



Biopesticides for the Control of Dollar Spot on Putting Greens

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Objectives

Determine efficacy of biopesticides for dollar spot control on golf course putting greens and the impact on plant health over a single growing season.

Materials and Methods

This study was conducted at the O.J. Noer Turfgrass Research and Education Facility in Madison, WI. The putting green stand is composed off creeping bentgrass (*Agrostis stolonifera*) and is maintained at a height of 0.125 inches. There are 10 individual 3 ft by 5 ft plots per replicate organized in a randomized block design with four replicates. These treatments were applied using a CO₂ pressurized boom sprayer with two XR Teejet AI8004 nozzles at a pressure of 40 psi. All treatments were agitated by hand and applied at 1.5 gallons of water per 1000 ft². The initial treatment application was done on May 23rd, 2017 and all following applications were either made at 14 or 28 day intervals for a total of 7 applications. Number of dollar spot infection centers, chlorophyll content, and turfgrass quality (1-9 scale, 9=excellent and 6=acceptable) measurements were taken immediately prior to each biopesticide application. Measurements were subjected to an analysis of variance and means separated test using Fisher's LSD (P=0.05). Results can be found in tables 1, 2, and 3 below.

Results and Discussion

Dollar spot pressure was quite high throughout most of 2017. There were two distinct levels of control from the beginning to the middle of the season. Nortica provided the lowest level of dollar spot control and Emerald (positive fungicide control) provided the highest. All other treatments were between these two extremes. After July 18th there was a breakthrough in disease and a high number of infection centers were present in all treated plots. This breakthrough is probably due to an application error where all treatments were mixed with double the amount of water that was needed. For the rest of the study the number of dollar spot infection centers on each plot is high. Before this breakthrough, Civitas and Double Nickel LC seemed to be providing some level of control.

Chlorophyll content remained mostly consistent through the season with few differences between treatments observed. Turfgrass quality results were very similar to the dollar spot infection centers data. Plots treated with Emerald had the highest turf quality with Civitas Pre-Mixed and Double Nickel LC providing an intermediate level of quality. Nortica and Timorex Gold are on the other end of the spectrum with a low turfgrass quality throughout the season. All other treatments were on the lower middle end of the spectrum.

No treatments were independently continuously effective against dollar spot except for the positive control, Emerald. There does seem to be some potential with Civitas Pre-Mixed and

Double Nickel LC. These products could be tested to see their effects within a pesticide management program or in a tank mix with conventional fungicides. This may help with preventing pesticide resistance and reduce potential environmental toxicity exposure.

Table 1. Mean dollar spot infection centers per treatment on creeping bentgrass maintained at putting green height at the OJ Noer Turfgrass Research Facility in Madison, WI during 2017.

	Treatment	Application Rate	Application Interval	Application Dates ^b	Dollar Spot Infection Centers ^a		
					June 20	July 18	August 15
1	Non-treated control	N/A	N/A	N/A	107.8 b	248.0 a	96.8 ab
2	Emerald	0.18 oz/1000 ft ²	28 Day	CGK	8.0 c	5.8 c	24.3 b
3	Nortica	12.9 oz/1000 ft ² (initial rate) 6.4 oz/1000 ft ²	28 Day	CGK	199.0 a	216.3 ab	98.0 ab
4	Timorex gold	0.314 fl oz/1000 ft ²	14 Day	CEGIKM	142.8 ab	207.3 ab	56.5 ab
5	Double Nickel LC	4 fl oz/1000 ft ²	14 Day	CEGIKM	77.0 bc	191.8 ab	114.5 a
6	Rhapsody	10 fl oz/1000 ft ²	14 Day	CEGIKM	122.5 ab	250.5 a	113.8 a
7	Civitas Pre-Mixed	8 fl oz/1000 ft ²	14 Day	CEGIKM	73.0 bc	143.0 b	65.8 ab
8	Actinovate AG Revolution	0.275 oz/1000 ft ² 6 fl oz/1000 ft ²	14 Day	CEGIKM CGK	136.5 ab	220.8 ab	85.0 ab
9	Zio	1.837 oz/1000 ft ²	14 Day	CEGIKM	125.8 ab	250.5 a	79.5 ab
10	Serenade OPTI	0.459 oz/1000 ft ²	14 Day	CEGIKM	71.0 bc	245.9 a	82.0 ab

^aMeans followed by the same letter do not significantly differ (P=.05, Fisher's LSD).

