Virginia Cooperative Extension
Virginia Tech • Virginia State University
www.ext.vt.edu

An Overview of Southern Blight, Caused by *Sclerotium rolfsii*

Jose Garcia-Gonzalez, Doctoral Candidate, School of Plant and Environmental Sciences, Virginia Tech; Mary Ann Hansen, Extension Plant Pathologist, School of Plant and Environmental Sciences, Virginia Tech; Laura K. Strawn, Associate Professor & Extension Specialist, Department of Food Science & Technology, Virginia Tech; Steve L. Rideout, Professor and Extension Plant Pathologist, School of Plant and Environmental Sciences, Virginia Tech

Introduction

Sclerotium rolfsii Sacc. (*Athelia rolfsii* (Curzi) Tu & Kimbrough*)* is a necrotrophic, soilborne, fungal plant pathogen that is present in tropical and subtropical regions worldwide. It causes a disease commonly known as "southern blight" on a variety of host plants. It was first described in tomato plantings in Florida in the late 19th century. In the United States, the disease is more problematic in southern states where warm and humid conditions favor the pathogen. Over the last decade, southern blight has increasingly become an issue in vegetable and field crops in Virginia and across the mid-Atlantic region.

Host Range

S. rolfsii can infect over 500 different plant species, including both monocots and dicots. The host spectrum includes several important agricultural crops. In Virginia, early reports focused on devastating occurrences in peanut. However, in recent years, the pathogen has frequently been diagnosed in vegetables, including tomato, pepper, potato, bean, and artichoke; herbaceous ornamentals, including daylily, red hot poker, cardinal flower, creeping jenny, and hosta; fruit crops, including apple; and industrial crops, including sunnhemp.

Symptoms and Signs

Symptoms vary with host, growth stage and weather conditions, but typically, plants with early infections have pale green leaves that cluster and cup upwards. Eventually the whole plant wilts. Warm temperatures aggravate the wilting during the day. Some recovery may occur during the night, but eventually the whole plant wilts and fails to recover. Close inspection of affected plants reveals decaying outer tissue at the crown of the plant (Fig. 1 & 2). Often a white mat of mycelium is observed at the base of the stem at the soil line (Fig. 1).

Figure 1. Southern blight caused by *S. rolfsii* on a tomato stem. Photo by: J. Pollok

Figure 2. S. rolfsii on snap bean.
Photo by: J. Garcia- Gonzalez.

Four to five days after infection, small, spherical, white to tan structures with a smooth, hard texture, known as sclerotia, are observed. The sclerotia turn yellow and subsequently dark brown as they mature. They range in size from 0.5 to 2 mm in diameter. Microscopic examination of the mycelium reveals hyaline, irregular septa, and clamp connections (Fig. 3).

Figure 3. Mycelium and sclerotia of S. rolfsii on Potato Dextrose Agar on the right. Photo by: J. Garcia-Gonzalez.

In tuber crops, infection can also occur underground. In potato tubers, for example, small, round, sunken lesions with a brownish margin appear on lenticels. Later the lesions become deeply sunken and turn yellow or tan. A network of mycelium often adheres to the tuber surface (Fig. 4). As the disease progresses, the tissue becomes soft and disintegrates, producing odorless, white, opaque, cheesy material with sclerotia in the cavities. Field distribution occurs in a patchy pattern, which could be confused with symptoms of other soilborne diseases, such as *Fusarium wilt, Verticillium wilt*, or bacterial wilt; however, later symptoms are easily distinguished from symptoms of these diseases by the presence of white mycelium and brown sclerotia at the base of the stem.

Figure 4. *S. rolfsii* attacking pumpkin fruit (left) and potato tubers (right). Photos by: S. Rideout & J. Pollok.

Disease Cycle

Mycelium that overwinters in plant debris and volunteer plants, as well as sclerotia that survive in soil, serve as the primary source of inoculum. Mycelium does not survive freezing temperatures, but sclerotia are capable of survival for up to 2 years in field soil. Infection occurs at any vegetative stage of plant development and is favored by warm temperatures (80-95°F), high relative humidity (>50%), and wet soil conditions (below saturation). Under favorable conditions, a thick mat of mycelium is produced 3 to 4 days after initial infection occurs. The sclerotia are generally produced a week after infection.

