POINSETTIA DISEASES AND THEIR MANAGEMENT

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Diseases and their management must be an integral part of a poinsettia production program. Diseases are a threat to a poinsettia crop from the establishment of stock to sale of finished plants. The management of the many diseases that occur on poinsettia (Table 1) require a totally integrated program that includes sanitation, cultural practices, environmental control and as a last resort, the proper use of pesticides.

Description of Major Poinsettia Diseases. The importance and control of each of the following diseases will be discussed for each phase of production: stock plants, propagation and finishing.

Table 1. Diseases of Poinsettia.

Common Name of Disease	Pathogen	Importance in N.C.*	Occurrence**
Stem and Crown Rot	*Rhizoctonia solani*	++++	S,P,F
Root Rot	*Pythium spp.*	++++	S,P,F
	Phytophthora parasitica	+	S,F
	Thielaviopsis basicola	+	F
Leaf Spot	*Alternaria euphorbiicola*	-	S
Bacterial Leaf Spot	*Xanthomonas poinsettiicola*	-	F
Bacterial Soft Rot	*Erwinia carotovora*	+++	P
Botrytis Blight (Gray Mold)	*Botrytis cinerea*	++++	S,P,F
Bacterial Canker	*Corynebacterium poinsettiae*	+	F
Crown Gall	*Agrobacterium tumefaciens*	-	S
Rust	*Uromyces euphorbiae f. poinsettiae*	-	F
Root Knot Nematode	*Meloidogyne spp.*	-	F
Scab	*Sphaceloma poinsettiae*	-	S,F
Crown Rot	*Sclerotinia sclerotiorum*	-	S,F
Watery Rot	*Rhizopus spp.*	++	S,P
Virus	Poinsettia mosaic virus	+	S,P,F
Wet Rot	*Choanephora cucurbitarum*	++	S,P
Greasy Canker	*Pseudomonas viridaflava*	-	S,F

*Relative importance in N.C.: (++++) most important; (-) very rare or does not occur.
**Stage of production: S = Stock plants; P = Propagation; and F = Finish.

Diseases Caused by Fungi

Rhizoctonia Stem Rot. This is one of the most important diseases on poinsettia as it kills plants in all stages of production (see Table 1). *Rhizoctonia solani* causes a light to dark brown water soaked lesion on the stem extending just above and just below the soil line. The lesion gradually expands until it encircles the stem. The lesion becomes slightly sunken and remains as a dry rot. Infection often begins during rooting and may kill plants before or after transplanting. If the disease progresses slowly, plants may not die until mid- to late-November.

Plants with stem rot may be stunted, lower may leaves abscise, upper leaves may be chlorotic and the leaf edge may curl upward along the midrib. If the disease progresses rapidly, the foliage wilts suddenly and plants fall over and die. In later stages of the disease, roots may also be discolored.

Development of Rhizoctonia stem rot is not affected by pH. Disease development increases as soil temperature is increased from 17 to 26°C (62–80°F). Soil moisture levels below 40% moisture holding capacity (MHC) are not favorable for Rhizoctonia stem rot and a MHC above 80% retards disease development.

Pythium and Phytophthora Root Rot. Root rot of poinsettia can be caused by *Pythium aphanidermatum, P. debaryanum, P. irregular, P. megalacanthum, P. oligandum, P. perniciorum, P. polymastum,* and *P. ultimum.* Poinsettia root rot is also caused by the closely related fungus *Phytophthora parasitica.* Disease severity may vary between the above species but the conditions for disease development and symptoms are quite similar. Root rot caused by these fungi may be the most common disease on poinsettia in North Carolina. It can occur at any stage of production but often shows up in November or early December.

The primary symptoms of root rot are badly rotted dark wet roots. The rot may affect stems to varying degrees depending upon the age of plant and upon cultural conditions. If

roots of very young succulent plants become infected, the pathogen may proceed up the stem several inches and cause the entire stem to become water-soaked, then turn dark brown to black. Stems may collapse at the soil line and fall over.

Infected plants can be stunted, have chlorotic leaves, and lower leaves abscise. Plants infected with Pythium or Phytophthora that survive the disease in early growth stages may bloom early or wilt, collapse, and die.

Pythium and Phytophthora root rot is favored by high soil moisture. Disease development may be reduced by lowering the media pH to 5.5 or below. Moderate to cool media temperatures are best for disease development for Pythium where as Phytophthora root rot is usually more severe under warm conditions. Pythium and Phytophthora root rot is also favored by high soluble salts.

Thielaviopsis Root Rot (Black Root Rot). This root rot disease is less common now than it was 30 to 40 years ago. This is probably due to the elimination of soil from media and to warmer growing temperatures. This disease has become more important over the past 4 to 5 years on pansy and vinca plugs. This raises concern about re-introduction of this fungus into greenhouses.

The above ground symptoms of Thielaviopsis root rot and Pythium root rot are very similar. Affected plants are stunted with badly rotted roots. Initial root symptoms are speckled light brown lesions. As the disease progresses, the root system may turn brown and later black. Longitudinal black cracks develop on lower portions of stems. These black cracks on the lower portion of rotting poinsettia stems infected with Thielaviopsis distinguish it from Pythium, Phytophthora and Rhizoctonia root rots.

