Interaction of biofungicides and chlorothalonil for control of dollar spot on creeping bentgrass, 2008

R. Latin, Professor of Plant Pathology

Objective:

The objective of this research was to evaluate the disease control benefit of adding biofungicides to chlorothalonil for dollar spot control.

Rationale:

Unlike conventional synthetic fungicides, biofungicides are composed of living organisms or living organism metabolites. Some simple compounds derived from nonliving sources (hydrogen peroxide and potassium bicarbonate), referred to as biorationals, also are classified as biofungicides for regulatory purposes. Because they already occur or are produced in nature, toxicity to humans and the environment are very low, and they are perceived as less threatening and noxious than synthetic products by the public at large. In theory, biofungicides offer several advantages beyond their safety and eco-friendly attributes. For high maintenance turf, the promise of biofungicides lies in their potential to reduce disease pressure, thereby improving performance of conventional fungicides, resulting in a reduction in fungicide use.

Procedures:

The research was conducted at the Purdue University Daniel Turfgrass Research and Diagnostic Center in West Lafayette, IN. The plots were located on adjacent swards of Crenshaw creeping bentgrass maintained at a height of 0.18 in. Irrigation and aerification operations were done according to standard practices for creeping bentgrass putting greens. During the 2008 experimental period, fertilizer (18-4-10) was applied at a rate of approximately 0.75 lb N per 1000 sq ft on May 9 and 0.5 lb N per 1000 sq ft on August 16.

Individual treatment plots measured 3.3 ft by 6.6 ft (1m x 2m) and were randomized within each of the 4 replications. Disease was allowed to develop from natural inoculum as the site has been thoroughly involved with dollar spot symptoms in years past. Fungicide applications were made using a custom-built boom sprayer. Three Tee-Jet air induction nozzles (AI9503EVS for the middle, AIUB8503EVS for both sides) were mounted approximately 12 in. apart on the boom located 14 in. from the ground. The sprayer was calibrated to deliver 2 gal per 1000 sq ft at 40 psi. For the spring 2008 experiment, treatments were initiated on May 22 and were repeated at 7- or 14-day-intervals as described in the table below. For the fall 2008 experiment, treatments were initiated on September 9 and were repeated at 7- or 14-day-intervals as described in the table below.

Visual evaluations of disease severity were recorded at approximately 3-7 day intervals. Data were subjected to analysis of variance and mean separation procedures.

Results and Interpretation:

The spring and summer of 2008 was relatively cool in the Midwest. Ample precipitation and heavy dews promoted dollar spot establishment in early June. A similar weather pattern prevailed in early September. The environmental component of disease pressure was considered high to moderately high throughout both experimental periods (spring and fall).

All treatments, including the conventional 14-day Daconil 3.2 oz treatment failed to sustain acceptable levels (less than 1%) of infection throughout the experimental period (Table 1). I think that is an indication of high disease pressure during the spring trial.

The fall trial was initiated during a period of high disease pressure. Disease severity remained unacceptable for all treatments until a period of cool dry environmental conditions suppressed disease progress and allowed turf to recover (Table 2). After September 23, it was difficult to distinguish among treatments that received regular Daconil applications. Although we were able to demonstrate some separation between Rhapsody and the unsprayed treatment on some dates, it was difficult to show a consistent benefit of Rhapsody when combined with Daconil at 1.6 oz at 7-day intervals.

Manufacturers are careful to warn against using biofungicides as stand alone measures for turf disease control, especially under conditions of high disease pressure. Instead biofungicides are often marketed as supplements to conventional fungicide programs. They are not inexpensive and it is reasonable to expect measureable improvement in disease control where biofungicides are added to conventional products. In this study, designed to make direct comparisons between the efficacy of weekly or bi-weekly fungicide sprays vs. weekly or biweekly treatments with fungicides plus biologicals, the biological did not contribute to an improvement in dollar spot control. A disease control benefit was calculated for each treatment by subtracting the amount of dollar spot in plots treated with fungicide (chlorothalonil) plus the biological from disease severity in plots treated with chlorothalonil alone. With few exceptions during spring and fall experiments, no significant differences in dollar spot severity occurred between plots treated with chlorothalonil alone compared to plots treated with chlorothalonil plus the biofungicide (Figure 1). Furthermore, where significant differences did occur, disease severity was more likely to be greater in plots treated with chlorothalonil plus the biological (negative benefit). With few exceptions over these two experiments, there was no benefit in dollar spot control associated with the use of any of the biologicals.

