PLANT DISEASE AND INSECT ADVISORY

Entomology and Plant Pathology
Oklahoma State University
127 Noble Research Center
Stillwater, OK 74078

Vol. 7, No. 36 http://entoplp.okstate.edu/Pddl/ Sep 12, 2008

Results of fungicide evaluations for control of black rot of grape in Oklahoma, 2008

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As most of you are aware, black rot is the most economically important disease of grapes in Oklahoma. Much of the fungicide testing for management of black rot has taken place in the Northeastern or North Central region of the U.S. In an effort to test several fungicides for controlling black rot in Oklahoma, and validate other's results, a small trial was established to test a few popular compounds. This trial was not meant to be an exhaustive evaluation of all compounds available. The purpose was to generate base-line data of fungicide efficacy and use that information for planning future studies.

Methods: Research plots were established at a grower's vineyard with a history of black rot in Shawnee, OK. Two-vine plots were established where center facing cordons were the plot area and outer cordons were used as borders between adjacent plots. Vines were spaced 8 ft apart with a between-row spacing of 10 ft. The experimental design was a randomized complete block with four replicates. The vineyard was planted on a Konawa loamy fine sand soil. Irrigation was applied as needed. Standard maintenance practices were followed throughout the growing season. Fungicides evaluated included Nova 40 WP at 5oz/acre; Flint at 2 oz/acre; Pristine at 12.5 oz/acre; and Abound at 15.4 oz/acre. Non-treated plots were also included. Fungicides were applied with a CO2 pressurized wheelbarrow sprayer equipped with a vertical boom and TX8010 flat fan nozzles, calibrated to deliver 100 GPA. All fungicide treated plots were sprayed with Dithane Rainshield + Quintec for the first spray on 28-Apr. Subsequent sprays were comprised of the assigned fungicides for each plot, applied using a 14-day interval.

A total of eight fungicide applications were conducted. Ratings of leaf incidence (percent of leaves with symptoms of black rot), leaf severity (average percent of leaf area with symptoms of black rot), fruit incidence (percent of clusters with symptoms of black rot) and fruit severity (average percent of cluster area with symptoms of black rot) were taken at regular intervals. All data were subjected to the area under the disease progress curve (AUDPC) transformation to account for season-long ratings in a single value.

Results: Weather early in the evaluation period was cool, with low humidity and limited precipitation. Later, weather was hot, very humid with above average rainfall. Highest levels of leaf and fruit disease incidence and severity were observed for plots not treated with fungicide (Table 1). All plots treated with fungicide had significantly less leaf incidence and severity compared to the non-treated checks, except plots treated with Nova. Measurements of leaf incidence and severity were not significantly different for all fungicide treated plots. Plots treated with Nova had significantly lower fruit incidence and severity but not leaf incidence and severity when compared to the non-treated check. Plots treated with Nova did not have significantly different levels of fruit incidence and severity compared to Flint treated plots. Abound, Pristine, and Flint had the lowest levels of fruit incidence and severity and were not different from each other.

Conclusions: Abound, Pristine, and Flint performed well in this particular vineyard. Nova did not perform as well, but provided better control of fruit disease than not spraying at all. Nova should not be deleted from a sound fungicide program. Fungicides should be rotated frequently to minimize the occurrence of fungicide resistant populations of pathogens in the vineyard. Abound, Pristine, and Flint are members (or have components that are members) of the strobilurin class (MOA class 11) of fungicides. No more than two consecutive sprays, and no more than four applications of strobilurin fungicides should be applied to a single vineyard in one season. The strobilurin compounds are also effective on many diseases that appear later in the season. Therefore, use of the strobilurin compounds (Abound, Pristine, Flint etc.) might be reserved for that time to take advantage of their ability to control multiple diseases. In addition to chemical management, growers should use good cultural practices in their vineyards to prevent black rot. Proper canopy management and sanitation, including removal of mummies from the canopy and cultivation or burial of debris can help limit damage caused by the black rot fungus.

Table 1. Season-long leaf and fruit incidence and severity for fungicide treatments applied to grapes (cv. 'Pinot noir') for control of black rot.

Treatment (active ingredient)[Z]	Season-long Leaf Incidence Intensity[Y]	Season-long Leaf Severity Intensity[X]	Season-long Fruit Incidence Intensity[W]	Season-long Fruit Severity Intensity[V]
Non-treated check……	647.5 A	1023.8 A	3027.1 A	2888.3 A
Nova (myclobutanil)……..	422.0 AB	688.4 AB	1203.1 B	1247.5 B
Flint (trifloxystrobin)……	242.8 B	332.3 B	609.4 BC	526.3 BC
Pristine (boscalid + pyraclostrobin)……..	266.6 B	397.9 B	215.6 C	301.1 C
Abound (azoxystrobin)……..	235.4 B	256.9 B	440.6 C	381.1 C

[Z] For the first fungicide application, all plots except the non-treated check received Dithane Rainshield (mancozeb) + Quintec (quinoxyfen) on 28-Apr. All subsequent sprays were the treatments assigned to each plot. All ratings were recorded at regular intervals from 26-May to 18-Jul.

