Selerotinia Diseases of Vegetable and Field Crops in Florida

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The fungus, *Sclerotinia sclerotiorum*, causes a profusion of Sclerotinia diseases on more than 360 different host plant species. There are at least 61 different common names that have been used for different *Sclerotinia* diseases, and these range from banana fruit rot to wilt. Some common names for *Sclerotinia* diseases of important crops in Florida are **white mold** (beans), **watery soft rot** (cabbage), **drop** (lettuce), **stem rot** (potato and tomato), and **nesting** (post-harvest disease of bean).

Sclerotinia diseases of plants that grow in Florida have a history of more than 80 years. Lettuce drop was reported to be present in fields of lettuce in 1896 near Gainesville where certain fields were almost completely destroyed. Since that time *Sclerotinia* diseases have been reported on many crops in the state and have been particularly damaging in bean, lettuce, cabbage, potato, and tomato. Although *Sclerotinia* is known to attack peanut and soybeans, it does not appear to be a pathogen of economic importance on these field crops at this time.

Symptoms

The best indicator of *Sclerotinia* disease is the presence of small, black sclerotia (resistant structures) of the fungus (Fig. 1). Sclerotia vary in size and may be spherical, flattened on one or more sides, elongated, and almost any other shape imaginable. They usually are about 3-10 mm long x 3-7 mm wide, with a black outside covering and usually a white interior. Sclerotia form on the surface of certain plant parts as well as inside the stem cavity of tomato and potato. A ring shaped sclerotium may develop around the stem of tomato fruit when they are infected by *Sclerotinia*. Sclerotia enable the fungus to survive from season to season and are the source of inoculum to infect crops.

Another common indicator of *Sclerotinia* diseases is the presence of white, cottony-like mycelium. of the fungus when the environmental conditions are favorable, i.e. cool and moist (Fig. 2).

Symptoms of *Sclerotinia* are often different for different crop plants. The disease white mold in beans usually does not appear until after blossoming begins. When flower petals become senescent, die, and fall from the flower, they may be invaded by the fungus. These fungus-invaded petals serve as an essential, intermediate form of organic matter that allows the fungus to advance into the plant itself. The disease often appears first in leaf axils where flower petals often lodge after falling from the flower. The disease advances into the stem, as water-soaked spots that increase in size, girdle the stem, and kill it above the point of infection. The disease can also enter the bean plant through leaves or pods that lie on the soil surface where sclerotia or infected plant parts act

as sources for infection; the pods pictured in Fig. 3 were infected in this way.

Lettuce drop usually begins when wrapper leaves still attached to the plant fall to the soil surface in the normal growth processes and contact a sclerotium that germinates to initiate infection. This fungal growth progresses through the leaf into the base of the lettuce stem, where the fungus destroys the stem causing the plant to collapse or drop (Fig. 4). The entire lettuce plant may be invaded by the fungus, as evidenced by the cottony-white fungus growth on plant surfaces that is often followed by the production of sclerotia when environmental conditions are favorable.

In tomato and potato the *Sclerotinia* diseases begin usually about the time of flowering. Early stages of these diseases are similar to the disease in bean. Infections usually start in the leaf axils or joints of the plant where fallen flower petals lodge. Spores of the fungus light on these flower petals, germinate, invade the petal, and subsequently advance into the stem. Water-soaked spots are usually the first symptom observed, and these are followed soon by further invasion of the stem, girdling, and death of the upper part of the stem that turns a bleached light gray, causing the stems to resemble bones of animals that have been left in the sun. The fungus can also enter plants at the soil line or at other points where plant parts touch the soil or other plants that are diseased. Plants in large portions of the field may become diseased and die, producing large, more or less circular, areas of dead plants (Fig. 5). The hard, black sclerotia of the fungus are often formed inside the stem cavity and tend to assume the shape of the cavity; that is, they are definitely longer in one dimension than in the other (Fig. 6). Some may be almost tubular.

The *Sclerotinia* disease of cabbage may be similar to the disease in lettuce, and, indeed, may be referred to as drop of cabbage, but watery soft rot is a better name. The disease begins usually on the leaves where growth cracks or other damage occurs. Spores of the fungus land on these places, germinate, invade the leaf, and grow into the head and stem. Eventually the entire plant may be invaded by the fungus and sclerotia often form over the surface of the head.

Almost all *Sclerotinia* diseases are field diseases, but when they occur in post-harvest situations they are very damaging. When beans are shipped in hampers or other containers in which diseased pods are included, a situation called nesting may develop. The fungus grows from the diseased pod to other adjacent pods and produces the cottony-white fungus growth and sclerotia. A mass of diseased pods is created that is stuck together by the fungus growth, resembling a nest (hence, the name “nesting”).

Epidemiology

Sclerotinia is a fungus that prefers cool, moist weather, causing diseases of great intensity when the temperature ranges from 60 - 70°F (15 - 21°C). High humidity with dew formation supports the spread and increases the intensity of disease.

