



Southern Blight - a disease becoming more prevalent in Missouri *by Zelalem Mersha*

Southern blight, a disease caused by the soil-borne fungal pathogen *Sclerotium rolfsii* affects many vegetables, ornamentals, and agronomic crops. Some estimates suggest it can infect up to 100 plant families and 500 species. Southern blight causes damping off if the pathogen infects seedlings. Other synonyms of the disease include southern wilt, southern stem rot and *Sclerotium* stem rot. Because of the warmth-loving nature of *S. rolfsii*, the disease is most common in the southern climates (and hence named southern). However, it also affects a wider range of crops in other regions during seasons or months with higher-than-normal temperatures. In Missouri, the disease was seen in the Southwest region few years ago and it is anticipated to be frequent in the south eastern part of the state too where the average temperature is warmer. It usually occurs sporadically in other parts of the state. However, the recent unusual trends of warmth have been leading to frequent incidences of the disease, especially in protected production systems.

The typical diagnostic feature of the disease on susceptible hosts such as tomatoes and peppers is the wilt symptom. Brown-to-black lesions appear near the soil line or around the lower stem and crown areas. Under moist conditions, abundant white mycelium that often has a distinct fan-shaped pattern will develop on or around these lesions. If conditions continue to favor infection, a tan to reddish-brown 0.04-0.08 inch (1-2 mm) diameter, spherical **sclerotium (plural sclerotia)** forms on the mycelial mat. Mature sclerotia have hard rinds which protect the cortex and viable hyphae inside. Fruits with a sunken or ruptured epidermis coming into contact with the fungus, often develop a fruit rot.

Sclerotia can be disseminated by the movement of infested soil, contaminated

tools and machinery, irrigation water, or plant material. Key environmental factors that favor the fungus and disease development are high temperature, aerobic, and moist conditions and acidic soil. Germination of sclerotia occurs in the range pH 2-5 but is inhibited at pH higher than 7 implicating southern blight less of a problem in calcareous soils with a high pH.

What can be done to control southern blight?

- Avoid fields with a southern blight history. Prevention is critically useful to avoid this disease. At the planning stage, select fields (or tunnels or beds) that are free of any southern blight inoculum (mycelium, sclerotia or any infected plant residue).
- Sanitation. Good sanitation involves early detection and removal of all diseased (symptomatic) plants and crop residues from the field or protected systems. Make sure no symptomatic or diseased transplants are introduced into the field or greenhouses/tunnels. Once the disease is seen in a tunnel or field, get protective gloves, boots, and disinfectants ready to avoid further spread of the disease.
- Crop rotation with non-host plants. Crop rotation is the next best management practice, also during the planning stage. Grasses including corn and small grains are non-susceptible and hence useful to reduce the inoculum level. However, it is worth noting that this pathogen has a wide host range. The other challenge with rotation is that the mustard-seed like brown-to-orange colored sclerotia, once they are formed, stay in the soil for long periods. Thus short ending rotations are ineffective. If rotation is an option, wait to come back with the same crop (family) until after 5-6 years have passed.

- Deep plowing. Plowing as deep as 8 inches or more and burying infected plant debris greatly helps reduce incidence of southern blight as the fungus causing southern blight (*S. rolfsii*) is highly aerobic.
- Best management practices. This includes procedures such as wider plant spacing, modifying the planting dates in a way to avoid wet and warmer temperatures (disease development is highly favored at temperatures 77 - 95F), avoiding injuring plants during cultivation, raising soil pH by liming, and use of physical barriers such as aluminum foil or plastic bags to protect the stem at the soil line (for home gardeners) or plastic mulch in commercial fields and tunnels. Addition of straw mulch to the soil has also been effective for reducing the disease incidence.
- Ammonium source of nitrogen. Using ammonium instead of nitrate has resulted in a reduced incidence of the disease.
- Biological control and solarization. Soil solarization followed by the introduction of *Trichoderma harzianum* has resulted in better control of the disease than either of them practiced alone. Other beneficial fungi such as *Penicillium* spp. and *Gliocladium virens* and the bacterium *Bacillus subtilis* have also showed good efficacy for controlling southern blight.
- Fungicides. The only chemistry mentioned for southern blight in the 2017 Midwest Vegetable Production Guide is Terraclor® whose active ingredient is pentachloronitrobenzene (PCNB). For crops like peppers and tomatoes, this fungicide can be applied as a transplant solution or applied as an in-furrow spray to the soil. Read and follow the labels for the rates, recommendations and safety precautions.

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Before applying ANY product, read the label (1) to be sure that the product is labeled for the crop and the disease you intend to control in your state, (2) to take the necessary safety precautions and application restrictions, and (3) to make sure that the product is listed in your Organic System Plan and approved by your certifier (organic growers).

