

DISEASES OF BEDDING PLANTS

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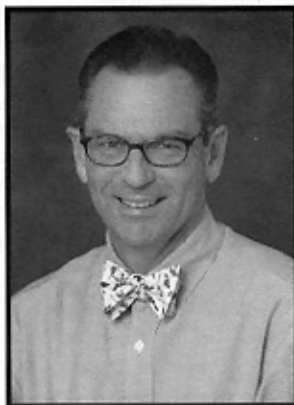
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As a grower of greenhouse bedding plants, one of your major concerns is the management of diseases. Plant pathogenic fungi, bacteria, and viruses are all microorganisms that are responsible for causing a variety of diseases in greenhouse bedding plants. Diseases caused by fungi are the most common but not necessarily the most important, and depending on the host, other pathogens such as bacteria and viruses have the potential to cause some of the most economically important diseases.

The purpose of this article is to familiarize the reader with some of the most common diseases associated with bedding plant production and provide the reader with information on methods used to control/manage these diseases in an economically equitable manner. The diseases will be covered based on the part of the plant they affect.

PLUG DISEASES

Diseases of plugs or seedlings can be divided into two types, preemergence diseases and postemergence diseases. Preemergence diseases occur prior to or at the time of seed germination. The most obvious symptom of this disease is that the seedlings never break the surface of the growing

medium and you have bare spots. Postemergence disease occurs after the seedling has grown above the medium surface and the seedlings have produced cotyledons or immature true leaves. The most obvious symptom associated with postemergence damping-off is that the seedlings wilt and subsequently collapse onto the growing media. In most cases, preemergence damping-off is caused by the same three plant pathogenic fungi: *Pythium* sp., *Rhizoctonia* sp., and *Thielaviopsis* sp. Many of the environmental conditions that favor the development of preemergence damping-off are similar for all three fungi.

Postemergence damping-off is usually caused by *Pythium* sp., *Rhizoctonia* sp., and *Botrytis* sp. Like preemergence damping-off, the environmental conditions that favor these pathogens are very similar.

Since all of the diseases that affect plugs also affect plants in the grow-on stage, we will cover them in detail as grow-on diseases. However, the control strategies apply to plugs as well.

ROOT AND CROWN ROT

PYTHIUM ROOT ROT

This is one of the most common diseases in the greenhouse. It is caused by the fungus *Pythium* sp. The fungus infects the root tips of the host, and if environmental conditions favorable for disease continue, the fungus moves progressively up the root and can cause a rot in the crown and the stem. Symptoms associated with *Pythium* root rot include wilt, lack of vigor, and nutrient deficiencies. Affected roots appear brown and mushy; in later stages, the whole root mass will be brown. Once the fungus has spread to the crown and into the stem, it may appear black in color and soft to the touch. *Pythium* stem infection is called black leg and indicates advanced stages of root rot. Growing plants in a well-drained medium that inhibits saturated conditions goes a long way in

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controlling this disease. Chemicals such as mefenoxam and the trifloxystrobin are some of the best in controlling this disease.

BLACK ROOT ROT

Black root rot is caused by the fungus *Thielaviopsis* sp. Some bedding plant species are more prone to be affected by black root rot than others. Bedding plants such as viola, pansy, vinca, and petunia are very prone to black root rot if grown under adverse environmental conditions. Plants infected with black root rot are stunted and sickly looking. Leaf yellowing is a common symptom. Infected roots will appear black and mushy. Plants stressed by pH and a salt imbalance are more prone to infection. Products containing thiophanate-methyl and triflumizole offer excellent control.

RHIZOCTONIA CROWN ROT

Crown rot of bedding plants caused by *Rhizoctonia* sp. is another disease associated with bedding plant production. This disease starts at the crown of the plant and works its way up the stem. The stem becomes soft and mushy, and the plant starts to wilt.

