight (*Pseudomonas syringae* pv. *glycinea*)

**Symptoms:** Leaf spots appear water soaked at first. Yellow halos develop around lesions with brown centers (Figure 18). Over time, dead tissue falls out causing a tattered appearance (Figure 19).

**Signs:** Bacteria stream from infected tissue placed in water and viewed with microscope (Figure 20).

**Control:** Avoid highly susceptible varieties, plant pathogen-free seed, and use tillage to enhance decay of infested crop residues.



Figure 18. Early symptoms on young leaves.



Figure 19. Lesions merge to cause blight of leaf.



Figure 20. Bacterial streaming from blighted tissue.

## **Bacterial pustule (*Xanthomonas campestris* pv. *glycines*)**

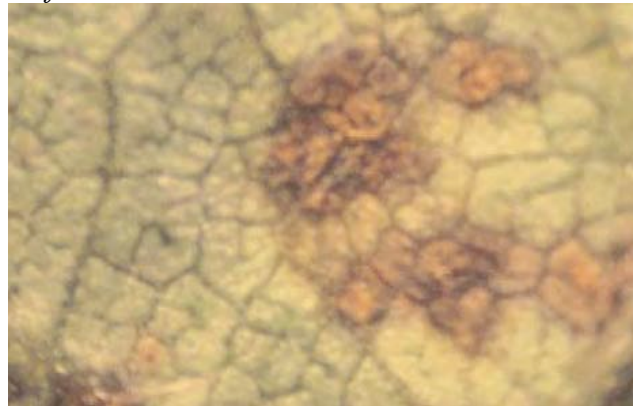
**Symptoms:** Begins as minute lesions with elevated centers (Figure 21). Pustules form in center of lesions mostly on lower leaf surface (Figure 22). Pustules can be confused with soybean rust.

**Signs:** None other than pustules formed by enlargement of host tissues on underside of leaves.

**Control:** Most soybean varieties have some resistance to the disease. Use same procedures as recommended for bacterial blight in problem fields.



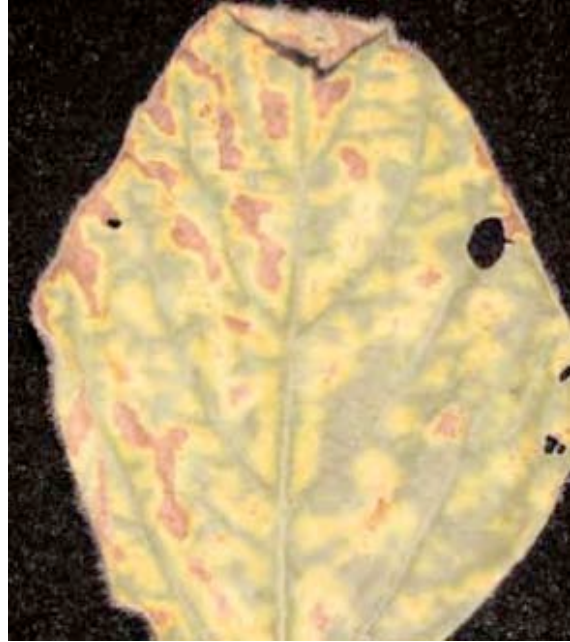
*Figure 21. Lesions on upper and lower leaf surface.*



*Figure 22. Pustules on lower leaf surface.*

## Examples of Soilborne Diseases of Soybean:

Soilborne diseases often produce symptoms of disease in leaves that may include wilting (charcoal rot, *Sclerotinia*), yellowing between veins and/or necrosis between veins (brown stem rot, sudden death syndrome, red crown rot) or mild yellowing between veins similar to manganese deficiency (soybean cyst nematode) (Figures 23 and 24).



*Figure 23. Leaf symptoms.*



*Figure 24. Leaf symptoms.*

## Charcoal rot (*Macrophomina phaseolina*)

**Symptoms:** Stunting and reddish brown to black discoloration of lower stem in seedlings. Taproot and lower stem of older plants have reddish to brown stains (Figure 25). Black flecking under the bark and black streaking in wood of taproots are diagnostic symptoms.

