Managing Southern Stem Blight on Tomato Plants: Symptoms to Solutions.

Name of Disease: Southern Stem blight in tomatoes

Pathogen: *Sclerotium rolfsii* (*Athelia rolfsii*) (Soil-borne fungal pathogen)

Host Plants: This disease has a very wide host range. It can cause infection in over 500 plant species. There are several major vegetable and fruit hosts for this pathogen, including solanaceous crops like tomato (*Solanum lycopersicum*), pepper (*Capsicum spp.*), tobacco (*Nicotiana tabacum*) and potato (*Solanum tuberosum*) as well as other economically important crops including strawberries (*Fragaria* × *ananassa*), bean (*Phaseolus vulgaris*), cantaloupe (*Cucumis melo*), sweetpotato (*Ipomoea batatas*), watermelon (*Citrullus lanatus*), soybean (*Glycine max*) and peanut (*Arachis hypogaea*).

Typical Symptoms (How to identify the disease)

When conditions are favourable fungal development occurs (high humidity and warm temperature: 80-95F). In most cases, the symptoms can be seen on the lower stem at the point of contact with soil, i.e., soil line or collar region. Initially, brown to black lesions start to increase rapidly and cause complete girdling of the stem, leading to abrupt and permanent plant wilting. Whitish mycelial growth can be observed moving a few centimeters upwards on the plant stem. In later stages, spherical, reddish-brown survival structures of fungi (sclerotia) can be observed, ranging in size from 1-3mm. These sclerotia look like mustard seeds in structure and are the source of inoculum for the next season, which can survive in soil for multiple years.

Figure 1. Tomato plant infected by *Sclerotium rolfsii* in grower's field.

