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www.canadanursery.com

Canada’s International Horticultural Trade Show & Conference
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Mid-America Horticultural Trade Show
www.midam.org

Mid-Atlantic Nursery Trade Show
www.mants.com

New England Grows Trade Show
www.negrows.com

Ontario Turfgrass Symposium
www.open.uoguelph.ca

Southwest Horticultural Trade Show & Conference
www.azna.org/tradeshow/index.html

The Farwest Show
www.farwestshow.com

Western Nursery & Garden Expo
www.westernexpo.com

Work Truck Show
www.ntea.com

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Environmental Protection Agency (EPA)
www.epa.gov

Occupational Safety and Health Administration (OSHA)
www.osha.gov

U.S. Dept. of Agriculture (USDA)
www.usda.gov

U.S. Small Business Administration (SBA)
www.sba.gov

USDA Animal and Plant Health Inspection Agency (APHIS)
www.aphis.usda.gov

USDA APHIS National Agricultural Pest Information System (NAPIS)
www.ceris.purdue.edu:80/napis/

USDA APHIS National Plant Board

**Diagnostic Labs**

Auburn U Plant Diagnostic Lab
www.aces.edu/department/imp/plantlab.htm

Cornell U Plant Disease Diagnostic Clinic
plantclinic.cornell.edu/

Iowa State U Extension Plant Disease Clinic
www.extension.iastate.edu/Pages/plantpath/pdcintro.html

Montana State U Plant Sciences & Plant Pathology
plantsciences.montana.edu

North Carolina State U Plant Disease and Insect Clinic
www.ces.ncsu.edu/depts/ent/clinic/index.html

Ohio State U Plant & Pest Diagnostic Clinic
www.ag.osu.edu/plantdoc/cweppdbp/index.php

Oklahoma State U Plant Disease and Insect Diagnostic Lab
plants.okstate.edu/Pddl/index.htm

Oregon State U Plant Clinic
www.bcc.orst.edu/Pddl/clinic.html

Purdue U Plant & Pest Diagnostic Lab
www.ppdld.purdue.edu/ppdl/

Rutgers Plant Diagnostic & Soil Testing Lab
aesop.rutgers.edu/~floriculture/diagnostic/diagnost.htm

Texas A&M Plant Pathology & Microbiology Diagnostics Lab
plantpathology.tamu.edu/index4.html

U of Florida Plant Disease Clinic
128.227.207.24/pdc/

U of Georgia Extension Plant Pathology
www.aces.uga.edu/Agriculture/plantpath/ephomep.html

U of Maryland Plant Diagnostic Laboratory
pest.umd.edu/PlantDiagnosticIntro.html

U of Mass Plant Pathology & Nematode Assay Lab
www.ppws.vt.edu/clinic/

Virginia Tech Plant Disease Clinic and Nematode Assay Lab
www.ppws.vt.edu/clinic/

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www.eetc.org

Irrigation Association
www.irrigation.org

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www.nbspa.org

National Truck Equipment Association
www.ntea.com

Outdoor Power Equipment Institute (OPEI)
opei.mow.org

Responsible Industry for a Sound Environment (RISE)
www.pestfacts.org

Turfgrass Producers International (TPI)
www.turfgrassiod.org

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www.anla.org

American Society of Irrigation Consultants (ASIC)
www.asic.org

Associate Landscape Contractors Association (ALCA)
www.alca.org

Canadian Nursery Landscape Association (CNLA)
canadanursery.com

Golf Course Superintendents Association of America (GCSAA)
www.gcsaa.org

National Arborist Association (NAA)
www.natiarb.com

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www.nawma.org

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February
Andrews, Bob; Dale, Don; Fogarty, Phil; Hall, Ron; Porter, Sue; Poulsen, Vicky; Riley, Shane; Rao, Balakrishna; Stahl, Jason

March
Hall, Ron; Harler, Curt; Hoopes, Bill; Neal, Joseph; Porter, Sue; Poulsen, Vicky; Rao, Balakrishna; Stahl, Jason; Van Haasteren, George; Witterschein, George

