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White Mold and Gray Mold of Snap Beans

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White mold (*Sclerotinia sclerotiorum*) and gray mold (*Botrytis cinerea*) cause heavy losses in some fields of snap beans in the Pacific Northwest each year. Many other crops, such as lima beans, carrots, cabbage, and lettuce, also are attacked. Control of these diseases is difficult because the organisms are widespread, infection occurs under the crop canopy where it may not be seen, and growth of the molds depends on the weather.

Symptoms

In the early stages of disease development the symptoms of both molds are the same. Water-soaked spots develop on leaves, stems, and pods. These spots expand rapidly, causing a watery soft-rot. The fungi frequently attack the main stem at ground level, causing yellowing, wilt, and death of the entire plant.

When immediate death does not occur, the areas affected by white mold are covered with cottony white fuzz called the mycelium. White, irregularly shaped, hardened areas called sclerotia (see figure 1) form in the mycelium and inside the affected tissues. These hardened areas (sclerotia) quickly turn black in color. They are variable in shape and size, but most are the size of a small pea. The mycelium and sclerotia can occur on any part of the plant and often occur inside infected pods and in the lower stem.

The areas affected by gray mold (*Botrytis*) become covered with a gray to gray-brown mass of fungus conidia (seeds or spores of the organism). Sclerotia, when present, are very small and inconspicuous in gray mold. In contrast, the white mold organism produces masses of white mycelium and more numerous and large sclerotia.

Initial infection of healthy tissue by either of the molds frequently occurs where dying flower parts have stuck to other portions of the plant. Dead or dying flower parts are infected more readily than healthy tissue. The infected flower parts spread the fungus into the healthy tissue they contact.

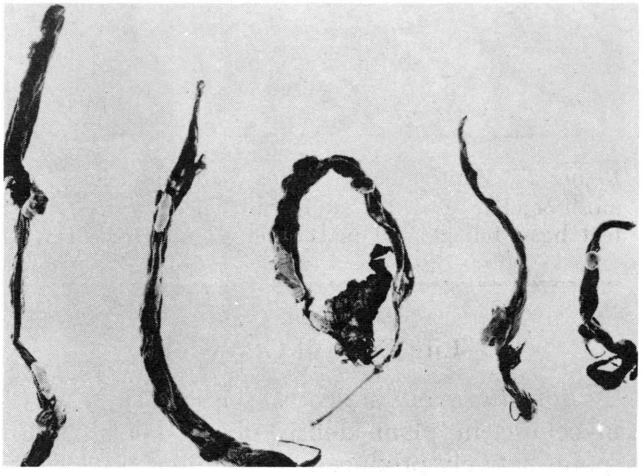

Figure 1. Five bean pods affected with bean white mold. Note white, cushionlike sclerotia. At maturity these sclerotia turn black.

Life Cycle of White Mold

The fungus overwinters as hard, black sclerotia in the soil. When weather conditions become mild and moist, infection can occur in either of two ways. The sclerotia of the fungus can germinate, form new mycelium, and infect any portion of the bean plant in or on the soil. This type of infection can occur in any type of weather if there is moist soil under the canopy of bean leaves. The second type of infection occurs when the sclerotia germinate and produce small mushroomlike growths called apothecia (see figure 2). The apothecia produce spores, which are forcibly ejected into the air. These spores are carried by wind currents and can cause infection of any above-ground part of the plant when sufficient moisture is present. Although the airborne spores can move considerable distances, most infections occur close to the apothecia. After infection, the fungus moves into uninfected tissue, producing white mycelium and sclerotia. In the fall the sclerotia return to the soil with the decaying plant. Tissue infected with white mold does not form airborne spores to cause new widespread areas of infection.

