

Progress in developing integrated southern blight management tools and risk forecasting for central valley growers

Megan McCaghey¹, Mrinalini Narayan¹, Kelley Paugh¹, Amber Vinchesi-Vahl², and Cassandra Swett¹

¹Department of Plant Pathology, University of California, Davis
²UC ANR Cooperative Extension

Southern blight, caused by the soil borne fungus, *Sclerotium rolfsii*, is among the most damaging diseases in annual cropping systems throughout the Central Valley. This pathogen causes a crown rot which rapidly kills plants, often within one week of infection.



Figure 1. (L) *S. rolfsii* mycelia (white threads) and sclerotia (copper-colored bodies the size and color of alfalfa seeds) on a sunflower (M. McCaghey). (C) Stunting and wilting in sunflower caused by *S. rolfsii* infection (M. McCaghey). (R) *S. rolfsii* mycelia on a potato tuber (C. Swett).

Southern blight is triggered by warm temperatures, moist soil conditions, and dense crop canopies. As average spring and summer temperatures increase in the Northern San Joaquin Valley, disease outbreaks are becoming more common in many crops including tomato, potato, sunflower, bean, pepper, and sweet potato (see below). While often easily diagnosed in the field based on sclerotia and fan-like fungal growth (shown above), with over 500 hosts and limited genetic resistance it is notoriously difficult to manage. However, fungicides can be effective if properly applied. The chemicals must cover the crown and must be applied prior to infection.

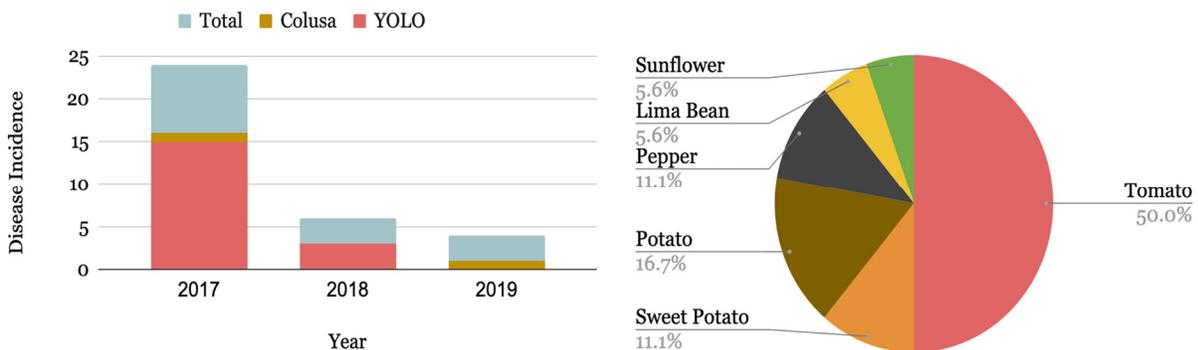


Figure 2. (L) Southern blight diagnoses based on submission to the Swett lab over three years—in all years, submissions from Colusa and Yolo represented over 50% of total submissions statewide; (R) Crops diagnosed with southern blight over a three year period (statewide) (M. Narayan).

The inconsistent appearance of southern blight in the Northern San Joaquin Valley makes it hard to determine when or if fungicides are needed in a given year. We are conducting a multi-year project to provide a risk forecasting tool which can demystify southern blight risk events, to determine when fungicide applications are needed. This summer, we are collecting data on soil temperature, soil moisture, and disease incidence in annual cropping systems throughout the Central Valley in order to develop a predictive model, which we are validating in controlled trials in collaboration with Brenna Aergenter and Jaspreet Sidhu.

While fungicides can be effective, dense canopies and lack of crop registrations limit their usefulness; moreover, there are limited fungicide options available to organic producers, who are often the most impacted by this disease. A second goal of our project is therefore to provide an integrated management toolkit for southern blight, which includes organic options. This includes:

1. **Developing crop rotation information.** There is some indication that certain rotation crops (such as corn) are less affected by southern blight and slow population build up. We are evaluating higher and lower risk crop rotations across the state, which includes 13 farms in the Northern San Joaquin Valley. This is a continuation of a trial we started with Amber Vinchesi-Vahl and Sarah Light in 2018, and we are examining changes in fungal densities in soil, following planting to various crops including corn, sunflower, onion, tomatoes, potato, and cucurbits over three years (2018, 2020, 2021).
2. **Pathogen-suppression using chitin soil amendments.** Chitin – a compound present in crab shells – is the same compound that forms pathogen survival structures (sclerotia). Adding chitin in the form of crab shells to soil stimulates microbes that break down chitin, and thus survival structures. Studies indicate that sclerotia survival is reduced as a result of soil chitin amendment, with degree of impact depending on concurrent soil management practices (e.g. compost use and type).

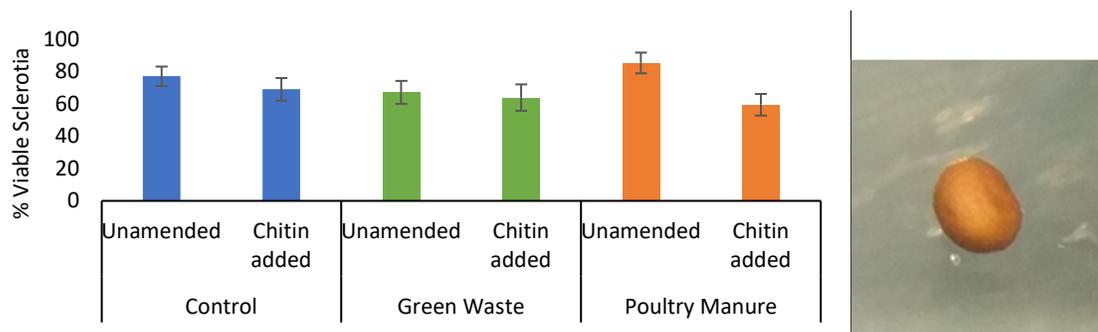


Figure 3. Chitin amendment consistently reduces sclerotia (image on right) survival in soils fertilized with synthetic nutrients either with or without composts in a field plot (K. Paugh).

3. **Pathogen suppression using soil solarization.** Preliminary data from laboratory trials indicates that fungal survival structures (sclerotia) are killed above 37°C (~99°F). With high post-harvest summer and fall air temperatures in much of the Central Valley, there is

strong potential to use solarization after harvest to reduce pathogen loads in soil. This season, we are conducting solarization trials at two sites in Kern and San Joaquin Counties.

The deliverables from this project include a disease forecasting tool, information on crops that are better and worse to grow in southern blight infested fields, and soil treatment tools including chitin and solarization for organic, high value and small acreage growers. This work is complemented by studies to evaluate cultivar and rootstock tolerance in tomato (Jaspreet Sidhu and Alex Putman), cultivar tolerance and fungicide efficacy in potato (authors, with J. Sidhu and B. Aegerter), and fungicide efficacy in sweet potato (Scott Stoddard).

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