**Signs:** Black sclerotia of causal fungus in taproots (Figure 26).

**Control:** Crop rotation, good soil fertility for maintaining crop vigor, and irrigation to minimize stress.



*Figure 25. Wilt and death of whole plants.*



*Figure. 26. Black sclerotia of fungus in taproots.*



## Sclerotinia stem rot (*Sclerotinia minor*, *S. sclerotiorum*)

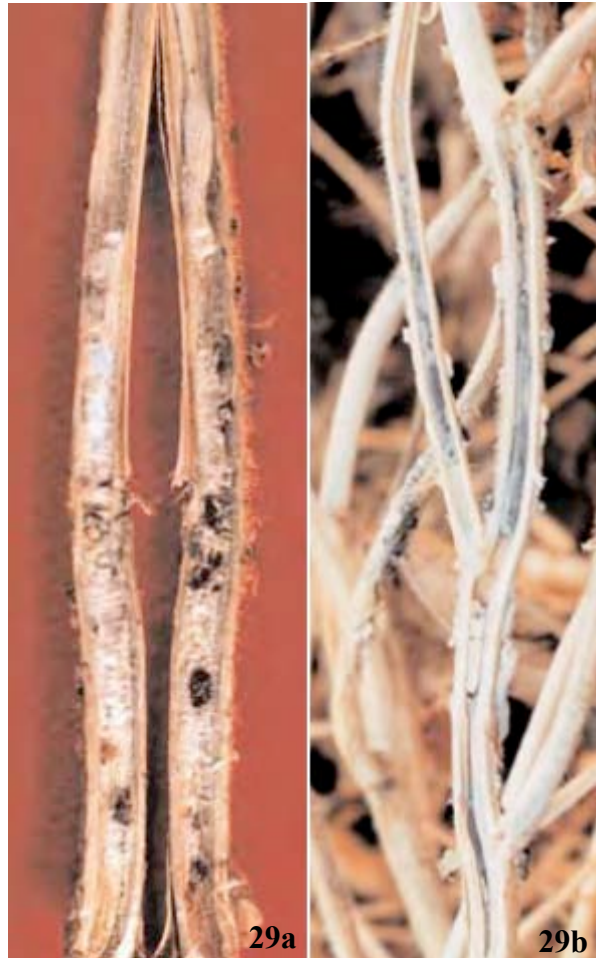
**Symptoms:** Wilt and eventual death of portions above stem infections. Stem lesions are tan to nearly white, with reddish discoloration at margins (Figure 28).

**Signs:** Fungus produces black sclerotia on stems, and inside pods and in the pith of stems: (Figure 29a) small sclerotia = *S. minor*, (Figure 29b) large sclerotia = *S. sclerotiorum*.

**Control:** Crop rotation with non hosts (legumes, sunflower, tobacco, etc.), soil tillage to bury inoculum, and use of tolerant varieties.



Figure 28. Tan to white stem lesions, with reddish discoloration at margins.



Figures 29a and 29b. Small sclerotia = *S. minor*; large sclerotia = *S. sclerotiorum*.

### **Sclerotium blight (*Sclerotium rolfsii*)**

**Symptoms:** Light brown lesions develop on stems near soil surface and later darken. Yellowing and wilting are usually the first symptoms.

**Signs:** The fungus grows from infection sites and produces a white mat of mold on infected stems (Figure 30). Numerous tan to brown resting bodies (sclerotia) about the size of mustard seed are produced by the fungus.

**Control:** Crop rotation with non-host crops (corn, or other grass-type crops), tillage to bury inoculum and reduce carryover and planting less susceptible varieties.



*Figure 30. White, fungal mat on stems.*

### **Red crown rot (*Cylindrocladium parasiticum*)**

**Symptoms:** Yellowing and browning between veins of upper leaves similar to brown stem rot and sudden death syndrome.

**Signs:** Red fruiting bodies of fungus develop on stems at the soil line (Figure 27).

**Control:** Crop rotations without legume hosts (peanut, alfalfa, etc.), delayed planting until soil temperatures are warmer.



*Figure 27. Red fruiting bodies of fungus at soil line.*