Thielaviopsis root rot is favored by cool soil temperatures of 13 to 16°C (55–60°F). This root rot is most likely to develop late in the production cycle when plants are grown cool to retard flower development and intensify bract color. Disease development is favored by soil moisture holding capacity by 70% or higher. Thielaviopsis root rot is also favored by media pH of 5.5 or above.

Botrytis Blight or Gray Mold. Botrytis blight, commonly called gray mold, is caused by the fungus *Botrytis cinerea*. This is the most important disease on floral crops and it is also the most important above ground disease on poinsettias grown in North Carolina greenhouses. Botrytis blight can occur on poinsettia during all stages of production.

This fungus causes brown lesions on leaf stem or bract tissue. Infection and initial disease development almost always occur on wounded, weakened or dead tissue of leaves, stems or bracts. Healthy tissues that come in contact with diseased tissues almost always become infected. Lesions on bracts are initially located near margins and are minute in size. First they are light tan in color but become darker brown as the lesion expands. Latex may be exuded on the underside of leaf lesions. Under high humidity, Botrytis produces grayish brown spore masses over the surface of the rotting tissue. Millions of spores may be produced on each rotting lesion and each spore is capable of causing a new infection. Spores are easily dislodged and carried by air currents or splashing water to healthy plants.

Botrytis cinerea attacks over 200 hosts and is not host specific. Epidemics of Botrytis blight are favored by high relative humidity (85% or above) and free moisture on the plant surfaces. The fungus is active over a wide temperature range. Growing plants with very tight spacing, plants with dense foliar canopies, plants with excessive shade, and plants with very succulent growth are also favorable for disease development.

Scab. Scab or spot anthracnose is caused by the fungus *Sphaceloma poinsettiae*. Raised circular to elongated lesions from a few mm to one cm appear on stems and midribs of leaves. Lesions are usually light tan and often are

surrounded by a purplish-red margin. Occasionally, lesions coalesce resulting in the girdling and death of stems. Brown spots up to one cm appear on leaf blades. These are usually concave on the upper surface giving the leaf a puckered appearance. Severely affected leaves drop prematurely. A grayish-brown velvety layer of fungal growth (spores) may be found in the depressed spots on stems. Conidia are spread to healthy plants by splashing water.

Scab is a more common disease on poinsettias grown outside in Florida than it is under greenhouse production in North Carolina. Wild hosts outside the production areas in Florida are important sources of the pathogen.

Wet Rot. Wet rot caused by the fungus *Choanephora cucurbitarum* occurs on both stock plants and on cuttings under mist propagation. The pathogen is capable of killing plants in all stages of production.

The symptoms of wet rot on poinsettia plants are a soft, wet, mushy decay of leaves, petioles and stems. If the stems are green and actively growing, they become soft, wet, flaccid and wilt or droop before collapsing. If the stems are somewhat woody, only necrosis occurs. Small plants and rooting cuttings may be destroyed in only a few days when weather conditions are favorable for disease development. On large multi-stemmed stock plants, the fungus may kill the plant stem by stem.

The pathogen usually sporulates profusely on diseased plant parts, especially on stems. The fungus produces single celled sporangiophores (stalks), each bearing a cluster of black spores on the end. The sporangiophores are long and very abundant, giving the appearance of a coarse, hairy or "whiskery" growth. The spores can be spread by water, wind, movement of plants (cuttings), hands, knives and insects.

Under North Carolina conditions, this is primarily a disease of stock plants and cuttings under mist. This fungus attacks the flowers a wide variety of plants including squash, okra, petunia and hibiscus.

Alternaria Blight or Leaf Spot. A new leaf spot or blight disease of poinsettia caused by the fungus *Alternaria euphorbiicola* was first observed in Florida in 1984. Symptoms of this disease can be confused with bacterial canker or scab. This disease has not been reported in North Carolina.

Leaf infections initially appear as 1 to 3 mm diameter spots with tan centers, dark thin margins and a chlorotic halo. As spots enlarge, they often progress along lateral leaf veins. Spots enlarge to form irregular necrotic lesions, 25 mm across or larger. Leaves with several spots become chlorotic and abscise.

Spores of *Alternaria euphorbiicola* are air-borne and can survive dry periods to cause disease when moisture becomes available. Environmental conditions in outdoor production areas are more favorable for disease development than greenhouse conditions, presumably because of frequent prolonged periods of leaf wetness. Outdoor production and wild host sources of spores make this an important disease in Florida. It should be less important in North Carolina if growers start with disease-free plants and grow them in greenhouses using a watering system that keeps the foliage dry.

Diseases Caused by Bacteria

Bacterial Canker. Bacterial canker is caused by *Corynebacterium poinsettiae*. It is not as wide spread today as in the past, probably due to healthier rooted cuttings and use of watering systems that keep above ground plant parts dry.