[Y]Season-long leaf incidence is defined as the area under the disease progress curve (AUDPC) for four ratings of % leaves with symptoms of black rot. Means followed by the same letter are not significantly different according to the test of protected least significant difference; LSD=301; R^2=0.60; CV=54; *P*=0.05.

[X]Season-long leaf severity is defined as the area under the disease progress curve (AUDPC) for four ratings of average % leaf area with symptoms of black rot. Means followed by the same letter are not significantly different according to the test of protected least significant difference; LSD=550; R^2=0.62; CV=66; *P*=0.05.

[W] Season-long fruit incidence is defined as the area under the disease progress curve (AUDPC) for four ratings of % of fruit clusters with symptoms of black rot. Means followed by the same letter are not significantly different according to the test of protected least significant difference; LSD=720; R^2=0.89; CV=42; *P*<0.001.

[V]Season-long fruit severity is defined as the area under the disease progress curve (AUDPC) for four ratings of average % cluster area with symptoms of black rot Means followed by the same letter are not significantly different according to the test of protected least significant difference; LSD=851; R^2=0.85; CV=52; *P*<0.001.

Evaluation of over-the-counter fungicides labeled for brown patch control in tall fescue/Kentucky bluegrass residential lawns, 2008

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In the age of increasingly restrictive pesticide laws, many homeowners are finding themselves with limited choices in how they manage diseases affecting lawns. In tall fescue lawns, brown patch can be a devastating disease in the summer months in Oklahoma. There are a few over-the-counter fungicides available to homeowners through hardware, landscape, and nursery stores that are labeled for brown patch control. Otherwise, homeowners must rely on a certified lawn care company for disease management options. The goal of this fungicide evaluation was to determine the efficacy of some of the compounds available directly to the homeowner, and compare those products to the industry standard that can be applied by a commercial lawn care company for effective control of brown patch.

Methods: Research plots were established at the Turfgrass Research Center located in Stillwater, OK. Plots were 3 ft wide and 8 ft long with 2 ft alleys between plots. The experimental design was a randomized complete block with five replicates. The turfgrass sward was a mature stand of tall fescue:Kentucky bluegrass (90:10 ratio) planted on a Norge loam soil. Mowing height was 3 in. Irrigation was applied to maintain an environment favorable for the pathogen. Standard maintenance practices were followed throughout the growing season. Plots were infested with R. solani uniformly spreading wheat grains infested with the fungus over plots on 10-Jul and again on 24-Jul. Fungicides were applied preventatively or curatively. The standard, commercial fungicide treatment was Heritage (wettable granule, azoxystrobin) applied preventatively (prior to infection by the pathogen) at 0.2 oz/1000 ft2 or curatively (after

symptom development) at 0.4 oz/1000 ft2. Over-the-counter fungicides evaluated included Scotts Fungus Control (granular, thiophanate methyl) applied preventatively and curatively at 2.7 lb/1000 ft2; Bayer Advanced Fungus Control (granular, triadimefon) applied preventatively and curatively at 3.0 lb/1000 ft2; Fertilome Liquid Systemic Fungicide (liquid, propiconazole) applied preventatively and curatively at 20.0 fl oz/1000 ft2; and Spectracide Immunox Lawn Disease Control (liquid, myclobutanil) applied preventatively and curatively at 10.6 fl oz/1000 ft2. Non-treated plots were also included. Liquid fungicides were applied with a CO2 pressurized wheelbarrow sprayer equipped with TX8008 flat fan nozzles and calibrated to deliver 87 GPA or 2 gal/1000 sq ft. Granular fungicides were pre-weighed and applied by hand. Preventative treatments of fungicide were initiated on 3-Jul prior to pathogen infestation and were applied four times at 14-day intervals. Curative treatments of fungicide were initiated on 31-Jul after symptoms of brown patch developed and were applied four times at 14-day intervals. Ratings of disease severity (percent of plot area with symptoms of brown patch), turfgrass stand (percent of plot area with living grass), and turfgrass quality (scale of 1 - 9 scale where 1 = no turf present, 5 = unacceptable turfgrass, 7 = acceptable turf, 9 = dense, dark color, thick stand of turfgrass) were taken at regular intervals.