April
Baxendale, Fred; Bowens, Marc; Fech, John; Hall, Ron; Harler, Curt; Phillips, Leonard; Porter, Sue; Potter, Daniel; Poulsen, Vicky; Rao, Balakrishna; Stahl, Jason; Wilkinson, Hank

May
Ayliwar, Larry; Dale, Don; Fech, John; Hague, Doug; Hall, Ron; Harler, Curt; Porter, Sue; Poulsen, Vicky; Rao, Balakrishna; Stahl, Jason; Wilkinson, Hank;吴

June
Hall, Ron; Harler, Curt; Iorio, Larry; Nicolosi, Ralph; Porter, Sue; Poulsen, Vicky; Rao, Balakrishna; Stahl, Jason; Wilkinson, Harry; Witterschein, George

August
Andrews, Bob; Baxendale, Fred; Brakeman, Lynne; Fech, John; Gibson, Porter, Sue; Hall, Ron; Harler, Curt; Porter, Sue; Poulsen, Vicky; Rao, Balakrishna; Sharma, Yogita; Stahl, Jason; Weiss, Daniel; Witterschein, George

September
Dale, Don; Grunder, Marty; Hall, Ron; Harler, Curt; Porter, Sue; Poulsen, Vicky; Rao, Balakrishna; Stahl, Jason; Grunder, Marty; Hall, Ron; Harler, Curt; Porter, Sue; Poulsen, Vicky; Rao, Balakrishna; Stahl, Jason; Witterschein, George

October
Glover, Steven; Harler, Curt; Perrault, Mike; Phillips, Leonard; Porter, Sue; Poulsen, Vicky; Rao, Balakrishna; Sharma, Yogita; Stahl, Jason; Weiss, Daniel; Witterschein, George

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Contact vs. systemic fungicides

Contact fungicides are an older type of fungicide also known as protectants that intercept a fungus and prevent it from attacking or getting inside a grass plant. They don't penetrate plant tissues but inhibit fungi by interfering with the growth and development of fungi in a number of ways, i.e., multiple site inhibitors. This creates a very low risk that fungal resistance will develop.

For a fungus to develop resistance, it needs to change its DNA. But contact fungicides are toxic to many different fungi, including many non-target fungi that are beneficial to your turf, and they must be applied frequently.

Systemic fungicides "move" once applied to the turf and redistribute inside the plant. Some fungicides are locally systemic; meaning they only move a few cells away from the point of entry. A carrier is a material upon which the active ingredient is loaded, for the application and the carrier itself can have fungicidal activity and can greatly affect how the active ingredient reacts and enters a plant.

Generally systemic fungicides require 3 to 5 days to become fully effective. To be effective, the disease severity at the time of application must be low, so it is important to scout your turf and look for the start of disease. — Hank Wilkinson

### CONTACT FUNGICIDES

<table>
<thead>
<tr>
<th>Common name</th>
<th>Trade name</th>
<th>Chemical class</th>
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<tbody>
<tr>
<td>captan</td>
<td>Captan</td>
<td>carboximide</td>
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<td>nitrile</td>
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<td>etridiazole (ethazole)</td>
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<td>triazole</td>
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<tr>
<td>mancozeb</td>
<td>Fore, Manzate</td>
<td>ethylene bis-dithiocarbamate</td>
</tr>
<tr>
<td>PCNB (quintozene)</td>
<td>Turfcide, Terraclor</td>
<td>chlorinated aromatic</td>
</tr>
<tr>
<td>thiram</td>
<td>Spotrete</td>
<td>dithiocarbamate</td>
</tr>
</tbody>
</table>

a Also known as “protectant” fungicides. Contact fungicides remain on plant surfaces and don’t penetrate into tissues. All are multi-site inhibitors and have low risk for supporting fungal resistance development.
b Purported to have some systemic activity.