The most prominent symptoms are water-soaked areas on the lower stem or narrow water-soaked streaks often extending several centimeters along branches. These lesions are associated with exuded droplets of latex that dry to form pale yellow or golden crusts. Infected plants frequently have malformed, small bracts, are stunted and retarded slightly in development. Under conditions of low moisture, marginal

wilting of leaves has been observed. Severely diseased branches may be girdled and die. Plants may grow out of visible symptoms yet retain internal low populations of the bacteria. Cuttings taken from these plants frequently show disease symptoms in later stages of production. In North Carolina, this disease is often seen in late stages of finishing.

The disease is spread by vegetative propagation of cuttings from apparently healthy plants. The bacteria can also be spread during pinching, by infested irrigation water, and on knives when taking cuttings.

Bacterial Soft Rot. Soft rot caused by the bacteria *Erwinia carotovora* and *E. chrysanthemi* is a common disease problem in North Carolina during and just after propagation. These bacteria are most likely to cause problems on succulent tissue, under hot wet conditions; wounded or bruised tissue is highly susceptible. Infected tissue becomes water soaked, and develops into a soft mushy rot. The disease can develop very rapidly on cuttings under mist. After propagation, *Erwinia chrysanthemi* causes chlorotic spots that rapidly coalesce forming large irregular chlorotic areas. Petioles turned black, shrivel and associated leaves wilt within a few hours. Chlorotic areas turned black, stems collapse and affected tissues become soft and water soaked.

Greasy Canker or Bacterial Stem Canker. Greasy canker caused by the bacteria *Pseudomonas viridaflava* has been reported from California and Florida. This bacterial disease appears as rapidly advancing oily or greasy canker associated with pruning wounds. Leaf spot bract and bud blight have also been observed.

This disease occurs at all temperatures as long as the relative humidity is high. Disease severity increases at higher temperatures (27–32°C or 80–90°F). Disease progress is arrested when relative humidity is reduced; infected tissue then becomes tan to brown and papery.

Control of Poinsettia Diseases.

Control of poinsettia diseases requires a total program starting with good planning before the plants arrive at the greenhouse and end with clean up after the last plant has been sold. Steps in a poinsettia disease control program include:

1. Do not carry any plants over from one season to the next.
2. Clean all benches where poinsettias will be grown.
3. Have clean pots and media available for potting.
4. Try to avoid any unnecessary wounding or bruising of the plants.
5. Purchase plants or cuttings from a reputable supplier.
6. Inspect the plants on arrival for any problems.
7. Try to grow plants as close to optimum conditions as possible to minimize stress.
8. Keep the relative humidity below 85% whenever possible.
9. Maintain temperatures below 90-95°F whenever possible.
10. Use a watering system that keeps the foliage dry.
11. Space plants properly to promote good air movement between the plants.
12. Have good horizontal air movement over the crop.
13. Try to prevent condensation on the plant surface during the night.
14. Chemical protection:
    (a) fungicides can help prevent root rot diseases and Botrytis blight
    (b) drench with the proper combination of fungicides on a preventative program for root rot (see Table 2)
    (c) repeat fungicide drenches monthly for root rot control
    (d) use sprays or fumigate as needed to control Botrytis blight
    (e) alternate fungicides for Botrytis control to avoid resistance.

Table 2. Some fungicides that can contribute to a total poinsettia disease control program based upon sanitation, sterilization, and cultural practices.

Common and trade name	Chemical	Comments
benomyl **Benlate**	methyl 1-(butylcarbamoyl)-2-benzimidazole-carbamate	Use as a drench against *Rhizoctonia solani* and *Thielaviopsis basicola* and as a foliar spray against *Botrytis cinerea.*
chlorothalonil **Daconil 2787** **Exotherm Termil**	tetrachloroisophthalonitrile	Use Daconil as a spray against *Botrytis* diseases. Exotherm Termil is heated to generate dust for greenhouse space treatment. Do not apply under slow-drying conditions.
metalaxyl **Subdue**	N-(2,6-Dimethylphenyl)-N-(methoxyacetyl)-alanine methyl ester	Specific for water mold. *Pythium spp.* and *Phytophthora spp.*
etridiazole **Truban**	5-Ethoxy-3-trichloromethyl-1,2,4-thiadiazole	Specific for *Pythium* and *Phytophthora* species.
etridiazole + thiophanate methyl **Banrot**	5-Ethoxy-3-trichloromethyl-1,2,4-thiadiazole + dimethyl 4,4-o-phenylenebis (3-thioallophanate)	Use as a drench against major root rot organisms.
PCNB **Terraclor**	pentachloronitrobenzene	Specific for *Rhizoctonia solani.* **NOT** effective against water molds. Good residual action.
Vinclozolin **Ornalin**	3-(3,5-dichorophenyl)-5-vinyl- 5-methyl-1,3-oxazolidine-2,4-dione	Specific for the control of *Botrytis* blight.

Fungicide recommendations often change from year to year. For the most current recommendations, consult the latest edition of the *North Carolina Agricultural Chemicals Manual.*