Results: Weather early in the evaluation was cool, with low humidity, and limited precipitation. Later, weather was hot, very humid, with above average rainfall. Disease severity was numerically higher, but not significantly different, for all Fertilome Liquid Systemic Fungicide and Scotts Fungus Control treatments, and preventative applications of Spectracide Immunox Lawn Disease Control and Bayer Advanced Fungus Control compared to the non-treated control (Table 2). Disease severity was numerically lower, but not significantly different, for all Heritage treatments and the curative Spectracide Immunox Lawn Disease Control and Bayer Advanced Fungus Control treatments compared to non-treated plots. Highest levels of disease severity occurred in plots treated with Fertilome Liquid Systemic Fungicide applied preventatively. Lowest levels of disease severity were observed for plots that received curative applications of Heritage. Turfgrass quality was highest for plots receiving preventative or curative applications of Heritage and no other treatments provided significantly better control of brown patch compared to non-treated plots. However, unacceptable turfgrass quality occurred in plots treated with preventative and curative applications of the fungicides Fertilome Liquid Systemic Fungicide and Scotts Fungus control and preventative applications of Spectracide Immunox Lawn Disease Control and Bayer Advanced Fungus Control. No turfgrass stands were significantly different from the non-treated check, with the exception of the poor stand in plots treated with Fertilome Liquid Systemic Fungicide. Plots treated with Heritage had the highest percentage of turfgrass stand but the two treatments were not significantly different from the non-treated check. Specific comparisons of each fungicide with the non-treated check indicated that only Heritage provided significantly better control of brown patch and improved overall turfgrass quality (data not shown).

Conclusions: The only effective compound for controlling brown patch was the commercial product, Heritage. Other fungicides directly available to homeowners were not effective in controlling the disease, or in some cases made the disease worse. Homeowners concerned about managing brown patch should focus on cultural practices to limit conditions favorable for the pathogen. Activities which minimize the duration of leaf wetness can greatly reduce infection by the fungus. Practices such as early morning irrigation, removing dew, and increasing air flow across the turf will help suppress disease. Irrigate based on the moisture

status of the soil, not by calendar. A soil moisture probe can be helpful for maintaining adequate moisture in the root zone without over irrigating. When water is required, apply a sufficient amount to wet the soil and then water as infrequently as possible without causing moisture stress between watering (Consult http://sip.mesonet.org/ for proper irrigation recommendations for your specific situation). Avoid frequent applications of small amounts of water, unless the water is used briefly to remove morning dew. Do not water in the late afternoon or evening.

For fescue turfgrasses and cool-season turfgrass blends, four pounds N per 1,000 square feet per year should be applied as one pound N per 1,000 square feet applications in March, May, September, and November. Over fertilization should be avoided as several diseases can be promoted by excessive nitrogen levels. Mow the turfgrass regularly at recommended heights and only when the turfgrass is dry. For more information about warm and cool-season turfgrass fertilization programs in Oklahoma, consult the Oklahoma Cooperative Extension Service fact sheet HLA-6420, "Lawn Management in Oklahoma."

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Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, VP, Dean, and Director for Agricultural Programs, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Dean of Agricultural Sciences and Natural Resources.

Table 2. Disease severity, overall turfgrass quality, and turfgrass stand for fungicide treatments applied to a tall fescue/Kentucky bluegrass blend for control of brown patch.

Treatment (Timing)[Z]	Severity[Y]	Quality[X]	Stand[W]
Fertilome Liquid Systemic Fungicide (Preventative)……..	32.0 A	4.8 C	72.0 C
Fertilome Liquid Systemic Fungicide (Curative)……..	25.0 AB	5.4 BC	79.0 BC
Scotts Fungus Control (Curative)……..	24.0 AB	5.4 BC	82.0 BC
Scotts Fungus Control (Preventative)……..	22.0 AB	5.8 BC	82.0 BC
Spectracide Immunox Lawn Disease Control (Preventative) ……..	21.6 AB	5.4 BC	84.6 B
Bayer Advanced Fungus Control (Preventative) ……..	18.4 AB	5.8 BC	85.0 B
Non-treated Check……	16.4 BC	6.0 BC	88.2 AB
Bayer Advanced Fungus Control (Curative) ……..	14.6 BCD	6.2 BC	89.2 AB
Spectracide Immunox Lawn Disease Control (Curative)……..	13.4 BCD	6.6 B	90.6 AB
Heritage (Preventative)……	2.0 CD	8.4 A	98.6 A
Heritage (Curative)……..	1.4 D	8.6 A	98.4 A

[Z] Preventative applications were made prior to infection by the pathogen that causes brown patch; Curative applications were made after symptom development; All ratings were recorded on 26-Aug.

[Y]Severity is the % of plot area with symptoms of brown patch. Means followed by the same letter are not significantly different according to the test of protected least significant difference; LSD=14.96; R^2=0.56; CV=67; *P*=0.004.

[X] Turfgrass quality is based on a scale of 1 - 9 where 1 = no turf present, 5 = unacceptable turfgrass, 7 = acceptable turf, 9 = dense, dark color, thick stand of turfgrass. Means followed by the same letter are not significantly different according to the test of protected least significant difference; LSD=1.45; R^2=0.71; CV=18; *P*<0.0001.

[W] Turfgrass stand is the % of plot area with living grass. Means followed by the same letter are not significantly different according to the test of protected least significant difference; LSD=12.16; R^2=0.58; CV=11; *P*=0.002.