Plant to plant spread via mycelium can occur in closely-spaced crops (e.g., carrot, sugar beet, snap bean). *S. rolfsii* is also dispersed through the movement of contaminated soil, plants, or water. Planting contaminated seed or seed pieces can also serve as a means of introduction of *S. rolfsii* into non-infested fields, although this is a less prevalent dispersal route.

Control

Disease-Resistant Plants

Unfortunately, for many host species, there are no cultivars that exhibit high levels of resistance to *S. rolfsii*. Therefore, using resistant cultivars is not currently a viable option for managing southern blight in most vegetable or ornamental crops.

Physical and Cultural Methods

Soil solarization reduces the viability of sclerotia when temperatures reach 50°C to 55°C (122°F to

131°F) for a period of up to 6 hours; however, efficacy depends on prolonged high temperatures, and this practice is more suitable for small scale productions in warmer climates. Anaerobic soil disinfestation, another alternative to soil fumigation, is currently being investigated in Virginia for suppression of *S. rolfsii*, however results are not conclusive at this time.

Other practices to manage *S. rolfsii* include the use of certified, pathogen-free seed to avoid the introduction of the inoculum to non-infested soil, scouting to detect infections, followed by plant removal, deep plowing (>4 inches), and crop rotation. Rotation with certain graminaceous crops can reduce the presence of *S. rolfsii* inoculum in the soil.

Biological Control

Biological control agents, such as *Trichoderma harzianum, Trichoderma viride,* and certain mycorrhizal fungi have been shown to provide some control of *S. rolfsii*. Consult the Mid-Atlantic Commercial Vegetable Recommendations VCE 456-420 for currently recommended disease control products (https://www.pubs.ext.vt.edu/456/456-420/456-420.html), and the National List of Allowed and Prohibited Substances for products that are currently approved for organic production (https://www.ams.usda.gov/rules-regulations/organic/national-list).

Chemical Control

Fumigants

Historically, soil fumigants were the most commonly used method to control certain soilborne plant pathogens, such as *S. rolfsii*, in commercial crops. In vegetable bedding plants, currently registered soil fumigants include chloropicrin, metam-sodium, and allyl isothiocyanate (Harvey 2002). For a complete list of the currently registered fumigants, consult the Mid-Atlantic Commercial Vegetable Recommendations VCE 456-420 (https://www.pubs.ext.vt.edu/456/456-420/456-420.html).

Fungicides

Active ingredients for fungicides that are currently registered for certain crops in Virginia and that have been shown to control southern blight include:

- Pre-plant fungicide: pentachloronitrobenzene (PCNB) and flutolanil
- Strobilurins: pyraclostrobin, azoxystrobin, and fluoxastrobin
- SDHI-containing: fluxapyroxad + pyraclostrobin and penthiopyrad
- Triazoles: tebuconazole and prothioconazole

For details on registrations for specific crops, growers should refer to the Mid-Atlantic Commercial Vegetable Production Recommendations VCE 456-420 (https://www.pubs.ext.vt.edu/456/456-420/456-420.html).

Disclaimer

Commercial products are named in this publication for informational purposes only. Virginia Cooperative Extension does not endorse these products and does not intend discrimination against other products which also may be suitable.

References

Aycock, R. 1966. Stem rot and other diseases caused by *Sclerotium rolfsii*: or the status of Rolfs' fungus after 70 years. Tech. bul. / North Carolina Agricultural Experiment Station 174:202.

Harvey, S. G., Hannahan, H. N., and Sams, C. E. 2002. Indian mustard and allyl isothiocyanate inhibit *Sclerotium rolfsii*. Journal of the American Society for Horticultural Science 127:27-31.

Keinath, A. P., and DuBose, V. B. 2017. Management of southern blight on tomato with SDHI fungicides. Crop Protection 101:29-34.

Mullen, J. 2001. Southern blight, southern stem blight, white mold. The Plant Health Instructor. DOI: 10.1094.

Punja, Z. K. 1985. The biology, ecology, and control of *Sclerotium rolfsii*. Annual Review of Phytopathology 23:97-127.

Visit Virginia Cooperative Extension: ext.vt.edu

2021 SPES-325NP