Poinsettias grown through the fall months for Christmas sales are vulnerable to destructive diseases from the time the cuttings are stuck into the rooting media until they are mature and ready for sale. A number of poinsettia diseases are favored by the same environmental conditions that promote propagation, making plant material at this stage particularly vulnerable. Diseases occurring in the later stages of production can be related to management issues or cultural problems, as well as the cooler temperatures needed for finishing. Some other diseases can be problematic to poinsettias at any phase of production. And finally, a phytoplasma organism found associated with poinsettias provides evidence that some host/pathogen relationships can actually be economically beneficial.

INTRODUCTION
Poinsettias grown through the fall months for Christmas sales are vulnerable to destructive diseases from the time the cuttings are stuck into the rooting media until they are mature and ready for sale. A number of poinsettia diseases are favored by the same environmental conditions that promote propagation, making plant material at this stage particularly vulnerable. Diseases occurring in the later stages of production can be related to management issues or cultural problems, as well as the cooler temperatures needed for finishing. Some other diseases can be problematic to poinsettias at any phase of production. And finally, a phytoplasma organism found associated with poinsettias provides evidence that some host/pathogen relationships can actually be economically beneficial.

FUNGAL DISEASES
PYTHIUM ROOT ROT
Symptoms
Pythium root rot causes a discoloration and decay of the small absorptive roots (feeder roots) (Figure 1). The outer layer of the root (cortex) is easily stripped off, leaving a narrow core of inner vascular tissue. Infections can extend up to the stem and result in a brown-colored canker. Rooted cuttings may be stunted and yellow with brown, decayed roots. The loss of root function in maturing plants produces yellowing, and wilting (Figure 2.) Plant death may occur, especially when plants are growing under stressful conditions.

Cause and Disease Development
Several different species of Pythium can invade roots that have been exposed to water stress or excess soluble salts. These fungus-like organisms, which are favored by wet conditions, are easily spread via droplets of contaminated water, as well as infested soil. Temperatures between 50°F and 86°F favor disease development.
**BLACK ROOT ROT**

**Symptoms**
Infected roots initially show black dead tips and distinct black bands or lesions that contrast sharply with the white, healthy portions of the root (Figure 3). Eventually the entire root system blackens as the disease progresses. Root dysfunction leads to stunting, poor growth of plants, and wilting. Leaves may turn yellow and drop.

**Cause and Disease Development**
The causal fungus, *Thielaviopsis basicola*, has a wide host range and can infect a number of other greenhouse and field crops. Commonly infected greenhouse ornamentals besides poinsettia include holly, pansy, and petunia. This disease is favored by cool temperatures and high soil pH. Black root rot symptoms usually appear late in the poinsettia production cycle.

**RHIZOCTONIA ROOT AND STEM ROT**

**Symptoms and Signs**
The lower stems and roots of cuttings and young plants can become infected. Stem lesions developing at the stem base are dry, brown, and shrunken (Figure 4). The infected plant roots may show individual brown lesions or they may be entirely brown, depending on the level of infection. Resulting top symptoms include yellowing, wilting, stunting, and defoliation. A brown fungal mat may cover the infected plant tissue and nearby soil surface (Figure 4).

**Cause and Disease Development**
This root and stem rot disease is caused by the common soil-borne fungus *Rhizoctonia solani*. It is spread from plant to plant via infested soil present on contaminated benches, pots, and tools. Conditions favoring disease development include planting too deeply and injuring the stem while planting. Soluble salts injury can also predispose plants to infection. Cuttings and mature plants are the most vulnerable to infection.

**SCAB**

**Symptoms and Signs**
Diseased leaves develop small, raised blister-like tan or brown circular spots that may expand to dead blotches (Figure 5); yellowing and leaf drop follow. Gray to tan lesions appear on stems (Figure 6) and petioles. A purple or red border may surround these infection sites. Later, fungal growth and sporulation in the center of the lesions gives them a velvety brown appearance. Young, diseased stems may become visibly elongated compared to healthy stems.
**Cause and Disease Development**

Also known as spot anthracnose, poinsettia scab is caused by the fungus *Sphaceloma poinsettiae*. High humidity and wet conditions favor infection and disease development. Fungal spores are spread from plant to plant in splashing water.