COURTESY OF R.T. KANE AND H.T. WILKINSON

Why fungicides fail in ornamentals

By Bal Rao, Ph.D

Generally, fungicides fail because of the conditions to which they’re exposed. Unreasonable expectations can also cause someone to call a fungicide application a failure. By following label specifications and using the process of elimination, you should be able to narrow down or identify the cause(s) of disease management failures. This will help you develop effective disease management strategies and correct or improve future failures.

Some of the following factors may be responsible for poor disease management on ornamentals.

- Not following label specifications
- Not knowing the disease or plants well through improper identification or not understanding resistance, plant sensitivity, disease characteristics or pathogen life cycle.
- Product failure due to improper selection, slow activity, low concentration, failure to penetrate surface, solvent causing phytotoxicity, product age or photodegradation or other breakdown, incompatibility of products, limited activity, short residual effect, label limitations or heavy disease pressure.

- Misunderstanding treatment methods by miscalculating active ingredient, improper or faulty mixing/cleaning, failure to add surfactant or other agents, failure on application, failure to water in, improper equipment or calibration, no follow-up applications, poor plant uptake, rain wash-off, wind drift, soil conditions, improper storage.
- Poor timing in application related to pathogen’s life cycle, degree days, extended cool and moist periods favoring disease developments, activity after residual is gone or multiple flushes of pathogen growth.

— The author is Manager of Research and Technical Development at The Davey Tree Expert Co., Kent, OH.
### Systemic Fungicides Grouped by Chemistry and Mode of Action

<table>
<thead>
<tr>
<th>Common name</th>
<th>Trade name</th>
<th>Mode of action</th>
<th>Resistance risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>(benzimidazoles):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>benomyl</td>
<td>Tersan 1991*</td>
<td>mitotic poison (SSI)</td>
<td>high</td>
</tr>
<tr>
<td>thiophanates</td>
<td>Fungo, Cleary 3336</td>
<td>mitotic poison (SSI)</td>
<td>high</td>
</tr>
<tr>
<td>(phenylamide):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>metalaxyl</td>
<td>Subdue, Apron</td>
<td>RNA synthesis inhibitor</td>
<td>high</td>
</tr>
<tr>
<td>mefanoxam</td>
<td>Subdue MAXX</td>
<td>RNA synthesis inhibitor</td>
<td>high</td>
</tr>
<tr>
<td>(1,2,4-triazoles):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cyproconazole</td>
<td>Sentinel*</td>
<td>demethylase inhibitor</td>
<td>moderate</td>
</tr>
<tr>
<td>mycobutanil</td>
<td>Eagle</td>
<td>DMI</td>
<td>moderate</td>
</tr>
<tr>
<td>propiconazole</td>
<td>Banner</td>
<td>DMI</td>
<td>moderate</td>
</tr>
<tr>
<td>tebuconazole</td>
<td>Lynx</td>
<td>DMI</td>
<td>(expmtl)</td>
</tr>
<tr>
<td>triadimefon</td>
<td>Bayleton</td>
<td>DMI</td>
<td>moderate</td>
</tr>
<tr>
<td>triticonazole</td>
<td>Triton</td>
<td>DMI</td>
<td>(expmtl)</td>
</tr>
<tr>
<td>(pyrimidinemethanol):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fenarimol</td>
<td>Rubigan</td>
<td>DMI</td>
<td>moderate</td>
</tr>
<tr>
<td>(strobilurins):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aoxystrobin</td>
<td>Heritage</td>
<td>respiration inhibitor</td>
<td>moderate</td>
</tr>
<tr>
<td>kresoxim-methyl</td>
<td>Experimental</td>
<td>cytochrome bc complex</td>
<td>moderate</td>
</tr>
<tr>
<td>trifloxystrobin</td>
<td>Compass</td>
<td>in mitochondria</td>
<td>moderate</td>
</tr>
<tr>
<td>(dicarboximides):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iprodione</td>
<td>Chipco 26019, GT</td>
<td>not well known</td>
<td>moderate</td>
</tr>
<tr>
<td>vinclozolin</td>
<td>Vorlan, Curalan</td>
<td>not well known</td>
<td>moderate</td>
</tr>
<tr>
<td>(benzamide):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flutolanil</td>
<td>Prostar</td>
<td>multi-site</td>
<td>low</td>
</tr>
<tr>
<td>(carbamate):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>propamocarb</td>
<td>Banol</td>
<td>membrane disruption MSI</td>
<td>low</td>
</tr>
<tr>
<td>(phosphonate):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fosetyl-aluminum</td>
<td>Aliette</td>
<td>indirect plant activity</td>
<td>low</td>
</tr>
</tbody>
</table>

