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Fungicides for Control of Turfgrass Diseases

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Many new fungicides have become available to professional turfgrass managers in the past few years, increasing the number of products available for control of many common diseases. At the same time, several popular fungicides and fungicide formulations have been removed from circulation, especially for use on home lawns. Fungicide options for homeowners are limited.

Systemic Fungicides

Fungicides may be grouped into two main categories: contact fungicides and systemic fungicides. Systemic fungicides are absorbed into turfgrass plants and will kill fungi that attempt to invade plants containing the fungicide.

Systemic fungicides generally move upwards from the roots toward the leaves. For this reason they are also called “acropetal (towards the top of the plant) penetrants.” Unlike many systemic herbicides, the majority of systemic fungicides are not able to travel down from the leaves to the roots. This means that in order to get these fungicides inside roots, it is necessary to water them into the soil where they can be absorbed by the roots. The only exceptions to this rule are the phosphite fungicides, which do move downwards from the leaves to the roots.

Systemic fungicides are useful against a variety of diseases, and are the only class of fungicides that will control root-infecting diseases. Because these fungicides are absorbed into the plant, they are a good choice for preventive fungicide applications and

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tend to have a longer period of residual activity than contact fungicides, typically 14-28 days.

Table 1 lists common systemic fungicides for turfgrass.

Contact Fungicides

Unlike systemic fungicides, contact fungicides are not transported through a plant's vascular system. They will not move from the roots to the leaves or vice versa. Contact fungicides provide a protective barrier on the leaf. Fungi that land on the leaf are killed before they can infect the plant. The more complete the barrier, the better the fungicide will work. Good coverage is critical when using a contact fungicide. The leaf should be coated on both sides for the best protection.

Since the barrier is disrupted by rainfall, UV light, mowing and other factors, contact fungicides must be reapplied more often than systemic fungicides. Five to 14 day intervals between sprays with contact fungicides are common. For best results with contact fungicides, mow and irrigate before, not after, applying these fungicides.

Some contact fungicides will move slightly within a leaf. Such fungicides are called "local penetrants." However, these fungicides still are not true systemics and will not move long distances in the plant.

It is important to remember that even though systemic fungicides can be absorbed into and move throughout a plant, they also have activity as contact fungicides. Therefore, good spray coverage will give better results no matter what fungicide is used.

Table 2 lists common contact fungicides for turfgrass.

Choosing the right fungicide

To choose the right fungicide for the job, an accurate diagnosis of the disease problem is critical. Contact your Extension plant disease diagnostic laboratory for assistance if necessary.

Systemic fungicides will be needed to treat root diseases, such as take-all patch, spring dead spot, bermudagrass decline and fairy ring. Only systemic fungicides, watered in and absorbed by the roots, will protect turf from root infection. Contact fungicides cannot create a barrier in the soil.

Either contact or systemic fungicides may be used to treat foliar diseases such as dollar spot, leaf spot, rust, or brown patch.

Intensively managed turf, such as on golf courses or high-profile athletic fields, may require the intelligent use of fungicides as preventive applications when environmental conditions favoring disease are present or forecasted. On home lawns and other turf that is not under as much stress, diseases are often not a routine problem if the turf is managed well. In those situations, fungicide use can be limited to curative applications only in areas where damage does occur.

Table 3 lists fungicides that are labeled for use on some common turfgrass diseases. Please note that this table is not a list of specific recommendations; see your current state recommendations publication for the most current information.

The special case of *Pythium*

Pythium is a special case in turfgrass diseases. Although it looks like any other fungus, *Pythium* is actually so different from the other fungi that cause turf diseases that most fungicides will not kill it. It is doubly important to get an accurate disease diagnosis when you suspect *Pythium* diseases, as different fungicides will need to be used. Most of the *Pythium* fungicides do not kill other fungi, and vice versa. An exception is the strobilurin class of fungicides, which do have activity against both *Pythium* and other fungi.

Table 4 lists fungicides that are active against *Pythium*. Note that some are contact fungicides and some are systemic.

Fungicide resistance

Many of the newest fungicides, least toxic to humans, birds and fish, have extremely specific modes of action. They kill fungi by targeting specific enzymes or biochemical processes. Although this means that the newest generation of fungicides can be used in low amounts and are much safer, there is also a greater danger of resistance building up to fungicides with very specific modes of action.