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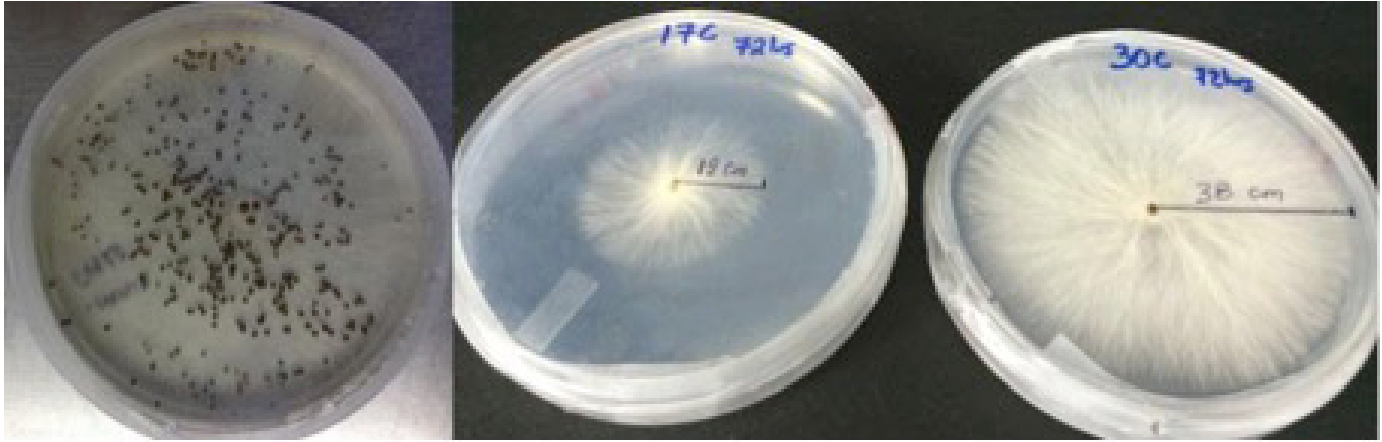


Fig. 1. Results of in vitro studies at Lincoln University showing tan to brown colored sclerotia of *Sclerotium rolfsii* (left) and its mycelial growth on Potato Dextrose Agar (PDA) after three days of incubation at 17°C (62.6 °F) and 30 °C (86 °F).



Fig. 2. Typical signs of southern blight disease on tomatoes caused by *Sclerotium rolfsii* shown by the white mycelium and tan to brown colored sclerotia (red circled). Picture: courtesy of Patricia Hosack, University of Missouri Plant Diagnostic Clinic.



Fig. 3. Typical diagnostic feature, the fan shaped mycelia of southern blight on tomatoes caused by *Sclerotium rolfsii*. Picture: courtesy of Patricia Hosack, University of Missouri Plant Diagnostic Clinic.

September Gardening Calendar

Ornamentals

Weeks 1-4

- Continue planting evergreens now.

Weeks 1-3

- Cuttings of annuals can be taken now to provide vigorous plants for overwintering.
- Herbs such as parsley, rosemary, chives, thyme and marjoram can be dug from the garden and placed in pots now for growing indoors this winter.

Weeks 2-4

- Except tulips, spring bulbs may be planted as soon as they are available. Tulips should be kept in a cool, dark place and planted in late October.

Weeks 2-3

- Begin readying houseplants for winter indoors. Prune back rampant growth and protruding roots. Check for pests and treat if necessary. Houseplants should be brought indoors at least one month before the heat is normally turned on.

Weeks 3-4

- Perennials, especially spring bloomers, can be divided now. Enrich the soil with peat moss or compost before replanting.
- Divide peonies now. Replant in a sunny site and avoid planting deeply.
- Lift gladioli when their leaves yellow. Cure in an airy place until dry before husking.

Week 3

- Poinsettias can be forced into bloom for Christmas if they are moved indoors now to a sunny windowsill. Each night, they must be kept in a cool, dark place where there is no light for 14 hours. This must continue until proper color is achieved in 6-10 weeks.

Lawns

Weeks 1-4

- Cool-season lawns are best fertilized in fall. Make up to 3 applications between now and December. Do not exceed rates recommended by fertilizer manufacturer.
- If soils become dry, established lawns should be watered thoroughly to a depth of 4-6 inches.
- Begin fall seeding or sodding of cool-season grasses. Seedbeds should be raked, dethatched or core-aerified, fertilized and seeded. Keep newly planted lawn areas moist, but not wet.

Weeks 2-4

- Lawns may be topdressed with compost or milorganite now. This is best done after aerifying.

Weeks 3-4

- It is not uncommon to see puffballs in lawn areas at this time.
- Newly seeded lawns should not be cut until they are at least 2 or 3 inches tall.

Vegetables

Weeks 1-2

- Egyptian (top-setting) onions can be divided and replanted now.
- Sowing seeds of radish, lettuce, spinach and other greens in a cold frame will prolong fall harvests.

Weeks 2-4

- Keep broccoli picked regularly to encourage additional production of side shoots.