(a) Some are single-site inhibitors (SSI), and a few are multi-site inhibitors (MSI). SSIs have a moderate to high risk of developing fungicide resistance.

(*) Systemic fungicides marked with an asterisk are no longer available.

COURTESY OF R.T. KANE AND H.T. WILKINSON
### KEY LANDSCAPE PLANTS AND THEIR DISEASES

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash (Fraxinus)</td>
<td>* Anthracnose, Black knot, Coccomyces leaf spot</td>
</tr>
<tr>
<td>Ivy, Boston (Parthenocissus)</td>
<td>* Black rot</td>
</tr>
<tr>
<td>Azalea (Rhododendron)</td>
<td>* Anthracnose, Black knot, Botrytis twig blight, Phomopsis twig blight</td>
</tr>
<tr>
<td>Crabapple (Malus)</td>
<td>* Anthracnose, Anthracnose, Black knot, Powdery mildew, Root rot</td>
</tr>
<tr>
<td>Lilac (Syringa)</td>
<td>* Anthracnose, Anthracnose, Black knot, Powdery mildew</td>
</tr>
<tr>
<td>Cherry (Prunus)</td>
<td>* Anthracnose, Anthracnose, Black knot, Powdery mildew</td>
</tr>
</tbody>
</table>

### HOW TO MANAGE WOODY ORNAMENTALS AND THEIR DISEASES

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Disease</th>
<th>Suggested Control Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arborvitae (Thuja)</td>
<td>Black knot, Botrytis blight</td>
<td>Prune</td>
</tr>
<tr>
<td>Catalpa (Catalpa)</td>
<td>Black knot</td>
<td>Prune, Verticillium wilt</td>
</tr>
<tr>
<td>Boxwood (Buxus)</td>
<td>Bacterial leaf spot</td>
<td>Prune, Bacterial leaf spot</td>
</tr>
<tr>
<td>Catalpa (Catalpa)</td>
<td>Leaf spots</td>
<td>Prune, Powdery mildew</td>
</tr>
<tr>
<td>Chestnut (Castanea)</td>
<td>Blight</td>
<td>Prune, Bacterial leaf spot, Powdery mildew</td>
</tr>
<tr>
<td>Cotoneaster (Cotoneaster)</td>
<td>Scab</td>
<td>Prune, Powdery mildew, Powdery mildew, Scab</td>
</tr>
<tr>
<td>Crabapple (Malus)</td>
<td>Cinnamon leaf rust</td>
<td>Prune, Powdery mildew, Powdery mildew, Scab</td>
</tr>
<tr>
<td>Dogwood (Cornus)</td>
<td>Anthracnose, Black knot</td>
<td>Prune, Powdery mildew, Powdery mildew, Scab</td>
</tr>
</tbody>
</table>

**ABBREVIATIONS**

- **BSp**: Begin spray schedule-discontinue when weather dries
- **CSp**: Continue spraying if wet-discontinue when weather dries
- **D**: Apply soil drench fungicides
- **F**: Fumigate before planting
- **I**: Irrigate to prevent drought stress
- **NT**: No treatment required
- **P**: Prune
- **R**: Remove infected plant
- **X**: Excise infected plant

**Visit our web site's "This Month's Features" page (www.landscapemanagement.net) to see a more comprehensive list of woody ornamentals and their diseases.**