Small, mushroom-like structures called apothecia develop from sclerotia and bear infectious spores (Fig. 7). When the environmental conditions change suddenly, these spores are ejected into the air and carried to healthy plants, where they germinate and produce diseases described here. Spore ejection will occur after sclerotia in soil have been wet or soil moisture is supportive of plant growth (e. g. after several rains or irrigations).

When in the soil, sclerotia may germinate to produce a fungus growth that may infect certain plants directly, without first growing on nonliving organic matter, such as senescent or dead leaves of the host plant, or dead leaves and plant parts of other plants. In certain situations sclerotia may germinate and the

resulting fungus growth remains on the dead leaves for a short time, after which the plant stem is invaded.

Control

Consult the University of Florida Plant Disease Control Guide and current labels for specific legal uses of fungicidal chemicals used in the control of *Sclerotinia* diseases.

Four to five weeks of flooding of fields that have a history of *Sclerotinia* diseases may reduce the numbers of viable sclerotia, thereby reducing the amount of disease in succeeding crops. Seedbeds for celery transplant production are flooded before seeding (Fig. 8). This practice, and the application of the practice to other locations, may reduce the incidence of *Sclerotinia* diseases as well as the incidence of other diseases.

Sprinkle irrigation has been reported to enhance the development of certain Sclerotinia diseases, mostly those that are initiated by *Sclerotinia* spores. Recycled irrigation water may move sclerotia to fields where sclerotia are not present. The suppressing effect of plastic mulch on *Sclerotinia* diseases, the density of plant canopy, and other cultural practices must be evaluated to establish conclusively their influence on Sclerotinia diseases in Florida.

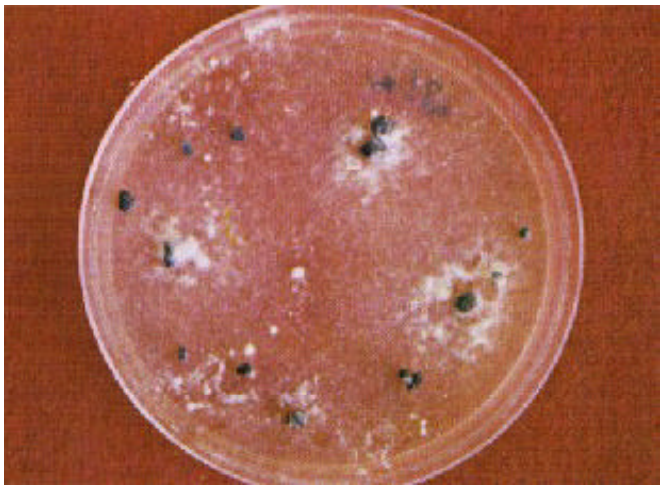

Figure 1. *Sclerotinia sclerotiorum* growth in Petri dish culture. Note large, black sclerotia (resistant structures, characteristic of this pathogen, in both culture and in the field).

Figure 2. Cottony, white, fungus growth on tomato plant with *Sclerotinia* stem rot.

Figure 3. *Sclerotinia* infection of bean pods.

Figure 4. Lettuce drop, showing collapse of outer leaves.

Figure 5. Roughly circular area of *Sclerotinia* infection in field of direct seeded tomatoes, showing severe wilting and plant death.

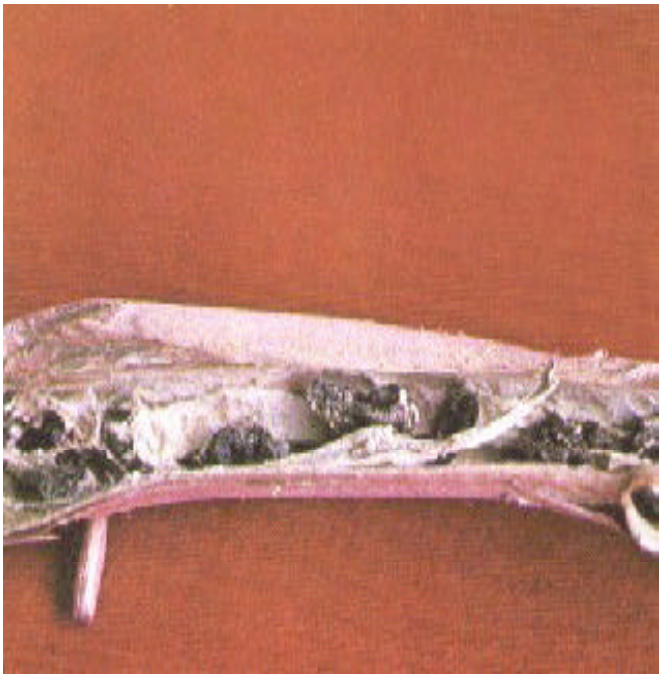

Figure 6. Black sclerotia inside tomato stem.

Figure 7. Mature apothecia (mushroom-like sporebearing structures) growing out of a *Sclerotinia* sclerotium (photo courtesy of Peter Adams, USDA, Beltsville, Md).

Figure 8. Flooding- a commoon practice for *Sclerotinia* control in celery fields.