Take note of the chemical or mode of action family that a fungicide belongs to, and try not to continually use the same fungicide, or two fungicides in the same family, over and over again. Over time, this may lead to fungi developing resistance. Instead, try to rotate between chemical families and modes of action.

Fungicides in an IPM program

Remember that fungicides should be only one part of a disease management program. Turf diseases are heavily influenced by management practices such as mowing height, irrigation practices, fertilization amount and scheduling, aerification, and thatch control. Some turfgrass species are more resistant to some diseases than others, and some varieties of the same species are resistant to specific diseases.

Contact your local Extension office for advice on how to keep a healthy lawn, and you will reduce the amount of disease as well. The best defense against lawn diseases is a healthy stand of turfgrass that is not under excessive stress.

Table 1. Common **systemic** fungicides used in turfgrass

COMMON NAME	SOME TRADE NAMES*	CHEMICAL FAMILY / MODE OF ACTION	COMMENTS
Benomyl	Benomyl, Tersan	Benzamidazole	Broad spectrum of control. Upwardly systemic. Resistance reported
Thiophanate-methyl	Cleary's 3336, Cavalier, Fungo, Proturf Systemic Fungicide, Scott's Lawn Fungus Control	Benzamidazole	See Benomyl. Some resistance reported
Fenarimol	Rubigan	Sterol inhibitor (DMI)	Broad spectrum, upwardly systemic. All DMIs are much better in preventative than curative applications. Some resistance reported. Can injure turfgrass if applied in hot weather.
Propiconazole	Banner, Banner MAXX	Sterol inhibitor (DMI)	See above
Triademefon	Bayleton, Bayer Advanced Lawn Fungus Control	Sterol inhibitor (DMI)	See above
Myclobutanil	Eagle, Golden Eagle, Spectracide Immunox	Sterol inhibitor (DMI)	See above
Azoxystrobin	Heritage	Strobilurin	Upwardly systemic. Broad spectrum, including activity against <i>Pythium</i> . Not active against dollar spot.
Pyraclotrobin	Insignia	Strobilurin	Similar to Heritage, but better activity against dollar spot.
Flutolanil	ProStar	Benzanilide	Upwardly systemic. Has some activity against fairy ring fungi. Not active against dollar spot
Boscalid	Emerald	Anilide	Dollar spot and bentgrass dead spot on golf courses only

*Not an exhaustive list of trade names.

Table 2. Common **contact** fungicides used in turfgrass.

COMMON NAME	SOME TRADE NAMES*	CHEMICAL FAMILY / MODE OF ACTION	COMMENTS
Chlorothalonil	Daconil, Manicure, Thalonil	Benzonitrile	Little if any resistance to chlorothalonil has been reported in fungi. Use on home lawns restricted.
Mancozeb	Fore, Mancozeb, Dithane	Dithiocarbamate	Broad spectrum of control
Iprodione	Chipco 26019, Chipco 26GT, Proturf Fungicide X	Dicarboximide	Local penetrant. Broad spectrum of control
Vinclozolin	Vorlan, Touche, Curalan	Diacarboximide	See iprodione. Some vinclozolin and iprodione products are no longer labeled for use on residential turfgrass.
PCNB	PCNB, Terraclor, Defend, Scotts FFII	Aromatic Hydrocarbon	May be locally systemic.
Trifloxystrobin	Compass	Strobilurin	Local penetrant
Fludioxonil	Medallion	Phenylpyrrole	Single-site mode of action.
Polyoxin-D	Endorse	Antibiotic	For brown patch and large patch only.

*Not an exhaustive list of trade names.

Table 3. Fungicides labeled for control of various diseases. Please note that these are not specific recommendations. Consult your state turfgrass pest control handbook for up-to-date recommendations. Always obtain a reliable disease diagnosis and read and follow label directions carefully.