Eventually, the fungus completely encircles the stem and the plant dies. In most plants, the roots still appear healthy, but the crown will be rotted. Saturated media helps promote this disease. Chemicals such as azoxystrobin and thiophanate-methyl can control this disease.

VASCULAR WILTS

Vascular wilt diseases in bedding plants are caused by a variety of plant pathogens. The most common of these are the fungi *Fusarium* sp. and *Verticillium* sp., and the bacterium *Xanthomonas campestris* pv. *pelargonii* (Xcp). *Fusarium* and *Verticillium* infect a wide variety of bedding plants hosts, while Xcp infects only geraniums. Symptoms associated with vascular wilt diseases are very similar. Infected plants wilt under conditions of moisture stress, primarily during the heat of the day. If symptomatic plant stems are cut open to expose the vascular tissue, it will appear dark in color. This symptom is diagnostic for all of the vascular wilt diseases. *Fusarium* wilt is a common disease on cyclamen.

The incidence of *Fusarium* and *Verticillium* wilt is relatively low when compared to other bedding plant diseases, and they usually do not lead to a major economic disaster. Prevention is the best way to control vascular wilt diseases. Fludioxinil works well to control vascular wilt in cyclamen.

FOLIAR DISEASES

BOTRYTIS LEAF BLIGHT

Botrytis leaf blight or gray mold is the most common disease in the greenhouse. Botrytis blight is caused by the fungus *Botrytis cinerea*. It has a very wide host range, and can persist in the greenhouse year-round. The fungus produces a large amount of spores that move throughout the greenhouse via air currents. Under the right environmental conditions, the spores land on the plant surface, germinate, and penetrate



the host plant. The optimum temperature for spore germination is 72 to 77°F. Germinating spores rarely penetrate actively growing tissue directly. However, penetration of actively growing tissue can take place through wounds.

Symptoms of Botrytis blight vary depending on the host and the greenhouse environmental conditions. It is characterized by the production of leaf spots, flower blight, bud rot, stem canker, stem and crown rot, cutting rot, and damping-off. Fungal growth is characterized by the presence of fluffy, gray/brown mycelium that produces a cloud of spores if disturbed (Figure 1). Affected tissue is soft and brown, and sometimes has a water-soaked appearance. Maintaining an environment within the greenhouse that will not permit the fungus to grow and sporulate is essential. By keeping the relative humidity below 85 percent as well as maintaining good air circulation and adequate plant spacing, excellent control can be achieved. Fans should be used to provide good air movement above the canopy. Plants with wounds should be either protected with a fungicide or removed from the greenhouse, because a wound is the perfect opening for the fungus to initiate the infection process. Many fungicides are labeled for *Botrytis* sp. Products that contain azoxystrobin, chlorothalonil, enhexamid, and combination products such as thiophanate-methyl plus chlorothalonil all work well to control this disease.

POWDERY MILDEW

This disease is caused by a variety of different fungi. The disease is characterized by the white fluffy growth of the fungus on the leaves and stems of the plant. Powdery mildew is most prevalent when greenhouse conditions are cool and damp at night and sunny and warm in the day. If powdery mildew is a problem, change the environmental conditions to inhibit disease development. Good air movement and products containing azoxystrobin and piperidin work well to inhibit this disease.

BACTERIAL LEAF SPOT

Under conditions of high humidity and abundant moisture on leaf surfaces, bacterial leaf spot can be a problem. Most bedding plant bacterial leaf spots are caused by the bacterium *Pseudomonas* sp. Bacterial leaf spots are small, round, and water-soaked surrounded by a purple halo (Figure 2). If allowed to go unchecked, the leaf spots will coalesce and whole leaves will appear water-soaked and rotted. Disease spread can be inhibited by avoiding overhead watering or allowing the leaf surface to dry. Copper-based fungicides may slow down the spread of the bacteria from plant to plant.