Table 1. Dollar spot severity in plots treated with chlorothalonil and biofungicides, spring 2008.

Spring 2008		Dollar spot severity (% plot with symptoms)		
Treatment and Rate/M	Interval	30-May	17-Jun	30-Jun
No treatment		1.92 a	17.10 a	42.20 a
Zerotol 6.25 fl oz	7	1.92 a	15.41 a	35.44 a
Zerotol + Daconil Ultrex 3.1 + 1.6	7	0.36 bc	1.36 b	3.98 b
Rhapsody 6.0 fl oz	7	1.01 b	11.51 a	35.44 a
Rhapsody + Daconil Ultrex 3.0 fl oz + 1.6 oz	7	0.15 c	0.83 b	5.92 b
Ecoguard 20 fl oz	14	1.01 b	13.84 a	28.68 a
Ecoguard + Daconil Ultrex 10 fl oz + 3.2 oz	14	0.24 c	1.73 b	6.67 b
Daconil Ultrex 82.5 WG 3.2 oz	14	0.15 c	1.21 b	2.96 b
Daconil Ultrex 82.5 WG 1.6 oz	7	0.19 c	0.80 b	2.59 b

Values within columns followed the same letter are not statistically different with 95% confidence.

Table 2. Dollar spot severity in plots treated with chlorothalonil and biofungicides, fall 2008.

Fall 2008		Dollar spot severity (% plot with symptoms)		
Treatment and Rate/M	Interval	9-Sep	23-Sep	7-Oct
No treatment		1.11 a	10.55 a	16.86 ab
Zerotol 6.25 fl oz	7	1.28 a	9.34 a	21.61 a
Zerotol + Daconil Ultrex 3.1 fl oz + 1.6 oz	7	1.11 a	0.94 c	0.49 d
Rhapsody 6.0 fl oz	7	0.92 a	6.91 ab	12.00 bc
Rhapsody + Daconil Ultrex 3.0 fl oz + 1.6 oz	7	1.10 a	0.84 c	0.45 d
Ecoguard 20 fl oz	14	1.01 a	2.44 bc	7.40 c
Ecoguard + Daconil Ultrex 10 fl oz + 1.6 oz	14	1.20 a	1.77 bc	0.23 d
Daconil Ultrex 82.5 WG 3.2 oz	14	0.92 a	0.58 c	0.19 d
Daconil Ultrex 82.5 WG 1.6 oz	7	1.54 a	1.01 c	0.80 d

Values within columns followed the same letter are not statistically different with 95% confidence.

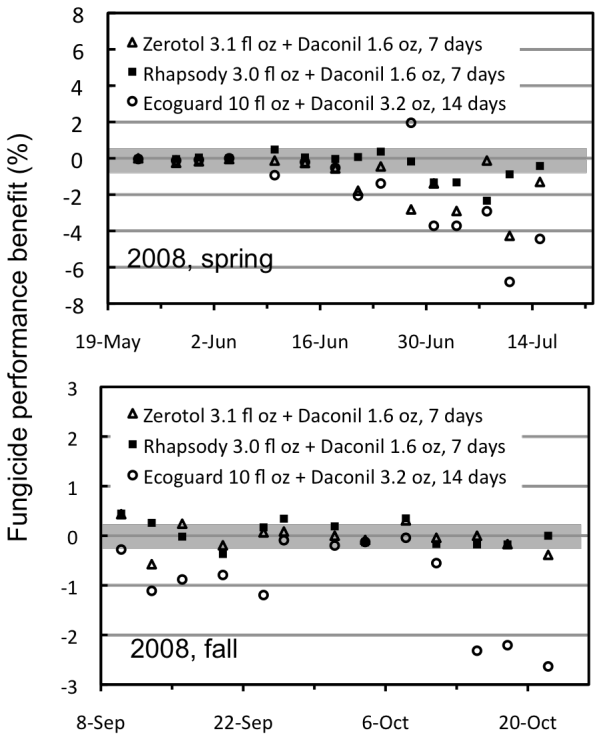

Figure 1. Identical experiments against dollar spot on creeping bentgrass were conductedin spring and fall 2008 to define a fungicide performance benefit associated with biofungicides. Fungicide performance benefit was calculated by subtracting the amount of disease (%) in plots treated with Daconil plus biofungicide from the amount of disease (%) in plots treated with Daconil only. Data points with the gray bars indicate little or no benefit from the biofungicide. Data points above the gray bar indicate a positive benefit associated with biofungicide. Data points below the gray bar indicate that more disease occurred in plots treated with biofungicide (negative benefit).