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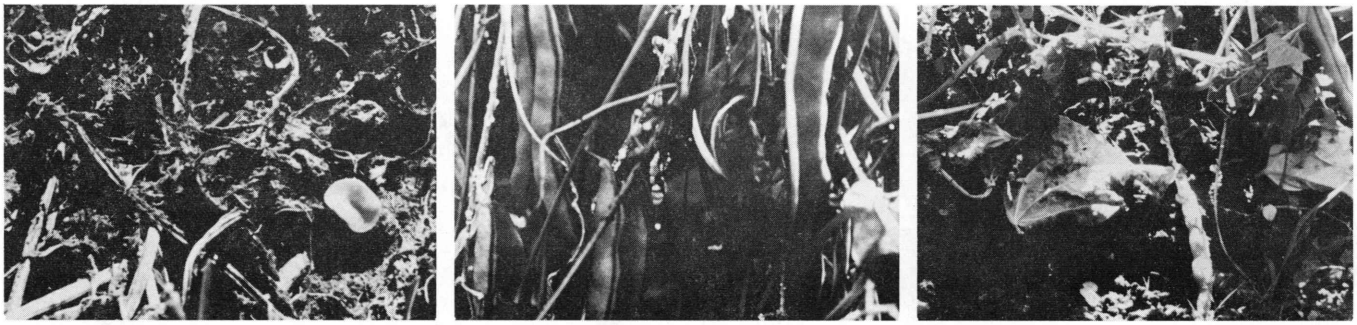

Figure 2. White mold on beans. Left: apothecia—small, mushroomlike growth that forcibly ejects spores that infect bean foliage and pods. Center: infected stems and pods. Right: a single bean pod covered with white sclerotia of bean white mold.

Life Cycle of Gray Mold

Botrytis overwinters as sclerotia in the soil, mycelium in plant debris of all kinds, and as spores actively produced year around on decaying plant material. Little is known of the role of *Botrytis* sclerotia in the disease cycle. Although the sclerotia of some species of *Botrytis* are known to produce apothecia, the apothecia do not play an important role in the field disease. The sclerotia, no doubt, serve as a resistant structure to allow the fungus to survive long, dry or extremely cold periods. Unlike white mold, tissue infected with gray mold can produce spores to cause new infections. Spores of the gray mold fungus are produced on decaying plant debris in every month of the year in Oregon. Therefore, spores are always available in the bean field awaiting enough moisture for infection. Although *Botrytis* is capable of direct penetration of beans, it usually enters fallen flower parts or organic debris in contact with the plant and then continues into the healthy tissue. The fungus can produce a new crop of spores in a few days, and the wind carries the spores to surrounding beans. As long as humidity is high or plants are wet, this cycle will continue.

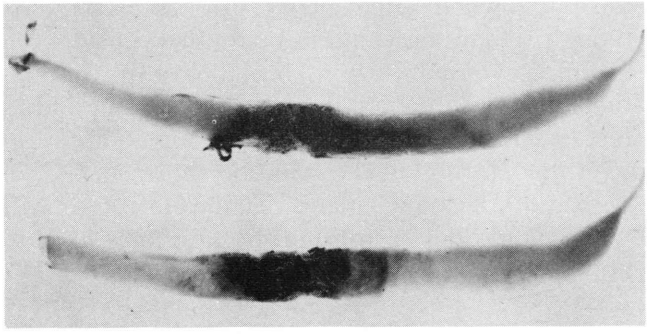

Figure 3. Two bean pods affected with gray mold. Note the gray spores and mycelium near the center of each lesion.

Effects of Weather on Molds

Weather appears to be the single most important factor in disease development of both the gray mold and the white mold. Both organisms need extremely high humidity or water to develop. Usually these diseases cause significant loss only in fields where sprinkler irrigation or rains have been followed by cloud cover. The disease cycle of both organisms continues in cool weather but disease develops more rapidly under warm conditions. Long periods of hot, dry weather temporarily arrest disease development.

Control

1. Arrange plantings so prevailing wind blows down the rows, reducing moisture levels in the soil and foliage canopy.

2. Rotate at least one year out of beans or other crops attacked by white mold.

3. Deep plowing will bury sclerotia.

4. Avoid frequent light irrigations and irrigations applied so late in the day that the foliage does not dry before dark.

5. Apply 1 pound actual Benlate (2 pounds 50 percent wettable powder) at 25 percent bloom. Under extreme disease conditions two applications of 1 pound actual per acre may be required, one at 25 percent bloom and one at full bloom. Do not apply on snap or dry beans within 14 days of harvest or on lima beans within 28 days of harvest.

6. In home gardens, space generously between rows and plants within the row to reduce humidity within the canopy.