

Rust

[*Puccinia spp.*]

SYMPTOMS

Early symptoms include small, yellow flecks that develop on the leaves and stems. The flecks expand over time into raised pustules, orange or red in color, that rupture to release powdery masses of yellow, orange, or red spores. Infected plants become yellow and are more susceptible to environmental stress. Heavily infected areas become thin and exhibit clouds of orange dust (rust spores) when the foliage is disturbed. The rust pustules on infected leaves turn black during the fall in preparation for overwintering.



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rust blisters

Characteristic	Description
Host Grass Species	Kentucky bluegrass, tall fescue, St. Augustinegrass, zoysiagrass
Month(s) with symptoms	March to June, September to November
Stand Symptoms	irregular distribution across turf stand
Foliar Symptoms - Location/Shape	dieback from leaf tip, blighting of entire leaves, or no distinct leaf symptoms
Foliar Symptoms - Color	yellow or orange
Root/Crown Symptoms	none
Fungal Signs	blisters on leaves

Note: Still not sure if this is the right disease? The [Turfgrass Disease Identification](#) program may be helpful. Or consult the experts at the [Turf Diagnostics Lab](#). Check the TurfFiles [glossary](#) for definitions of unfamiliar terms.

FACTORS AFFECTING DISEASE DEVELOPMENT

Rust fungi survive the winter in living plant tissue from which new spores are produced in the spring. Spores produced in the spring, summer, and fall are spread by the wind, germinate on the leaves, and infect new tissue. Extended periods of leaf wetness are required for the spores to germinate and for the disease to develop rapidly.

Rust diseases are most severe in turf that is growing slowly due to adverse weather conditions or inadequate management. Low light intensity, inadequate fertilization, drought stress, and infrequent mowing encourage rust development.

CULTURAL CONTROL

Plant rust-resistant turfgrass varieties whenever possible to reduce injury from this disease. Select cultivars based on regional trials and University recommendations. When planting cool-season turfs, use blends and mixtures of multiple species and/or varieties whenever possible. Plant shade tolerant grasses and raise mowing heights in heavily shaded areas.

Prune trees and remove unwanted undergrowth to improve air movement and reduce prolonged leaf wetness. Mow the turf on a regular basis, removing no more than 30 to 40 percent of the foliage in one mowing. Collect and dispose of clippings taken from infected areas to slow the spread of rust.

Fertilize to meet the nutritional needs of the turf. Submit a soil sample for analysis on a regular basis and apply recommended amounts of phosphorus, potassium, and lime. Apply nitrogen based on University recommendations.

Use the [Turf Irrigation Management System](#) available on TurfFiles to schedule irrigation based on weather conditions and turf needs. Water deeply but infrequently to encourage deep rooting and reduce drought stress and extended periods of leaf wetness. Avoid watering the turf before sunset or after sunrise.

CHEMICAL CONTROL

Fungicides can be used on a preventative or curative basis for rust control. Susceptible turfs should be monitored regularly for rust development during periods of cool and cloudy weather.

Fungicide	Efficacy ⁽¹⁾	Resistance Risk ⁽²⁾	Class ⁽³⁾	Products ⁽⁴⁾
metconazole	++++	6	DMI	Tourney
propiconazole	++++	6	DMI	Banner MAXX, Kestrel, Kestrel MEX, ProPensity, Propiconazole, Propiconazole G-Pro, Propiconazole Pro, Savvi, Spectator, Strider
tebuconazole**	++++	6	DMI	Torque
triadimefon	++++	6	DMI	Bayleton, Granular Turf Fungicide, Systemic Fungicide
triticonazole	++++	6	DMI	Trinity, Triton
chlorothalonil + propiconazole**	++++	4	DMI + nitrile	Concert
chlorothalonil + propiconazole + fludioxonil**	++++	4	DMI + nitrile + phenylpyrrole	Instrata
azoxystrobin + propiconazole	++++	9	DMI + QoI	Headway
triadimefon + trifloxystrobin	++++	9	DMI + QoI	Armada, Tartan
azoxystrobin	++++	9	QoI	Heritage
fluoxastrobin	++++	9	QoI	Disarm, Disarm G
chlorothalonil + thiophanate-methyl**	+++	6	benzimidazole + nitrile	Spectro, ConSyst, Peregrine, Tee-1-Up, TM/C
mancozeb**	+++	3	dithiocarbamate	Fore, 4 Flowable Mancozeb, Dithane, Mancozeb DG, Pentathlon, Protect, Wingman
mancozeb + myclobutanil**	+++	4	dithiocarbamate + DMI	Manhandle
mancozeb + copper hydroxide**	+++	3	dithiocarbamate + inorganic	Junction
chlorothalonil**	+++	3	nitrile	Daconil, Chlorostar, Chlorothalonil, Echo, Legend, Manicure, Pegasus
thiram**	+	3	dithiocarbamate	Spotrete

