



Effects of Weather and Disease on Commercial Soybean Seed

In any one year, yield potential can be reduced by several soybean diseases that can infect the crop depending on product susceptibility, available source of infection (fungus, bacteria, virus), timing of infection, and environmental conditions. However, only a few diseases have the potential to affect soybean seed quality and germination.

In general, the most probable conditions and time for quality deterioration of soybean seed occurs when the environment is warm and wet near or after seed maturation. A timely harvest after maturation is the best management practice for reducing the potential impact on seed quality.

Purple seed stain, caused by *Cercospora*, and the complex of Diaporthe fungal diseases (Phomopsis seed decay and pod and stem blight) are the diseases most mentioned for causing reductions in germination, and oil and flour quality. Frogeye leaf spot, Anthracnose, and downy mildew can also reduce seed quality but generally less than purple seed stain and the Diaporthe complex of diseases. Additionally, diseases caused by *Alternaria*, *Fusarium*, *Cladosporium*, and *Penicillium* are known as secondary diseases that are responsible for quality reduction because they have the potential to infect plants after injuries from insects, hail, or mechanical means.

Soybean Diseases Most Likely to Cause Reductions in Germination and Seed Quality

PURPLE SEED STAIN

Identification, Characteristics, and Diagnosis

Caused by the fungus *Cercospora kikuchii*.

Infected pods are likely to be purplish.

Infected seeds can be partially or entirely “stained” purple (Figure 1).

Initial foliar symptoms include light- to dark-purple areas on sun-exposed leaves that eventually become leathery, dark, reddish-purple, bronzed, and/or blighted (Figure 2).

Management

Apply Delaro® 325 SC Fungicide. To learn more about applying Delaro® 325 SC Fungicide, please visit <https://www.cropscience.bayer.us/products/fungicides/delaro> and contact your retailer.

Earlier-maturing soybean products may be less susceptible.

Individual soybean products may have higher tolerance levels.

Rotate to non-host crops.

Residue management through tillage can help reduce pathogen survivability.



Figure 1. Purple seed stain. Picture courtesy of Adam Sisson, Iowa State University. Bugwood.org.



Figure 2. Cercospora leaf blight.

PHOMOPSIS SEED DECAY

Identification, Characteristics, and Diagnosis

- Caused by the fungus *Diaporthe longicolla*.
- Infected seed can be shriveled, undersized, and have a white or chalky appearance (Figure 3).
- The interior of pods can contain a white, cottony mold.
- Favors warm, wet weather during pod fill.
- Early-maturing soybean products may be more prone to infection.
- Moisture content levels below 19% retard infection.

Management

- Do not plant infected seed.
- Seed treatments may help improve emergence.
- Plant resistant soybean products.
- Select fuller-season (for the area to be grown) soybean products.
- Utilize tillage to help promote residue deterioration.
- Control weedy hosts such as velvetleaf.
- Harvest in a timely manner to reduce the risk of extended exposure of the mature crop to wet weather.

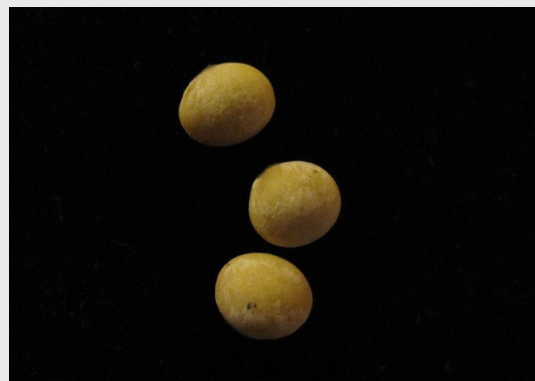


Figure 3. Phomopsis seed decay.

