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The Menace of Sclerotinia Diseases: Unveiling Their Impact and Management

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Sclerotinia Diseases fungi belonging to the Sclerotinia genus, notably *S. sclerotiorum* and *S. minor*, are responsible for causing highly destructive diseases in a wide range of succulent plants, particularly vegetables and flowers. Another species, *S. homeocarpa*, is notorious for triggering the devastating dollar spot disease in turf grasses. Sclerotinia diseases have a global reach, affecting plants at every growth stage, from seedlings to mature plants and even post-harvest products.

Sclerotinia Diseases in Vegetables and Flowers: Sclerotinia diseases afflict nearly all annual vegetables, ornamental plants, and field crops, resulting in substantial losses both in the field and during post-harvest handling. The symptoms associated with Sclerotinia can vary, contingent on the host plant, the affected plant part, and the prevailing environmental conditions. These diseases are identified by various names, including cottony rot, white mold, watery soft rot, stem rot, drop, crown rot, and blossom blight, among others.

Symptoms and Disease Progression: One of the most conspicuous early indicators of Sclerotinia diseases is the appearance of a white, fluffy mycelial growth on the infected plant, followed by the development of sizable, compact resting structures known as sclerotia. Initially, these sclerotia are white but eventually become black and hard on the outer surface. They exhibit variations in size, ranging from 0.5 to 1 millimeter in *S. minor* to 2 to 10 millimeters in diameter in *S. sclerotiorum*, typically having a flattened and elongated appearance rather than being perfectly spherical.

In succulent plants, infected stems initially develop pale or dark-brown lesions at their base. These lesions are often quickly covered by white, cottony patches of fungal mycelium. During the early stages of infection, the foliage may appear normal, making it easy to overlook infected plants. As the fungus advances through the stem, causing it to rot, the foliage above the lesion wilts and succumbs relatively rapidly. In some instances, the infection may originate from a leaf and then penetrate the stem via the leaf. Sclerotia of the fungus may form within the stem's pith or externally on the stem surface.

Leaves and petioles of plants like lettuce, celery, and beets may suddenly collapse and die as the fungus infects the base of the stem and the lower leaves. The fungus swiftly invades and spreads throughout the stem, resulting in the complete demise of the plant, with each leaf descending and resting on the one below. Mycelium and sclerotia typically manifest on the lower surface of the outer leaves. In moist conditions, the fungus can infiltrate the entire

plant, leading to rot and the development of a white, fluffy mycelial growth covering the entire plant.

Sclerotinia infections in fleshy storage organs, such as lettuce, cabbage, squash, and carrots, lead to the formation of a white, cottony growth on their surfaces, whether they are in the field or in storage. Externally, black sclerotia develop. Infected tissues become darker than healthy ones, turning soft and watery. If the disease develops after harvest in storage, it can spread to adjacent roots, bulbs, corms, and other organs, resulting in pockets of rotted tissue or causing all the organs in a container to become infected and collapse, resulting in a watery, soft rot covered by fungal growth.

Fleshy fruits like cucumbers, squash, and eggplants, as well as seed pods of beans, can be attacked by Sclerotinia through their contact points with the ground, where the fungus initiates a wet rot that spreads from the tip of the fruit or pod to the rest of the organ. Eventually, the entire pod or fruit rots and disintegrates, with white fungal mycelium and black sclerotia visible externally and internally.

Infections in flowers are primarily observed in camellias, daffodils, and narcissus. Small, watery, light-brown spots initially appear on the petals, enlarging and eventually encompassing the entire petal. Ultimately, the entire flower darkens and falls. Flower disintegration usually occurs in wet weather or after the flowers have fallen, when the fungus produces abundant mycelium and sclerotia.

In turf grasses, a related fungus, *Sclerotinia homeocarpa*, causes dollar spot disease, named so because symptoms in closely-mown grasses manifest as numerous small, circular, bleached-out spots, ranging in size from a quarter to a dollar. This disease is persistent in many golf courses and home lawns, often appearing as patches of blighted turf measuring 4 to 6 inches in diameter.

Pathogens

The fungus *Sclerotinia sclerotiorum* survives through the winter as sclerotia on or within infected tissues, as fallen sclerotia on the ground, or as mycelium in dead or living plants. In the spring or early summer, sclerotia germinate and produce slender stalks terminating in small, disk- or cup-shaped structures measuring 5 to 15 millimeters in diameter, known as apothecia. These apothecia contain asci and ascospores, and large numbers of ascospores are released into the air over a 2 to 3-week period. These ascospores can be carried by the wind, and when they land on senescent plant parts, such as old blossoms that serve as readily available food sources, they germinate and initiate infection. In some Sclerotinia species, sclerotia cause infection by producing mycelial strands that directly attack and infect young plant stems. Under moist conditions, this method of infection is likely more common than ascospore-based infection, although in *S. sclerotiorum*, almost all infections are initiated by ascospores.

Control Measures

The management of Sclerotinia diseases involves a combination of cultural practices and chemical control methods. Few plant varieties exhibit significant resistance to the pathogen. In greenhouse settings, soil sterilization using steam effectively eliminates the pathogen. When planting susceptible crops, it's important to select well-drained soils, maintain appropriate spacing between plants for adequate air circulation, and keep the soil free of weeds between crops. Since sclerotia can remain viable in the soil for up to three years and do not all germinate or die simultaneously, fields previously infected should be cultivated with non-susceptible crops like small grains for at least three years before susceptible crops are reintroduced. Several crops have shown promising results in controlling Sclerotinia

diseases through pre- and post-susceptibility stage soil or plant fungicidal sprays, with newer contact and systemic fungicides providing excellent control.

Furthermore, various species of fungi, bacteria, insects, and other organisms have been reported to parasitize or interfere with the growth of *Sclerotinia spp*. Some success has been achieved in the biological control of Sclerotinia diseases in certain crops by introducing mycoparasitic fungi such as *Coniothyrium minitans*, *Gliocladium roseum*, *G. virens*, *Sporodesmium sclerotivorum*, and *Trichoderma viride* into Sclerotinia-infested soil. These mycoparasites either destroy existing sclerotia or inhibit the formation of new ones.

Life cycle of the Pathogen