Preventative Application of Fungicides for the Control of Dollar Spot

By Jonathan Rivers[1], Pat Sisk[2], Mark Manemann[1], Paul Koch[1], Steve Abler[1], Dr. Geunhwa Jung[1],
[1]Department of Plant Pathology, University of Wisconsin-Madison, [2]The Milwaukee Country Club, River Hills, WI

Introduction

Each year golf course superintendents will encounter numerous turf grass pathogens attempting to wreak havoc upon their golf courses. To defend their courses, superintendents rely on a barrage of cultural and chemical controls. A particular turf pathogen that can have debilitating effects on a golf course is the fungus *Sclerotinia homoeocarpa,* commonly referred to as dollar spot. This past summer I evaluated the efficacy of a new and progressive chemical control approach that is designed to apply effective fungicide(s) in early spring when the pathogen starts to be active. The goal of this new approach is to delay the initial occurrence of dollar spot and or reduce the overall disease severity by knocking down the initial pathogen inoculum. This working hypothesis has been tested by several renowned turf pathologists such as Drs. J. Vargas, B. Clarke, M. Boehm, and R. Latin. It still requires more experiments before this practice is put in place. Two identical experiments designed to evaluate the early preventative application of fungicides were preformed at the OJ Noer Turfgrass Research and Education Facility in Verona, WI and at the Milwaukee Country Club in River hills, WI. The goal of the past summer's study was to determine the efficacy of various labeled fungicides and tank mixtures for controlling dollar spot when applied to turf grass in early spring. This is when the dollar spot pathogen slowly comes out of their over-wintering structure and becomes active.

Biology

Dollar spot (*Sclerotinia homoeocarpa*) is one of North America's most prevalent perennial turf grass pathogens. Dollar spot is an especially problematic disease of bentgrass putting greens and other common grass species used in Wisconsin and other states. Dollar spot fungus is active from early spring to late fall, covering a range of temperatures between 50° F and 90° F (Couch, 1995). As winter gives way to spring and eventually summer, dollar spot begins to transform from the dormant compact masses of mycelium or the thin flakes of fungal tissue and into the active fungus that is able to directly infect the tissues of many grass species. Greatest disease activity and development occurs between 70° F and 85° F with cool nights (~ 60° F). Moisture on the foliage of the desired host must also be present to allow for the disease to develop and spread. Once infection of the host tissues has occurred, the infected tissues will begin to show common symptoms associated with dollar spot due to the release of toxic metabolites by the fungus.

Symptoms of dollar spot include bleached hourglass shaped lesions of individual leaf blades (Image 1) and a cobweb like growth called mycelium, which can be observed in the mornings while morning due is still present on leaf blades (Image 2). With disease progression the lesions on individual leaf blades illustrated by Image 1 coalesce, forming larger blemishes approx-

imately the size of a silver dollar (Image 3).

Cultural and chemical controls thwart the spread of dollar spot. Cultural controls include adequate nitrogen fertility and reducing the duration of leaf blade moisture. Thatch removal is another example of a valuable cultural control practice. In addition, planting some recently developed cultivars with improved resistance to dollar spot is another control strategy. Chemical control elicits the help of individual and synergistic applications of fungicides. A synergistic combination is a calculated application of two chemicals with reduced rates, resulting in an effect greater than the sum of the effects from the two full rate chemicals when applied individually. Due to the prevalence of the pathogen, superintendents will apply multiple applications of different classes of fungicides in an effort to combat the negative effects (fungicide resistance) of the disease. The multiple applications of fungicides makes dollar spot one of the most expensive turf pathogens to control, giving further purpose for research designed to decrease the number of fungicide applications and thus the money and amount of chemicals that superintendents expend.