PHOMOPSIS SEED DECAY

Identification, Characteristics, and Diagnosis

- Caused by various species of the fungi Diaporthe and Phomopsis. *Phomopsis phaseolorum* var. *sojae* is the preferred scientific name.
- Pathogens overwinter on infected seed and soybean residue.
- Linear rows of dark lesions (specks) develop on stem nodes, pods, and petioles (Figure 4).
- The upper plant canopy turns yellow and dies.
- Pod infection can occur at flowering; however, most are infected around the R7 growth stage (beginning pod maturity). Injury to pods by insects favors pod infection.
- Seeds may appear healthy, shriveled, cracked, or chalky because of coverage by white mycelium.
- Oil and flour quality can be reduced.
- Favored by wet weather during maturation growth stages and delayed harvest.

Management

- Rotate crops to help reduce the amount of infected residue.
- Utilize tillage to promote decay of infected residue.
- Harvest in a timely manner to reduce the risk of extended exposure of the mature crop to wet weather.
- Utilize seed treatments to protect seed.
- Apply Delaro® 325 SC Fungicide. To learn more about Delaro® 325 SC Fungicide, please visit <https://www.cropscience.bayer.us/products/fungicides/delaro> and contact your retailer.

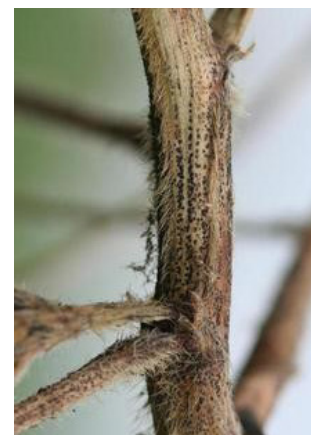


Figure 4. Linear lesions produced by pod and stem blight. Picture courtesy of Daren Mueller. Iowa State University. Bugwood.org

ANTHRACNOSE

Caused by the fungus *Colletotrichum truncatum*.

- Brown to black, irregularly-shaped lesions on stem, pods, and petioles (Figure 5).
- Premature defoliation can occur from petiole girdling.
- Infected pods may be filled with mycelium instead of seeds, or seeds may be fewer and/or smaller and can also be brown, moldy, shriveled, or normal in appearance.
- Dark spines or setae (acervuli) appear within lesions (Figure 6).
- Leaves roll and exhibit necrosis of minor veins between the major veins.
- Favors warm, wet, humid conditions.



Figure 6. Anthracnose setae. Picture courtesy of Purdue University, Plant and Diagnostic Lab.



Figure 5. Anthracnose lesions on a soybean stem. Picture courtesy of Daren Mueller, Iowa State University, Bugwood.org.

DOWNY MILDEW

Identification, Characteristics, and Diagnosis

- Caused by a fungus-like organism, *Peronospora manshurica*.
- Infection occurs in the spring when oospores germinate and infect seedlings.
- Upper surfaces of young leaves develop pale-green to light-yellow spots which enlarge into pale- to bright-yellow lesions (Figure 7).
- White to gray fungal tufts develop on the underside of the lesion.
- Oldest lesions become grayish-brown to dark-brown with yellowish-green margins.
- Masses of fungal-like growth can develop in pods and cause seed to become dull white and covered with the pathogen.

Management

- Plant resistant soybean products.
- Rotate with a non-host crop for one year or more.
- Rarely affects yield; therefore, foliar fungicides are not recommended.
- Residue management.
- Seed treatments can help protect seedlings from initial infection.



Figure 7. Downy mildew on soybean leaves.

FROGEYE LEAF SPOT

Identification, Characteristics, and Diagnosis

- Caused by the fungus *Cercospora sojina*.
- Symptoms initially appear during reproductive growth stages as dark, water-soaked lesions on younger leaves with centers that become ash-gray to light-brown in color.
- Later, the lesions become circular to angular with a purple to dark-brown margin around the tan to gray center (Figure 8).
- On leaf undersides, the center of the lesions may have a dark-black area where spores are being produced.
- Favored by warm (77 to 86°F) temperatures and prolonged periods of dew or light rain.
- Lesions can grow through pods and may cause seeds to be dark, shriveled, and have cracked seed coats. Seeds can also have no symptoms.