LEAF ANTHRACNOSE

This common disease is caused by a variety of anthracnose-causing fungi, and it can be a significant problem on selected hosts. The disease is characterized by grayish to

black, target-like leaf spots primarily on older leaves. In many cases, these spots start at the margins of the leaves and move inward. Avoid extended periods of leaf moisture to help control anthracnose leaf spot. Products that contain mancozeb help control this disease.

VIRUSES

A wide variety of plant pathogenic viruses can infect bedding plants; however, only a few of them are of significant economic importance. Viruses such as tobacco mosaic virus (TMV), cucumber mosaic virus (CMV), and tobacco and tomato ringspot viruses (TRSV and ToRSV) are all viruses which can infect bedding plants – and depending on the host, can cause crop loss. Symptoms associated with these viruses include mosaic or yellow mottling, yellow ringspots, overall yellowing, and stunting of plants (Figure 3).

Of all of the plant viruses that infect bedding plants, the most severe are the viruses in the tospovirus group – impatiens necrotic spot virus (INSV) and tomato spotted wilt virus (TSWV). The host range of these two viruses is very wide and diverse. Symptoms associated with these viruses include, but are not limited to, yellow or necrotic (dead) leaf or stem spots, leaf mosaic, leaf and stem death, black leaf or stem spots, black ringspots, overall yellowing, severe stunting, and rapid death of some plants, particularly small plants (Figure 4).

INSV and TSWV are moved about the greenhouse by thrips, particularly Western flower thrips. If left unchecked, these two viruses can move rapidly through the greenhouse and cause severe damage. If thrips are a problem, they need to be controlled.

The best way to control INSV and TSWV is to exclude these viruses from the greenhouse. If you are planting seed or cuttings, or bringing in unfinished plants, be sure this material is purchased from a producer who can certify that the material is free from virus or disease. If you suspect that your plants are infected, be sure to have them tested.

Bedding plant disease control is a three-step process: prevention, detection, and control. If you rely on the first one, the other two may not be necessary.



Figure 1. Mass of *Botrytis* spores on wounded stem of geranium.

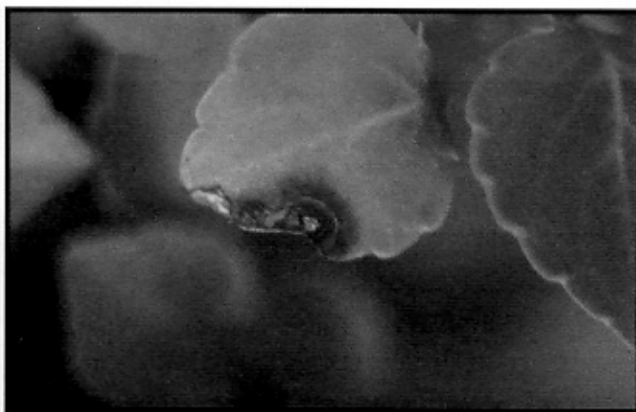


Figure 2. Bacterial leaf spot. Note halo.

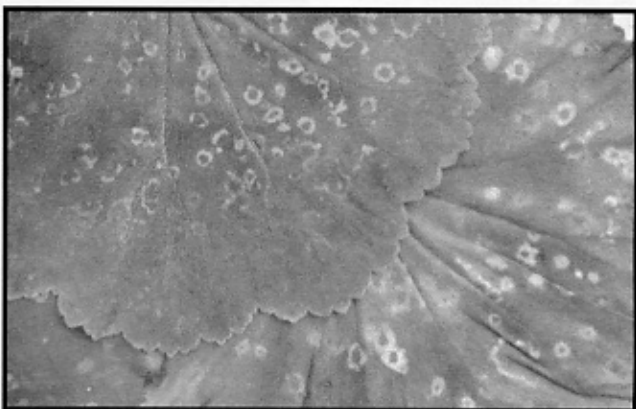


Figure 3. Ringspots on geranium caused by tobacco ringspot virus.



Figure 4. Black ringspots on impatiens caused by impatiens necrotic spot virus.