DISEASE	PATHOGEN	SUSCEPTIBLE TURFGRASSES	FUNGICIDES
Brown Patch and other <i>Rhizoctonia</i> diseases	<i>Rhizoctonia</i> species	TALL FESCUE ZOYSIAGRASS CENTIPEDEGRASS ST. AUGUSTINEGRASS Bermudagrass Ryegrass	Benomyl, Chlorothalonil, Fenarimol, Fludioxonil, Iprodione, Propiconazole, Mancozeb, Myclobutanil, PCNB, Polyoxin-D, Thiram, Thiophanate-methyl, Azoxystrobin, Trifloxystrobin, Pyraclostrobin Triademifon. Tank mixing useful
Rust	<i>Puccinia</i> and <i>Uromyces</i> species	ZOYSIAGRASS BLUEGRASS Bermudagrass St. Augustinegrass Ryegrass Fescue	Mancozeb, Propiconazole, Cyproconazole, Chlorothalonil, Triademifon, Fenarimol, Myclobutanil, Trifloxystrobin
Anthracnose	<i>Colletotrichum graminicola</i>	BLUEGRASS Bentgrass	DMIs, Thiophanate-methyl, Azoxystrobin, Pyraclostrobin
Leaf Spot	Various, including <i>Dreschslera</i> , <i>Bipolaris</i> , <i>Curvularia</i> spp. Also called “ <i>Helminthosporium</i> ”	BLUEGRASS BENTGRASS Tall Fescue Ryegrass St. Augustinegrass Zoysiagrass Bermudagrass Centipedegrass	Iprodione, Chlorothalonil, Fludioxonil, Mancozeb, Vinclozolin, PCNB, Azoxystrobin, Myclobutanil, Pyraclostrobin, Boscalid, Mancozeb Tank mixes
Dollar Spot	<i>Sclerotinia homeocarpa</i>	BERMUDAGRASS BENTGRASS Zoysiagrass Centipedegrass Tall Fescue Ryegrass	Benomyl, Chlorothalonil, Iprodione, Vinclozolin, Fenarimol, PCNB, Propiconazole, Thiophanate-methyl, Thiram, Triademifon, Myclobutanil, Pyraclostrobin, Boscalid Tank Mixes
Gray Leaf Spot	<i>Pyricularia grisea</i>	ST. AUGUSTINEGRASS RYEGRASS Tall Fescue	Thiophanate-Methyl, Trifloxystrobin, Azoxystrobin, Propiconazole, Chlorothalonil, Pyraclostrobin

DISEASE	PATHOGEN	SUSCEPTIBLE TURFGRASSES	FUNGICIDES
<i>Pythium</i> Blight	<i>Pythium</i> spp.	RYEGRASS BENTGRASS Bermudagrass Zoysiagrass St. Augustinegrass Zoysiagrass	Chloroneb, Ethazol, Metalaxyl, Mefanoxam, Propamocarb, Azoxystrobin, Fosetyl- Aluminum, Phosphites, Pyraclostrobin
Fairy Ring	Various	ALL	Flutolanil Very difficult to control with fungicides
Algae	Various	ALL	Chlorothalonil, Mancozeb, Maneb
Root Diseases Including : Spring Dead Spot Bermudagrass Decline Take-All Patch	Various	ALL	Azoxystrobin, Pyraclostrobin, DMIs. Water in well. Fungicides will not often give good control. Cultural controls such as nitrogen fertility management, soil pH management, etc. are often as effective as fungicides.

Table 4. Various fungicides labeled for the control of *Pythium*, in various chemical families.

COMMON NAME	SOME TRADE NAMES	COMMENTS
Chloroneb	Teremec SP, Proturf Fungicide II	Contact fungicide; not systemic
Ethazol	Koban, Terrazol	Contact fungicide; not systemic.
Metalaxyl	Subdue 2E, 2X	Upwardly systemic. Some resistance reported.
Mefanoxam	Subdue MAXX	Upwardly systemic. Some resistance reported.
Propamocarb	Banol	Upwardly systemic.
Azoxystrobin	Heritage	Upwardly systemic.
Fosetyl-Aluminium	Prodigy, Aliette Signature, Signature,	Upwardly AND downwardly systemic. Reports of activity against fungi other than <i>Pythium</i> .
Phosphites	Alude, Magellan, Vital	Upwardly AND downwardly systemic. Reports of activity against fungi other than <i>Pythium</i> .