**Botrytis Blight**

**Symptoms and Signs**

Tan to gray-brown blotches develop on bracts (Figure 7) while target spot lesions appear on the leaves (Figure 8) of mature plants. Damaged areas may be covered by the fuzzy gray growth (spores and mycelium) of the fungus. Because of this moldy growth, Botrytis blight is often called ‘gray mold’. Botrytis may also cause stem blight (Figure 9) on cuttings and plants, often at branch crotches. Stem cankers cause defoliation and death of the distal plant parts.

**Cause and Disease Development**

*Botrytis cinerea* causes one of the most common diseases of all greenhouse crops. It can be troublesome in all stages of poinsettia production. This fungus colonizes dead and senescing plant tissues, and then produces large numbers of spores which are easily carried from plant to plant via air currents and during handling. Water splash can also carry spores to susceptible tissues. Cloudy, moist conditions provide the ideal conditions for infections. Crowded plants and poor air circulation also promote disease development.

**Powdery Mildew**

**Symptoms and Signs**

The powdery mildew fungus causes yellow and brown spots to develop on susceptible leaves. Tell-tale patches of white fungal growth and spores may be evident on diseased leaves and bracts (Figure 10). This disease does not generally cause plant death, but it does make infected plants unmarketable.

**Cause and Disease Development**

Powdery mildew is caused by the fungus *Oidium* sp. Abundant spores are produced in the white fungal patches present on diseased tissues. These spores are easily moved from plant to plant via air currents and water splash. Powdery mildew appears first on crowded, shaded foliage. High humidity and moderate temperatures favor disease development; however infections do not require the presence of moisture on leaf or bract surfaces.
BACTERIAL DISEASES

BACTERIAL SOFT ROT

Symptoms
Infected cuttings become soft and mushy, generally starting at the base of the stem and moving upward. Rotting tissues turn brown and often have a disagreeable odor. When present in older plants, stem decay may result in lodging.

Cause and Disease Development
Bacterial soft rot is due to one or more species of *Erwinia*, most commonly *E. chrysanthemi* and/or *E. carotovora*. These wound pathogens are especially aggressive in the presence of soft, succulent cuttings, along with warm temperatures and high humidity. Older stems that have been wounded may be invaded by the soft rot bacteria. Under favorable conditions, bacterial soft rot can result in serious losses very quickly. The causal organisms are spread via contaminated tools, soil, potting media, plant debris, and water splash. Greenhouse insects can also carry the bacteria from plant to plant.

BACTERIAL CANKER

Symptoms
Initially, longitudinal water-soaked brown streaks form on plant stems (Figure 11) and water-soaked spots appear on the leaves. Enlarging stem lesions develop into cankers that crack and girdle the stem. As the disease progresses, cankered stems become defoliated and plant death follows.

Cause and Disease Development
Bacterial canker disease is caused by *Corynebacterium flaccumfaciens* and often appears on poinsettias in the latter stages of production. Warm, moist growing conditions favor disease development. The bacterium may be spread in splashing water, on hands, and on contaminated tools.

VIRAL AND PHYTOPLASMA DISEASES

POINSETTIA MOSAIC VIRUS

Symptoms
Scattered yellow spots appear on infected leaves. Some spots are angular and have necrotic centers (circled spot in Figure 12). Spots with necrotic centers could be confused with early scab infections. This virus may also cause mosaic, mottle, (Figure 13) and distortion of leaves and bracts.

Cause and Disease Development
Poinsettia mosaic virus (PnMV) is mechanically transmitted and mainly spread via hands and tools. The symptoms are more evident on poinsettias grown at cooler temperatures (between 61°F and 68°F), while plants grown at warmer temperatures (between 75°F and 82°F) may appear symptomless.

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*Figure 11. Brown, elongated bacterial stem canker lesions.*

*Figure 12. Yellow spotting due to Poinsettia Mosaic Virus infections.*

*Figure 13. Mottling and mosaic due to Poinsettia Mosaic Virus.*
Poinsettia Branch-inducing Phytoplasma

Symptoms and Cause
Since the 1920s poinsettia cultivars have been selected for the desirable traits of compact growth habit and free branching for multiple flowers (Figure 14). Fairly recently it was discovered that these characteristics so admired during the holidays can be attributed to a systemic phytoplasma infection rather than genetics. Phytoplasmas are important pathogens that have been associated with various detrimental symptoms in their hosts, including stem and branch proliferations (witches’ brooms).