Fungicide	Efficacy ⁽¹⁾	Resistance Risk ⁽²⁾	Class ⁽³⁾	Products ⁽⁴⁾
thiophanate-methyl	?	9	benzimidazole	3336, Fungo, Systec, T-Bird, T-Storm, Tee-Off, TM
flutolanil + thiophanate-methyl	?	9	benzimidazole + carboxamide	SysStar
iprodione + thiophanate-methyl**	?	9	benzimidazole + dicarboxamide	26/36, Dovetail, Fluid Fungicide
myclobutanil	?	6	DMI	Eagle, Myclobutanil
trifloxystrobin	?	9	QoI	Compass

** Not for application to residential lawns.

Footnotes:

(1) **Efficacy Codes:**

++++	excellent control when conditions are highly favorable for disease development
+++	good control when disease pressure is high, or excellent control when disease pressure is moderate
++	good control when disease pressure is moderate, excellent control when disease pressure is low
+	good control when disease pressure is low
0	does not provide adequate control under any conditions
?	cannot be rated due to insufficient data

(2) **Resistance Risk:**

- 1 Rotating and tank-mixing not necessary, but recommended to avoid potential side effects from continuous use of same chemical class.
- 2 Rotate to different chemical class after 3-4 applications; tank-mixing not necessary.
- 3 Rotate to different chemical class after 2-3 applications; tank-mixing not necessary.
- 4 Rotate to different chemical class after 1-2 applications; tank-mixing not necessary.
- 6 Rotate to different chemical class after 1-2 applications; tank-mixing with low or moderate risk product recommended.
- 9 Rotate to different chemical class after EVERY application; tank-mix with low or moderate risk product for EVERY application.

(3) Continual use of fungicides with similar control mechanisms (modes of action) can result in fungi that are resistant to some chemicals. Poor or ineffective disease control can be expected when this occurs. Managers can reduce the chances of this happening by mixing or alternating fungicides belonging to different chemical classes.

(4) Recommendations of specific chemicals are based upon information on the manufacturer's label and performance in a limited number of trials. Because environmental conditions and methods of application may vary widely, performance of the chemical will not always conform to the safety and pest control standards indicated by experimental data. When more than one brand name exists for an agricultural chemical, the name of brand that first came onto the market is listed first. Otherwise, brand names are listed in alphabetical order. The order in which brand names are given is not an indication of a recommendation or criticism.

Recommendations for the use of agricultural chemicals are included in this publication as a convenience to the reader. The use of brand names and any mention or listing of commercial products or services does not imply endorsement by North Carolina State University or

discrimination against similar products or services not mentioned. Other brand names may be labeled for use on turfgrasses. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before applying any chemical. For assistance, contact your county's Cooperative Extension agent.

Useful links:

Glossary: <http://www.turffiles.ncsu.edu/Glossary.aspx>

Turf Diagnostics Lab: <http://ncstateturfdiagnostics.com/TDL/Home.html>

Turfgrass Disease Identification Program: <http://www.turffiles.ncsu.edu/diseaseID/>

Turfgrass Disease Management Program: <http://www.turffiles.ncsu.edu/diseasemgmt/>

Turf Irrigation Management System: <http://www.turffiles.ncsu.edu/tims/>

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