Management

- Plant resistant soybean products.
- Crop rotation and use of tillage to encourage residue decomposition can help reduce pathogen levels.
- Apply Delaro® 325 SC Fungicide. To learn more about Delaro® 325 SC Fungicide, please visit <https://www.cropscience.bayer.us/products/fungicides/delaro> and contact your retailer.



Figure 8. Frogeye leaf spot.

ALTERNARIA LEAF SPOT

Identification, Characteristics, and Diagnosis

- Caused by fungal species of *Alternaria*, a seedborne pathogen.
- Leaves may become reddish or yellowish in color.
- Dark-brown lesions, usually with concentric rings, ¼ to 1 inch in diameter usually appear on leaves and pods near soybean maturity throughout the canopy (Figure 9).
- Leaf lesions enlarge and merge together to produce large dead areas.
- Leaves eventually die and fall from the plant.
- Infected seeds are smaller, shriveled, and dark-brown to black.
- Favored by warm, moist conditions late in the growing season.
- Usually a secondary disease after mechanical or insect injury, or another disease.

Management

- Infection usually occurs very late; therefore, management is generally not necessary.
- Many soybean products have resistance.
- Seed treatments may offer protection.
- Apply Delaro® 325 SC Fungicide. To learn more about Delaro® 325 SC Fungicide, please visit <https://www.cropscience.bayer.us/products/fungicides/delaro> and contact your retailer.



Figure 9. Alternaria leaf spot lesions. Picture courtesy of Robert Mulrooney, University of Delaware.

BEAN POD MOTTLE VIRUS (BPMV)

Identification, Characteristics, and Diagnosis

- Vectored by the bean leaf beetle, *Cerotoma trifurcate* Förster.
- Foliar symptoms range from mild chlorotic mottling on upper leaves to puckering and severe mosaic in lower leaves (Figure 10).
- Delayed maturity or green stems are often observed near harvest.
- Seed coat mottling may be present.
- Virus overwinters in bean leaf beetles and can infect seedlings as the beetles feed.
- Plant infection by BPMV and soybean mosaic virus (SMV), vectored by soybean aphid, may cause severe dwarfing, foliar distortion, leaf necrosis, leaf mottling, and severe yield loss.

Management

- Managing emerging and first-generation bean leaf beetles in the spring with timely and labeled insecticides can reduce populations of the virus-laden insects.
- Controlling alternative BPMV hosts (cowpea (*Vigna unguiculate*), other bean species, and *Demodium* species) can help reduce the inoculum source.
- Delayed planting may increase early-season death of bean leaf beetles, reducing the vectoring population.



Figure 10. Bean pod mottle virus symptoms on soybean leaves. Picture courtesy of Edward Sikora, Auburn University, Bugwood.org.

SOYBEAN MOSAIC VIRUS (SMV)

Identification, Characteristics, and Diagnosis

- Aphids are a primary vector.
- A green/yellow mosaic pattern is the most common initial symptom on leaves (Figure 11).
- More mature leaves may exhibit a yellow/brown mosaic pattern.
- Premature defoliation is common.
- Infected seeds exhibit a brown or black mottling.
- Spread from plant to plant by soybean aphid feeding.
- Plant infection by SMV and bean pod mottle virus (BPMV), vectored by bean leaf beetle, may cause severe dwarfing, foliar distortion, leaf necrosis, leaf mottling, and yield loss.

Management

- Seeds should be virus-free.
- Plant resistant soybean products.
- Early planting may minimize aphid transmission at an early crop growth stage.
- Insecticide applications are not recommended because some insecticides may increase soybean aphid movement in the field, increasing the dissemination of the virus.



Figure 11. Soybean mosaic virus symptoms. Picture courtesy of Daren Mueller, Iowa State University, Bugwood.org.

- Aspergillus, an infection that occurs while seed is in storage, can reduce seed viability.
- Cladosporium is a seedborne disease; however, infections are rare.
- Fusarium seed infection is likely related to an early-season infection.

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