University of California
Agriculture and Natural Resources

SOUTHERN BLIGHT, Southern stem blight, White mold
Sclerotium rolfsii

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Figure 1. Typical wilt symptoms of early infection (Chard).

Figure 2. Stem lesions on pepper seedlings. Note mycelial growth at soil surface.

Figure 3. Wilted pepper plant due to southern blight.

Figure 4. Thick mycelial growth at the plant crown (chard). Note the sclerotia formation near the center of the photo.

HOSTS

Infects more than 500 plant species. Bean, cantaloupe, carrot, chard, pepper, potato, sweet potato, tomato, watermelon, as well as ornamentals, flowers, fruit trees and others. Crosscheck before selecting a rotation crop.

SYMPTOMS

Wilt is one of the earliest symptoms followed by rapid decline (Fig. 1 and 3). In tomato, pepper and other woody hosts, initial symptoms are water soaked stem lesions at or near the soil surface, which can girdle young seedlings (Fig. 2). In older plants, similar lesions appear but may not girdle the stem, and often wilt symptoms dominate the above ground observations.

Additional diagnostic features will be (1) white, cottony mycelial growth just below the soil surface (Fig. 2 and 4) and (2) mustard seed-sized spherical balls called sclerotia, forming on this mycelial growth that are tan, brown or black in color and the size and shape of a mustard seed (Fig. 4). The sclerotia differ from the soil clinging to the plant by their perfectly spherical shape and possibly color. Sclerotia are the overwintering structures of the pathogen that remain in the soil until conditions are right for future infection. The absence of mycelium and sclerotia is not sufficient to rule out this disease, but rather help to confirm it.
Both mycelial growth and sclerotia are less common in tomato. The key symptom for tomato is sudden wilt of the entire plant. This is different from Fusarium wilt and Verticillium wilt, which often include yellowing leaves, wilt on one side of the plant, and/or slower onset of wilt. It is important to differentiate between diseases because the management can be significantly different.

DISEASE CYCLE

This soilborne fungal pathogen is more active in warm, even hot, wet weather, and it requires the presence of undecomposed crop residue to initiate infection. Wet springs followed by early season high temperatures create optimal conditions, as we saw in California in 2017. It is a heat-loving fungus, favoring growth above 86ºF, though hyphal growth occurs in a temperature range of 46-104º F, and optimal growth and sclerotia production occurs between 81-95ºF. It grows on living and non-living organic matter and becomes most severe when dead leaves or other types of organic matter are present around the base of the plant. This permits the fungus to build up momentum by utilizing energy from the decaying organic matter and rapidly killing the host plant.

The fungus overwinters as sclerotia in the soil and/or as mycelium in decaying host tissue debris. Sclerotia are reported to survive in the soil for 3-4 years. The fungus is generally restricted to the upper 2 or 3 inches of soil and will not survive at deeper depths. This can be used as a management tool. Studies have shown that sclerotia may pass through the digestive tract of cattle or sheep and still be viable.

Long distance spread occurs as a result of movement of infected plant material or infested soil. Therefore, removal of infected plants and cleaning of farm equipment are useful in minimizing pathogen increase and spread.

MANAGEMENT

Genetic Resistance

Overall, among the range of hosts, resistant varieties are not very common. When sourcing seed, do inquire whether resistance is available. Some rootstocks used for grafting, in tomatoes for example, have resistance to Southern Blight.

Deep Cultivation

Infected residue should be buried deep enough to prevent its being brought back up in land preparation and cultivation. The fungus requires oxygen for development and deep burial reduces its activity. Studies suggest that germination is nil below 3.2” of soil (Punja, 1984).

Plant Removal

Removal of infected plants is an important aspect of disease control since the pathogen resides in plant residue. *Sclerotium rolfsii* usually causes infection at the lower stem (crown) section of the plant, and once infection takes place, removal of the whole plant is necessary.

Prompt removal of infected plants will help prevent the addition of abundant fungal inoculum to the soil. If infected plants are allowed to remain, these plants will add inoculum to the soil when incorporated.

Rotation

While rotation is often a great method of managing soilborne diseases, with the exceptionally wide host range of *S. rolfsii*, this tool is limited. Corn, Sudan grass, and other summer grains are reported to be non-hosts and would be good choices for a summer rotation crop. For winter rotations with a non-host, grains, such as wheat, rye, oats and others, are generally best. Mustard may provide suppression of the pathogen.

Solarization

Solarization has been shown to be effective at reducing *S. rolfsii* and disease development. Successful solarization requires that the soil is prepared properly as for planting. Adequate soil moisture must be present. Clear plastic sheeting, 0.025 - 0.4 mm thick, must be applied to the area for 4-8 weeks, depending upon the time of year, but generally during the hottest months. Treated areas should receive direct and full sunlight. Soil solarization will significantly reduce viable sclerotia. It will also help control other soilborne diseases, plant parasitic nematodes, and some weeds. Solarization followed by the addition of a biocontrol agent such as *Trichoderma harzianum* (Ex. RootShield) has been shown to increase efficacy of the soil treatment.

Steam

Where inoculum resides, the area must be brought to a temperature of 160-180°F for 30 minutes.

REFERENCES

Mullen, J. 2001. Southern blight, Southern stem blight, White mold. *The Plant Health Instructor*.

Punja, Z. K . Jenkins, S. F. 1984 . Influence of temperature , moisture, modified gaseous atmosphere, and depth in soil on eruptive sclerotial germination of Sclerotium rolfsii. Phytopathology 74:749-54