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BOTRYTIS GRAY MOLD IN GREENHOUSE FLORAL CROPS

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The disease gray mold, caused by the fungus Botrytis cinerea, is the most commonly encountered disease of herbaceous ornamentals. It can affect almost every type or variety of floral crop, as well as many other types of plants. Depending on the host and the conditions under which the crop is grown, this disease can either be a common nuisance or an economic disaster.

Symptoms

Symptoms of gray mold vary depending on the host, the environmental conditions associated with the host and the plant's growth stage. In most cases, the fungus prefers to go after the soft, weakened or dead tissues on its host, such as buds, seedlings and locations where recent cuttings were made, but it can spread to stronger and healthier tissues such as the stem after initial infection. Therefore, symptoms may include pre- and post-emergence damping off, leaf spots, flower blights, bud rots, stem cankers, stem and crown rots, cutting rots and in extreme cases, plant death. Necrotic tissues are an excellent substrate for the prolific sporulation of the fungus, that when conditions of high relative humidity (at or above 85 percent) prevail, appears as a fuzzy gray mold (Figure 1).

Figure 1. *Botrytis cinerea*-infected petals on New Guinea impatiens. Note fuzzy spores. Image courtesy of Francesca Peduto Hand.

Damping-Off or Bed Rot

Damping-off due to Botrytis can occur on herbaceous ornamentals commonly propagated by seed, and it is prevalent when the relative humidity is high or when the growing medium is contaminated with the fungus. Infected seeds may fail to germinate, and young seedlings may

wilt or collapse at or near the soil line. Susceptible hosts include pansy, petunias, cineraria, cyclamen, exacum and snapdragon.

Leaf Spot and/or Blight

Leaf spots often appear when infected flower petals or other plant parts fall on the leaves. Small, water-soaked spots are frequently the initial evidence of the infection. These spots may coalesce rapidly and a large portion of the tissue becomes gray-brown (Figure 2). The pathogen can also invade damaged tissue on leaves that have marginal or tip burn. In this case, affected leaves develop characteristic triangular-shaped lesions (Figure 3).

Figure 2. *Botrytis cinerea*-infected leaf tissue of New Guinea impatiens. Note chlorotic areas and necrotic lesions. Image courtesy of Francesca Peduto Hand.

Figure 3. Gray mold symptoms on geranium leaf. Note v-shaped lesions. Image courtesy of Francesca Peduto Hand.

Flower Blights and Bud Rots

Symptoms of flower blight appear as tannish, irregular spots on the flower petals that may eventually coalesce into larger areas (Figure 4). In crops such as begonia, carnation, chrysanthemum, cyclamen, geranium, impatiens, marigold and petunia, the fungus may become established in the flower petals, and under ideal conditions, may move from the flower to the pedicel or peduncle and eventually to the stem (Figure 5). Flowers can also become infected in the bud stage. The buds turn brown and appear to be water-soaked. Infected buds fail to open and may sometimes abort.

Figure 4. Water-soaked lesions on pansy petals. Note coalescing necrotic lesions. Image courtesy of Francesca Peduto Hand.

Figure 5. Flower blight on geranium. Note brown, water-soaked look of petals. Spores can also be seen. Image courtesy of Francesca Peduto Hand.

Stem Canker and Cutting Rot

When the fungus infects a flower or leaf near its base of attachment to the stem, the disease can spread into the stem, causing sunken, discolored areas known as cankers. This symptom is most common in crops like roses, snapdragons and geraniums, among others. Cutting rot occurs when the fungus infects tissues of the plant after it has been damaged due to cutting.

Causal Agent and Disease Cycle

Botrytis cinerea is a ubiquitous pathogen with a very wide host range and can persist in the greenhouse year-round, on living or dead tissue, as mycelium (fungal hyphal tissue, visible as a white to gray colored growth), conidia (reproductive stage of the fungus visible as gray, dusty spores) or sclerotia (hardened fungal hyphal tissue visible as tiny, black, round balls). The fungus produces a large amount of spores that are dispersed in the greenhouse via air currents. Any activity in the greenhouse can trigger spore release. Under conditions of cool temperatures, relative humidity at or above 85 percent, little or no air circulation or free water on the leaf surface, the spores land on the plant surface, germinate and penetrate the host plant. The optimum temperature for spore germination is 72–77°F (22–25°C). Germinating spores rarely penetrate actively growing tissue directly. However, penetration of actively growing tissue can take place through wounds. Cutting stubs are particularly susceptible to gray mold infections. Symptoms will appear on infected plants within a few days. If left unchecked, the fungus will grow and sporulate, and the newly produced spores will be the source of infection for other hosts in the greenhouse. The fungus can also be a post-harvest problem, becoming established at temperatures of 32–50°F (0–10°C).

Disease Management

Botrytis gray mold is often considered a disease of bad management. Appropriate crop management techniques and manipulation of the greenhouse environment can reduce the impact of this disease, in most cases without the need of fungicide applications.

Cultural Practices

Sanitation practices before, during and after each cropping cycle are the first important steps to achieve good control. Plants with wounds should be removed from the greenhouse, as the wound is the perfect environment for the fungus to initiate the infection process. Petals falling from hanging basket plants may encourage the growth of the fungus on plants at ground level. Senescing flowers, leaves and infected plant material should be removed from the greenhouse so that they are not a source of inoculum for the rest of the house. Infected plant material should not be allowed to sit in trash cans within the house as the fungus will continue to grow and sporulate on the dead and dying tissue. Subsequent opening and closing of the trash cans will produce enough air movement to release spores out into the greenhouse.

Maintaining an environment within the greenhouse that will not permit the fungus to grow and sporulate is essential for control. To this extent, excellent control can be achieved by keeping the relative humidity below 85 percent. Proper plant spacing is important to allow better air circulation and to reduce relative humidity within the plant canopy. Formation of free moisture on plant surfaces should be avoided, so fans should be used to provide good air movement above the canopy. Overhead watering is discouraged, as the water droplets will cause the spores to

become airborne, allowing for further infections to occur.

Chemical Control

A variety of fungicides are available to control gray mold in the greenhouse. However, because some Botrytis populations have developed resistance to certain chemicals, it is recommended not to rely on the use of a single chemical or on multiple chemicals with the same mode of action (check label for FRAC group number). Fungicides with different modes of action can be mixed simultaneously or used in rotation so that the fungus does not develop resistance to one particular chemical. Contact your local OSU Extension educator for the chemical treatment that might be right for your plants.

Biological Control

Several biological control agents are also available and are known to be effective to control gray mold in the greenhouse. These include *Bacillus subtilis*, *Streptomyces lydicus*, *Streptomyces griscoviridis* and *Trichoderma harzianum*.

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