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Timing Fungicide Applications for Management of Sclerotinia Stem Rot

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Sclerotinia stem rot, also called white mold, is a widespread problem in potato fields in the Columbia Basin. The disease is favored by high relative humidity, long periods of free moisture on foliage, and fertility practices that promote dense foliage. *Sclerotinia sclerotiorum*, the fungus that causes white mold, has a wide host range of approximately 400 species of broad leaved (dicotyledonous) plants. Among these are potato, bean, tomato, carrot, radish, pea, sunflower and canola.

Basics of Sclerotinia Stem Rot

Sclerotinia stem rot first appears as small water-soaked lesions usually at the point where branches attach to stems or on branches or stems in contact with the soil. A white cottony growth of fungus mycelium develops on the lesions and the infected tissue becomes soft and watery. Lesions expand and may girdle the stem, which causes the foliage to wilt.

During dry conditions, lesions become dry and will turn beige, tan, or bleached white in color and papery in appearance. Hard, irregularly shaped resting bodies of the fungus, called sclerotia, form in and on decaying plant tissues. Sclerotia are generally ¼ to ½ inch in diameter, initially white to cream in color but become black with age and are frequently found in hollowed-out centers of infected stems. Sclerotia will eventually fall to the ground and enable the fungus to survive until the next growing season.

Sclerotia are very durable and can survive in soil for at least three years. They require a conditioning period of cool temperatures, provided by winter weather, before germination. During the growing season, sclerotia within 1 to 1.5 inches of the soil surface germinate when the canopy of the growing crop shades the ground and soil moisture remains high for several days.

Sclerotia either germinate directly as mycelium which may infect stems near the soil surface, or they produce fruiting bodies called apothecia (singular is apothecium). Apothecia are cup-shaped on their upper surface, about 0.5 inch in height, fleshy in texture, and pale pink or light tan in color. Millions of ascospores are formed in each apothecium. Ascospores are ejected into the air and are carried by air currents up to several miles in distance. Airborne ascospores are deposited into potato fields before row closure and continue for eight or more weeks. Number of ascospores peak near full bloom of primary flower clusters, which is defined as bloom of more than 90 percent of the flower buds on primary inflorescences over more than 75 percent of the field.

Ascospores of *S. sclerotiorum* are incapable of direct infection of intact green potato tissues, but **they must first colonize flowers** or senescing or dead plant tissues and then use them as an **energy source** to infect green tissues. Blossoms are crucial for infection and development of Sclerotinia stem rot in potato. Airborne ascospores are deposited on open potato blossoms still attached to the canopy. Infested flowers fall and are trapped on stems, usually leaf axils, or fall on the ground and fungal mycelia then rapidly colonize the blossoms when humidity is high in the plant canopy. Ascospores are also deposited on senescent and dead plant material on the ground,

germinate, and produce mycelium. Infection occurs shortly after contaminated blossoms become lodged on stems in the plant canopy, or after stems come in contact with contaminated fallen blossoms or decomposing plant tissues on the ground. Secondary spread to additional stems may occur when green stems lodge or lean onto actively expanding lesions on infected stems. Flowers and other senescing tissues colonized by ascospores are generally the cause of the vast majority of lesions as opposed to infections near the soil line initiated by mycelium from soil-borne sclerotia.

Fungicide Application

Foliar fungicides are needed in areas with severe disease pressure. Effective materials include Endura, Omega, and Topsin M. Foliar fungicides should be targeted at infection from ascospores via contaminated blossoms. Current research has demonstrated that **foliar fungicides should be applied at full bloom of primary flower clusters.** An additional application of a foliar fungicide could be made seven to ten days later to cover secondary and ternary flower clusters in areas with severe disease pressure. Full bloom of primary flower cluster is a narrow application window, but **application at this time has been significantly more effective than application at row closure** in three of three years of research trials in commercial fields in the Columbia Basin. Fungicides applied at row closure are generally washed from stems and partially degraded before effective inoculum (colonized blossoms) is present; whereas, applications at full bloom of primary clusters are made just before infection would otherwise occur from dropping blossoms. Fungicides applied after blossom fall are ineffective because infection has already been initiated. Omega also has activity against **late blight** and Endura has activity against **early blight**.

Full Bloom of Primary Flower Clusters

Time of potato flower blooming depends on cultivar, fertility practices, and weather. **Full bloom of primary flower clusters** is when all flowers on the primary clusters (inflorescences on the main plant stems) are all blooming throughout most of the field. This generally occurs 5 to 10 days after row closure in commercial potato fields of cultivars Shepody and Ranger in the Columbia Basin. This is when the first fungicide application should be made. In cultivars that flower over an extended period such as Russet Burbank, initial fungicide application in the Columbia Basin has been most effective about 7 days after row closure.

Cultural Tactics

Fungicides will be most effective when combined with practices that limit potato vine growth such as avoiding excessive application of fertilizer. Irrigation practices that promote frequent and long periods of leaf wetness within the crop canopy should be avoided. Irrigation should be restricted during rainy weather, and on cool, cloudy days, whenever possible. Cultural practices need to be employed before stem rot begins developing in fields.

Potato Insect Pest Survey for the Columbia Basin of Washington

Washington State University Extension and the Washington State Potato Commission have joined efforts to conduct a regional potato insect pest monitoring program that targets green peach aphid, potato tuberworm, and beet leafhopper. Fields across the Columbia Basin are monitored weekly, and the results are communicated to potato growers via a phone-in hotline (888-673-6273) and a website: http://potatoes.wsu.edu/survey/PotatoInsectSurvey.html. These insect monitoring efforts present a regional snapshot of insect populations, and are not meant to replace insect monitoring activities by growers and fieldmen in individual fields.