Rationale

In an attempt to answer the growing desire for cost effective and environmentally friendly fungicide application practices a progressive approach to dollar spot control has been proposed. The preventative application of fungicides is a new approach designed to suppress the barely active turf pathogen before it can infect host tissue. The hypothesis is that by reducing the initial population of pathogen in the thatch and soil the symptoms of dollar spot infection will be delayed until later in the summer or the disease severity that is observed is lower than normal. The delay increases the time between fungicide applications, saves superintendents money, and reduces the use of chemicals. The exact mechanisms of the preventative application for control of dollar spot have yet to be established. Possible explanations deal with the suppression of the initial pathogen population so that it will take longer for the pathogen to build up enough inoculum to cause symptomatic disease on plants

Experimental Methods

Two identical studies were preformed at the OJ Noer Turfgrass Research and Education Facility in Verona, WI and Milwaukee Country Club in River Hills, WI. The Noer performed studies at green and fairway heights while Milwaukee only had a study at fairway height. The individual plots of the study measured 3 x 5 ft and were arranged in a randomized complete block design with four replications. All study locations received all 26 treatments on May 2nd, 2005 (Table). Fungicide treatments were applied at a rate of 2 gallons per 1000 ft^2 using a CO_2 pressurized boom sprayer (40 psi) equipped with XR Teejet 8005 VS nozzles. Ratings of the amount of disease present (% diseased area per plot) were taken weekly at both experimental locations. The results of the weekly ratings were then analyzed for their statistical significance via analysis of variance.

Image 1: Dollar spot lesion on an individual grass blade, bleached hourglass shaped lesions.

Image 2: A cobweb like growth called mycelium, which can be observed in the mornings while morning due is still present on leaf blades.

Image 3: Individual lesions forming larger, symptomatic, "dollar spots".

Table 1: Efficacy of fungicides and tank mixtures for pushing the initial outbreak of dollar spot or reducing the disease severity by knocking down the initial disease inoculum based on a working hypothesis from Milwaukee Country Club in 2005.

		Disease rating (mean percent diseased area per plot)					
Treatment	Rate	21-Jun	6-Jul	12-Jul	18-Jul	21-Jul	28-Jul
1 Untreated Control		4	7.5	6.5	29.3	28.8	71.3
2 Chipco 26GT	4 FL OZ/1000 FT2	0	2.3	1.3	23.8	33	56.3
3 Chipco 26GT	2 FL OZ/1000 FT2	0	0.8	5.5	26.8	33.8	68.8
4 Emerald	0.18 OZ/1000 FT2	0	2	1.3	13.8	23	67.5
5 Banner MAXX	2 FL OZ/1000 FT2	1.3	0.3	1.3	18.5	12.5	50
6 Banner MAXX	0.5 FL OZ/1000 FT2	3	1.8	2.3	14.3	21.3	47.5
7 Spotrete	5 OZ/1000 FT2	0	2.5	3.3	12.5	20.5	66.3
8 3336F	4 FL OZ/1000 FT2	12.5	3	3.3	9.3	26.3	67.5
9 Curalan EG	1 OZ/1000 FT2	9.3	2.5	2.5	7	9.3	53.8
10 Turfcide 400	3 FL OZ/1000 FT2	0	1.3	3.8	10.5	9.3	56.3
11 Fore Rainshield	8 OZ/1000 FT2	6.3	8.8	6.3	19	30	57.5
12 Daconil Ultrex	5 OZ/1000 FT2	1.3	2.3	2.5	21.3	18.8	50
13 Daconil Ultrex	1.8 OZ/1000 FT2	5	8.8	7.5	27.3	48.8	76.3
14 Rubigan AS	1.5 FL OZ/1000 FT2	0	1.8	0	10	14.3	52.5
15 Eagle	2.4 FL OZ/1000 FT2	0	1.3	2.5	10.5	10	50
16 Lynx	2 FL OZ/1000 FT2	0	4	1.8	11.8	20	51.3
17 Bayleton	1 OZ/1000 FT2	0	0	0.5	6.8	11.5	48.8
18 Bayleton	0.25 OZ/1000 FT2	0.8	1.5	3	12.5	12.5	61.3
19 Banner MAXX Chipco 26GT	2 FL OZ/1000 FT2 4 FL OZ/1000 FT2	0	0	1.8	11.3	15	62.5
20 Banner MAXX Chipco 26GT	0.5 FL OZ/1000 FT2 2 FL OZ/1000 FT2	2.5	0.3	1.8	11.3	11.3	55
21 Banner MAXX Curalan EG	2 FL OZ/1000 FT2 1 OZ/1000 FT2	0	1.8	1.8	20	25	61.3
22 Banner MAXX Curalan EG	0.5 FL OZ/1000 FT2 1 OZ/1000 FT2	0	0	1.3	11.3	12.5	52.5
23 Banner MAXX Daconil Ultrex	2 FL OZ/1000 FT2 5 OZ/1000 FT2	3.8	1.8	2.3	18.8	11.3	65
24 Banner MAXX Daconil Ultrex	0.5 FL OZ/1000 FT2 1.8 OZ/1000 FT2	0	1.8	4.3	8.3	11.3	73.8
25 Banner MAXX Bayleton	2 FL OZ/1000 FT2 1 OZ/1000 FT2	0	0	0.3	8.3	10	48.8
26 Banner MAXX Bayleton	0.5 FL OZ/1000 FT2 0.25 OZ/1000 FT2	0	1.3	3.8	21.3	27.5	71.3
Treatment Prob (F)		NS	Sig	NS	NS	Sig	NS

