Southern blight on apples – a new root disease problem for apples in the Northeast

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Southern blight is a root disease on over 500 different plants and crops, including both herbaceous plants such as tomatoes and zinnias as well as woody perennials such as forsythia and, yes, apples. The disease is caused by a fungus, *Sclerotium rolfsii*, and can be a significant problem on several crops. Usually, the fungus infects plants at the lower stem or crown, near the soil line, eventually girdling the plant and causing the leaves to wilt and brown. The first Southern blight symptoms most people see in apples are dying trees. Checking more closely around the crown and roots, white fungal hyphae are usually visible, either as thread-like individual hyphae or in mats. Sometimes small, brown, round structures made by the fungus, sclerotia, are also visible. The fungus can quickly rot roots and crown tissue, rapidly destroying trees. While smaller, younger trees are generally more susceptible, trees that have been in the ground for several years can also be killed.

White hyphae and small, tan sclerotia from the southern blight fungus around the base of an apple tree. (Photo Kari Peter, Penn State)

People have known that Southern blight can cause problems on apple trees for nearly 100 years. It was a particular problem on nursery trees and young apple trees in the South. The pathogen thrives in warm, moist soil. The optimum temperature for *S. rolfsii* growth is about 85 F, which is a very warm soil, with relative soil water content of 30% or higher (Dong et al. 2022). But it appears, as with the summer fruit rots, the warming climate is making Southern blight more common in the Northeast. Southern blight is a problem in apple production areas around the world, particularly in warmer climates. In a 2008 study, researchers showed that the pathogen doesn't survive the cold winters of North Dakota and Iowa, but did survive in North Carolina and Georgia, supporting the idea that a warming climate may increase Southern blight problems in more northern regions (Xu et al., 2008).

We first discovered a Southern blight problem in apples in Massachusetts in 2017 in a newly planted block. Symptoms developed the year of planting, with many trees rapidly developing brown leaves, and dying back (Figure 1). When trees were dug up, roots were black, and rotted with few fine roots. There were distinct white mycelia or hyphae, typical of Southern blight (Figure 2). Samples were submitted to the UMass Plant Diagnostic Lab, which tested for *Phytophthora* (a possible cause of the root rot), which were negative. The lab noted abundant white mycelia, with small

cream to brown-colored sclerotia growing from rootstocks (similar to those in Figure 3). DNA was extracted and sent to Macrogen for DNA sequencing. The sequences were identified as *Sclerotium rolfsii*, confirming a diagnosis of Southern blight. Since then, Southern rot has been identified in apple in Pennsylvania in 2018 and New Jersey in 2022.

Fig. 1. New apple planting showing tree-dieback caused by southern blight.

Fig. 2. Red arrows pointing to white hyphae in soil from the southern blight fungus. The white at the base of the trunk is paint.

Guides for the management of Southern blight stress not introducing the pathogen. That is, prevention is the best management. That's difficult for a pathogen with so many hosts. And there we really don't know why the disease is showing up in the Northeast more frequently. Where did it come from?

Fig. 3. Apple rootstock completely killed and rotted by southern blight.

It could have been in the soil at or near the planting site. In that case, why didn't it cause problems before 2017? Perhaps new, young trees are more susceptible. Or maybe it's because climate in Massachusetts has gotten warmer (Figure 4). Soil temperature tracks closely with air temperature, and as mentioned above, *S. rolfsii* likes warm climates and soil. Perhaps the fungus has always been in Massachusetts soils, but didn't cause problems because the cool climate, particularly cold winters, kept it in check.

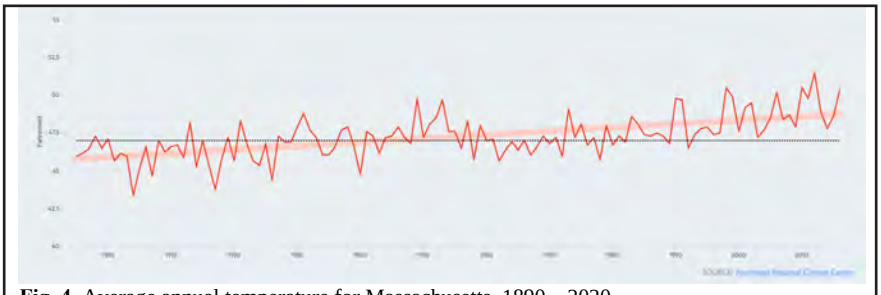

Fig. 4. Average annual temperature for Massachusetts, 1890 – 2020.

It's possible that the fungus came in with the new trees. However, nurseries should notice Southern blight easily, as it is a fast-acting disease that causes rapid decline, particularly on small, young trees. However, the nursery possibility has not been examined. It could be a new strain of *S. rolfsii* that has arisen recently and can survive in the Northeast, or a strain that is particularly pathogenic on apples that has recently moved into the region. Whatever the reasons, Southern blight is here and will probably need to be managed.

Unfortunately, there aren't any fungicides registered for use against Southern blight on apples. There are fungicides that are effective against *S. rolfsii* registered for other crops. Some of these are labelled for use in apples against diseases other than Southern blight but are illegal to use as a soil application in apple orchards. Some biological controls have been shown to be effective against Southern bight, but no studies on apple indicate that they are effective.

Pre-plant fumigation may be useful, though specific trials looking at Southern rot in apples haven't been done. In addition, fumigation involves broadly toxic chemicals, is expensive, and not good for overall soil health.

A cultural control that's useful is keeping the area around tree trunks free of weeds and dead plants. The fungus can grow on dead plant material, and debris and weeds around the base of trees keep humidity higher, which helps the fungus grow.

In addition, inspect newly arrived nursery trees for any signs of the disease, such as the white hyphae or the tan sclerotia. Remove infected trees as soon as they're identified, including the soil in the root zone, and avoid replanting for at least a year.

Presently, there are more questions than answers about Southern blight in apples and what to do to

manage it. Hopefully over the next year or two, studies and registration work will help us better understand the disease, and in particular identify fungicides and/or biocontrols for registration against the disease.

References

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