The poinsettia branch-inducing phytoplasma (PoiBI), which appears to be related to the peach X-disease group of organisms, is the first reported phytoplasma inducing an economically advantageous trait. Researchers have been able to produce “healthy” poinsettias free of the phytoplasma. However, when the disease agent is removed, the plants no longer branch freely and they grow taller. Thus, a “healthy” poinsettia is actually a more spindly, taller plant with fewer flowers and less branching. These disease-free plants are in fact less desirable than those infected with the phytoplasma. As it turns out, the phytoplasma has helped growers breed multi-flowered holiday showpieces and generate over $350 million in revenues annually. More information on this topic is available from the American Phytopathological Society.

Disease Management
Disease control is best done through prevention using an integrated program involving sanitation, cultural control, and chemical fungicides.

Sanitation
Cleaning up and discarding diseased plant material is important for control of any greenhouse crop disease, and poinsettia is no exception. Disease-causing fungi and bacteria survive in plant debris from the previous crop, as well as in soil and water left on floors, benches, and equipment. Infectious microbes can also be brought into the greenhouse via diseased plant material, infested soil, irrigation water, and dirty potting materials.

Sanitize by doing the following:
- Remove pathogen-infested plant debris and soil from the greenhouse.
- Clean and disinfect the benches and equipment with a germicide.
- Root cuttings in well aerated, sterilized rooting medium.
- Transplant rooted cuttings into a sterilized soil mix.
- Regularly collect organic debris (such as shed leaves or bracts or declining plants and remove from the greenhouse).
- Pick off and destroy diseased leaves as they appear.
- Keep the water hose emitter from contacting the greenhouse floor.

Cultural practices
Crop management influences poinsettia diseases. The following practices can help reduce disease in the greenhouse:
• Reduce nitrogen fertilization in order to harden plants before taking cuttings.
• Inspect purchased cuttings and reject those that are diseased.
• Handle cuttings carefully and plant at the correct depth.
• Maintain optimum growing conditions.
• Monitor mineral nutrient levels regularly through soil testing. Common nutritional problems that cause infectious disease-like symptoms include low calcium compared to potassium and magnesium or calcium-ammonium antagonism (marginal bract spots); magnesium deficiency (interveinal leaf yellowing); and molybdenum deficiency (lower leaf yellowing, burning, and downward cupping).
• Avoid ammonium toxicity (lower leaves yellow with marginal burn) due to excess use of ammonium nitrate fertilizer, low soil pH, and overwatering.
• Watch for and correct soluble salts and overwatering/underwatering problems.
• Provide plant spacing that allows good air movement.
• Avoid splashing water on the foliage.
• Use greenhouse ventilation systems to maintain a low humidity.

**Chemical Control**
Fungicides applied preventively and regularly to poinsettias can help control many of the diseases; however, chemical applications must be combined with good sanitation and cultural practices. Many fungicides are used as soil drenches. Fungicide drenches should thoroughly wet the growing medium. Read and follow all label directions and restrictions. The following fungicides may be used for poinsettia disease control:

**BLACK ROOT ROT** — Banrot, Cleary’s 3336, Domain, Fungo, Medallion.

**BOTRYTIS GRAY MOLD** — Chipco 26019, Cleary’s 3336, Daconil 2787, Domain, Fungo, Exotherm Termil, Ornalin.

**POWDERY MILDEW** — AQ 10, Benefit, Chipco 26019, ConSyst, Cygnus, Duosan, Phyton 27, Pipron, Sunspray, SysTec 1998, Systhane, Terraguard, Triact, Zyban.

**PYTHIUM ROOT ROT** — Banol, Banrot, Subdue, Subdue Maxx, Terrazole, Truban.

**RHIZOCTONIA STEM AND ROOT ROT** — Banrot, Chipco 26019, Contrast, Medallion, Terrachlor, Terraguard.

**SCAB** — Compass, Duosan, Compass, Phyton 27, SysTec 1998, Systhane, Zyban.

**Disclaimer:** Fungicides listed here are not intended to be an endorsement to the exclusion of others that may be similar.

**ADDITIONAL RESOURCES**

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Photos courtesy of: Roberto Lopez, Purdue University (Figs. 1 & 2); Cheryl Kaiser, University of Kentucky (Fig. 3 & 11); Kimberly Chapman, Purdue University (Fig. 4); John Hartman, University of Kentucky (Figs. 5, 6, 7 & 9); University of Hawaii Extension (Fig. 10); University of Wisconsin Extension (Fig. 13); Mike Dyche, University of Georgia, Bugwood.org (Fig. 14); and unknown sources (Figs. 8 & 12)