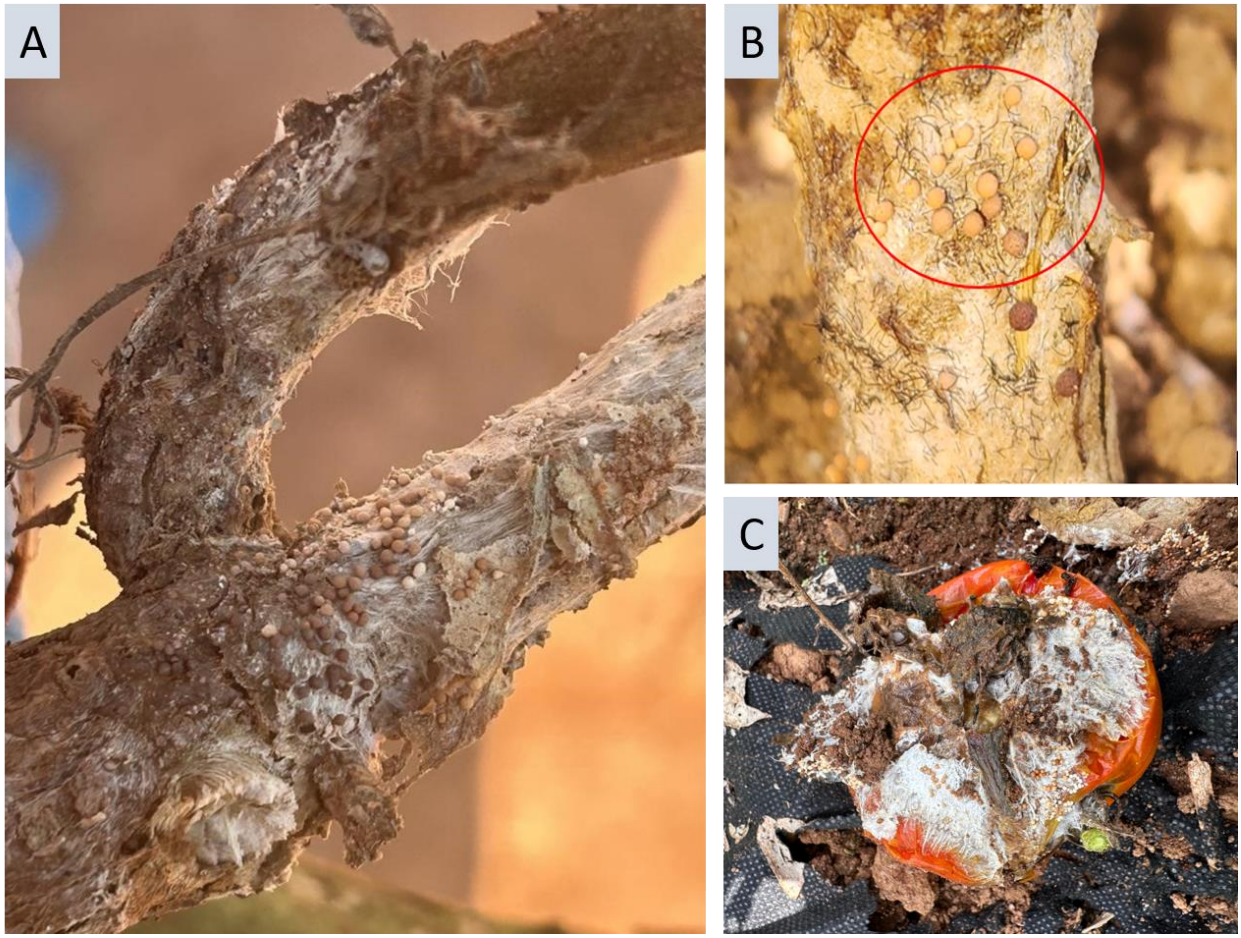

Figure 2. Symptoms of Southern stem blight of tomato on stem and fruit. A) and B) Closeup of tomato stem infected with southern blight with mycelia and sclerotia. Circled are the sclerotia that form in the latter stages of infection. C) Infected tomato fruit at farmer's field.

Disease cycle and epidemiology

The disease typically begins when sclerotia present in the soil germinate under favorable environmental conditions. Once the sclerotia germinates, they produce a thick mycelial mat on the area of infection (the soil line) and infect the host stem. This leads to tissue necrosis at the point of infection, chlorosis on above-ground parts, and finally girdling and permanent wilting and drying of the entire plant.

High temperatures (77–95 °F), aerobic and moist conditions, and acidic soil promote disease development and fungal growth. Sclerotia germinate in pH conditions ranging from 2 to 5, while germination is inhibited at pH above 7. The spread of sclerotia occurs through the movement of contaminated plant material and soil.

Management Strategies

Control of southern blight using organically approved fungicides is scarce. Therefore, control is oftentimes preventative rather than curative.

Use of organic amendments: Methods to mitigate southern blight infection rates, including the addition of organic amendments, have demonstrated significant decreases in infection rates compared to the use of synthetic fertilizers. Amendments shown to reduce southern blight include: cotton gin trash, pig manure, poultry manure, rye vetch green manure, and composts. However other amendments could potentially be used to reduce southern blight incidence. The inclusion of organic amendments in soil has been shown to increase the presence of biodiversity of beneficial microbes and increase the presence of Trichoderma fungi, which have been shown to be antagonists to southern blight development. If possible, mulching of amendments rather than tilling have also resulted in lower disease incidence.

Crop rotation: Although crop rotation is a traditional and widely favored method for disease management, it proves less effective against southern blight due to the extensive host range of *Sclerotium rolfsii* and the long-term survival of sclerotia in the soil. Planting susceptible crops like tomatoes, and rotating with nonsusceptible crops such as corn or wheat is also an important step in preventing outbreaks of southern blight.

Soil solarization is the process of covering soil with a heat-absorbing material prior to planting. Several studies have shown that this technique reduces the incidence and severity of southern blight. This technique is a favorable option for controlling many soil-borne diseases like southern blight because it is compatible with other modes of disease control.

Another method for management of this disease is using grafted seedlings. For soil borne diseases like this, grafting a desirable scion with resistant rootstocks can be very successful in managing the disease. Grafting the high-yielding yet susceptible hybrids/heirlooms with commercially available resistant rootstocks like Maxifort, Bigpower, and Estamino can be really successful in managing the disease.

Further reading:

- Rivard, C. L., O'Connell, S., Peet, M. M., & Louws, F. J. (2010). Grafting Tomato with Interspecific Rootstock to Manage Diseases Caused by Sclerotium rolfsii and Southern Root-Knot Nematode. *Plant disease*, *94*(8), 1015–1021. https://doi.org/10.1094/PDIS-94-8-1015

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