^bApplication dates: C=5/23, E=6/6, G=6/20, I=7/4, K=7/31, M=8/15

Table 2. Mean chlorophyll content per treatment on creeping bentgrass maintained at putting green height at the OJ Noer Turfgrass Research Facility in Madison, WI during 2017.

	Treatment	Application Rate	Application Interval	Application Dates ^b	Chlorophyll Content ^a		
					June 20	July 18	August 15
1	Non-treated control	N/A	N/A	N/A	266.50 a	284.50 a	248.50 a
2	Emerald	0.18 oz/1000 ft ²	28 Day	CGK	261.25 a	288.25 a	276.50 a
3	Nortica	12.9 oz/1000 ft ² (initial rate) 6.4 oz/1000 ft ²	28 Day	CGK	258.25 a	265.25 a	250.50 a
4	Timorex gold	0.314 fl oz/1000 ft ²	14 Day	CEGIKM	244.50 ab	272.00 a	263.25 a
5	Double Nickel LC	4 fl oz/1000 ft ²	14 Day	CEGIKM	247.75 ab	276.50 a	263.50 a
6	Rhapsody	10 fl oz/1000 ft ²	14 Day	CEGIKM	207.75 b	203.25 b	249.50 a
7	Civitas Pre-Mixed	8 fl oz/1000 ft ²	14 Day	CEGIKM	247.75 ab	260.25 a	270.25 a
8	Actinovate AG Revolution	0.275 oz/1000 ft ² 6 fl oz/1000 ft ²	14 Day	CEGIKM CGK	245.25 ab	265.00 a	267.00 a
9	Zio	1.837 oz/1000 ft ²	14 Day	CEGIKM	253.50 ab	261.25 a	247.50 a
10	Serenade OPTI	0.459 oz/1000 ft ²	14 Day	CEGIKM	252.50 ab	266.50 a	260.50 a

^aMeans followed by the same letter do not significantly differ (P=.05, Fisher's LSD).

^bApplication dates: C=5/23, E=6/6, G=6/20, I=7/4, K=7/31, M=8/15

Table 3. Mean turfgrass quality per treatment on creeping bentgrass maintained at putting green height at the OJ Noer Turfgrass Research Facility in Madison, WI during 2017.

	Treatment	Application Rate	Application Interval	Application Dates ^b	Turfgrass Quality ^a		
					June 20	July 18	August 15
1	Non-treated control	N/A	N/A	N/A	4.75 bc	3 bc	3.5 b
2	Emerald	0.18 oz/1000 ft ²	28 Day	CGK	6.5 a	7.5 a	5.25 a
3	Nortica	12.9 oz/1000 ft ² (initial rate) 6.4 oz/1000 ft ²	28 Day	CGK	3.75 bc	2.5 c	3.25 b
4	Timorex gold	0.314 fl oz/1000 ft ²	14 Day	CEGIKM	3.5 c	2.5 c	3.75 b
5	Double Nickel LC	4 fl oz/1000 ft ²	14 Day	CEGIKM	5 b	4 b	2.75 b
6	Rhapsody	10 fl oz/1000 ft ²	14 Day	CEGIKM	4.25 bc	2.5 c	3 b
7	Civitas Pre-Mixed	8 fl oz/1000 ft ²	14 Day	CEGIKM	4.25 bc	3.75 bc	4 ab
8	Actinovate AG Revolution	0.275 oz/1000 ft ² 6 fl oz/1000 ft ²	14 Day	CEGIKM CGK	4 bc	2.75 bc	3.5 b
9	Zio	1.837 oz/1000 ft ²	14 Day	CEGIKM	4.75 bc	3 bc	3.5 b
10	Serenade OPTI	0.459 oz/1000 ft ²	14 Day	CEGIKM	6.5 a	7.5 a	5.25 a

^aMeans followed by the same letter do not significantly differ (P=.05, Fisher's LSD).

^bApplication dates: C=5/23, E=6/6, G=6/20, I=7/4, K=7/31, M=8/15