Weeks 2-3

- Pinch out the top of Brussels sprout plants to plump out the developing sprouts.
- Harvest herbs now to freeze or dry for winter use.
- Tie leaves around cauliflower heads when they are about the size of a golf ball.

Weeks 3-4

- Pinch off any young tomatoes that are too small to ripen. This will channel energy into ripening the remaining full-size fruits.

Week 4

- Sow spinach now to overwinter under mulch for spring harvest.

Fruits

Week 1

- Pick pears before they are fully mature. Store in a cool, dark basement to ripen.

Weeks 3-4

- Bury or discard any spoiled fallen fruits.

Week 4

- Paw paws ripen in the woods now.
- Check all along peach tree trunks to just below soil line for gummy masses caused by borers. Probe holes with thin wire to puncture borers.

Miscellaneous

Weeks 1-4

- Autumn is a good time to add manure, compost or leaf mold to garden soils for increasing organic matter content.

Weeks 1-2

- Monitor plants for spider mite activity. Reduce their numbers by hosing off with a forceful spray of water.

Weeks 2-4

- Seasonal loss of inner needles on conifers is normal at this time. It may be especially noticeable on pines.

Gardening Calendar supplied by the staff of the William T. Kemper Center for Home Gardening located at the Missouri Botanical Garden in St. Louis, Missouri. (www.GardeningHelp.org)

Divide (and conquer) Iris in August

David Trinklein

Considered to be one of the more carefree perennials, bearded iris is not difficult to grow. However, when iris clumps become too large and overcrowded, fewer flowers are produced in the spring. This series of events signals it is time to rejuvenate the clumps by dividing the rhizomes into small sections. A rhizome is a thickened stem that grows horizontally at ground level or just below the surface of the soil. During July and August the growth of iris slows. It is during this period that the clump is most easily and successfully trimmed back, dug, divided and transplanted.

For the best display of flowers, iris that are growing in good conditions need to be divided every three to four years. A good sharp knife is an important tool for this procedure. Trowels, spades or dull knives may cause wounds that allow disease organisms to enter. If a disease known as bacterial soft rot is present in any of the rhizomes, extreme care must be taken to make sure that it is not accidentally spread to healthy rhizomes during division.

Division of iris is the only way to propagate the plant to insure that new plants are genetically the same as the parent plant. Iris may be grown from seeds, but these vary widely and seldom give rise to flowers similar to the plant that bore them. Both color and form may be different.

Among the tall bearded iris, there is a group known as remontant or reblooming irises. These cultivars not only bloom in the spring, but repeat bloom in the fall. They often are more expensive than “normal” bearded iris and usually are available only from specialist iris propagators. However, to rebloom in the fall, excellent growth must be maintained; therefore, regular division of this group is necessary. When dividing plants into smaller section, blooms should not be expected during the fall immediately after the clumps were divided.

When planting iris rhizomes, they should be set so that the rhizome is horizontal and at or just below the surface of the soil. The tops of the rhizomes should be visible and the roots spread out and pointing downward. If sections are small, three rhizomes may be set close together so they radiate outward. When planting iris, separate plants by a distance of between 18 to 24 inches.

At the time of iris renovation or replanting, the fans of leaves may be cut back to two to three inches in height. This removal of leaf tissue is especially important if iris leaf spot, a common disease of iris, is present. Iris leaf spot seldom kills iris but it can disfigure leaves and weaken plants. Cleanliness is important. Gather up and pull off any dead or badly diseased leaves. Early in the season prior to flowering, application of a fungicide containing chlorothalonil or thiophanate-methyl as its active ingredient can help prevent or reduce incidence of iris leaf spot. Always read and follow label directions when using any pesticide.

Another potentially destructive disease that may appear in iris plants is the aforementioned bacterial soft rot. When plants are infected, the leaf base and rhizome may develop into a soft, rotten mass having a foul, objectionable odor. When this disease is detected, infected plants should be dug and all diseased parts removed from the garden and destroyed. Damaged rhizomes should be trimmed back to sound, healthy tissue and exposed to the sun for at least two days before replanting. Do not replant iris back into the spot where the diseased plant was located.

Iris borer is an insect that feeds on the rhizomes of iris and may help spread soft rot. Cleaning up debris and dead iris leaves in late fall and again in very early spring the following year is a good way to reduce the number of the eggs of iris borer. Additionally, the use on an insecticide labeled for iris borer control (e.g. acephate or spinosad) in spring near bloom time can help prevent borer damage on leaves and rhizomes.

If iris plants have not flowered well, look for a new location when renovating. Iris requires a sunny location and well-drained soil. In wet, poorly-drained soil or shady exposures, or where iris must compete with trees or shrubs, plants tend to grow poorly which makes them more subject to diseases and other problems. High soil fertility is not required, but a complete fertilizer high in phosphorus and potassium but lower in nitrogen can be beneficial.

Additional information about iris care can be found on the American Iris Society website.