Sig and NS define Significant and Non-significant at P=0.05 based on Student-Newman-Keuls, respectively.

Results

Due to the abnormally cool spring and then a hot, dry summer, disease pressure did not appear until much later than anticipated. At the Noer major disease pressure was not observed until the 1st week in August, well past the efficacy of the fungicides applied on May 2nd. As a result of the abnormal disease pressure no statistically significant data was obtained from the Noer. However, Milwaukee did have a small amount of statistically significant data. Daily high and low temperatures in each site (Graphs 1 and 2) illustrate the unfavorable range of temperatures for dollar spot development. Through June and July Madison and Milwaukee rarely fell below 80°F, and into the favorable range of temperatures for dollar spot activity. Furthermore, the nights also slowed the development of the disease by staying above 65°F.

The slight difference in daily highs and lows between Madison and Milwaukee did allow for earlier disease pressure at Milwaukee. The first rating in Milwaukee occurred June 21st 2005. At this point many of the treatments still displayed efficacy against dollar spot. Treatments 8, 9 and 11 were less effective than the untreated control (only 4%). The ratings for % dollar spot and quality on July 6th, 2005 were statistically significant among the treatments at $p = 0.05$ but still low on the control plot (7.5%). On July 21st the % dollar spot among the treatments was statistically significant with $p = .03$. Most of the synergistic combinations of reduced rates (treatment# 20, 22, and 24) controlled the dollar spot as much as with the combinations of the same chemicals with full rates. The synergistic combination of Banner Maxx and Bayleton (treatment #26) did not work for this particular study. Interestingly, three fungicides, Curalan (1 oz/1000 ft^2), Turfcide 400 (3 fl oz/1000 ft^2), and Eagle (2.4 fl oz/1000 ft^2) showed exceptional control (less than 10% damage) against dollar spot. This significant result is hypothesized to be related to the differences in the ability of the treatments to suppress the initial pathogen population. Increased control of the initial pathogen population correlates with a decrease in disease prevalence during the summer ratings. The first major indication of dollar spot disease pressure occurred between the 12th rating and the 18th rating of July when dollar spot percent per plot in control plot jumped from an average of 6.5 to 29.3 percent disease per plot. By July 28th dollar spot lesions ranging

from 47.5 to 73.8% densely covered the experimental area.

In summary, most DMI fungicides (treatments: 5, 14, 15, 17, and 18) and synergistic combinations (treatments: 20, 22, and 24) displayed significant control over dollar spot through July 21st when applied once on May 2nd. These synergistic combinations also showed great curative efficacy on the dollar spot suppression just published in the Grass Roots article (Jan/Feb issue of 2006). Interestingly, Bayleton at both rates, 0.25 and 1 oz/1000 ft^2, controlled dollar spot equivalently. In conclusion, the early preventative application of fungicides individually or in synergistic combinations significantly delayed the progression of dollar spot.

Importance of Study

The studies at the Noer and Milwaukee Country Club were designed to identify effective and appropriate rates of fungicides for the control of dollar spot when applied preventatively (early May). The abnormal weather conditions reduced the overall disease pressure. Despite the lack of cooperation from the weather, the data from the preventative study still adds to the growing understanding of the rationale behind early preventative applications. The goal of this study and the preventative applications is to save superintendents money and decrease the use of pesticides. Future studies will be needed to further investigate the practicality and efficacy of preventative fungicide applications.

Literature Cited

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