Precision Disease Management of Dollar Spot

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OBJECTIVE

To determine if using weather stations embedded with the Smith-Kerns dollar spot prediction model scattered around the same golf course can result in different fungicide application timings and fungicide savings relative to a traditional method of fungicide application.

MATERIALS AND METHODS

The study was replicated at 3 locations: the O.J. Noer Turfgrass Research and Education Facility in Madison, WI and the 7th and 18th holes at University Ridge Golf Course in Madison, WI. At all sites the study was conducted on creeping bentgrass (*Agrostis stolonifera* 'Pencross') maintained at a 0.5 inch cutting height. The individual plots measured 6 ft X 10 ft and were arranged in a randomized complete block design with four replications. Individual treatments were applied at a nozzle pressure of 40 p.s.i using a CO2-pressurized boom sprayer equipped with two XR Teejet AI8004 VS nozzles. All fungicides were agitated by hand and applied in the equivalent of 1.5 gallons of water per 1000 ft^2. Three fungicide programs were tested in addition to the non-treated control. One was a standard fungicide program based off the program of a local golf course, the second based the application timing on the Smith-Kerns dollar spot prediction model, and the third based the application timing on the Smith-Kerns dollar spot model but used an adjustment we called the 'Clarke Correction'. This adjustment states that spray intervals should be lengthened when the Smith-Kerns model is over 20% and the overall slope of the Smith-Kerns model forecast is generally negative. The Clarke Correction treatment was only tested at the OJ Noer site. Number of dollar spot infection centers per plot and turfgrass quality (1-9, 9 being excellent, 6 acceptable, and 1 bare soil) were assessed every two weeks. Results were subjected to an analysis of variance and means were separated using Fisher's LSD (P = 0.05). Disease severity and turfgrass quality from all locations can be found in the following tables.

RESULTS AND DISCUSSION

Due to technical issues with new weather stations, there were no differences in application timings among the three locations. However, there were clearly differences in dollar pressure among the three locations that indicates that precision dollar spot management could be successful once the weather stations are operational. Due to the Smith-Kerns model being above 20% for most of the season there was no difference between the application timings of treatments 2 and 3. Treatment 4, which was only conducted at the OJ Noer site and utilized the Clarke Correction, gave a few small windows of reapplication extension. These small windows only added up to 8 days over the course of the summer.

Table 1. Mean number of dollar spot infection centers on nontreated controls in all 3 locations.

	Jul 10	**Aug 21**	**Sep 18**
OJ Noer	45.0	76.8	123.5
7 Fwy	13.0	110.5	69.0
18 Fwy	0.0	38.3	264.0

Table 2. Mean number of dollar spot infection centers per treatment at the OJ Noer Turfgrass Research and Education Facility in Madison, WI in 2019.

	Treatment	Rate	Application Date/Interval	Dollar spot severity[a]		
				Jul 10	Aug 21	Sep 18
1	Non-treated control			45.0a	76.8a	123.5a
2	Standard Program			0.0b	11.8b	1.0b
	Emerald	0.18 oz/1000 ft2	May 28			
	Banner Maxx	2 fl oz/1000 ft2	Jun 25			
	Interface	4 fl oz/1000 ft2	Jul 16			
	Velista	0.5 oz/1000 ft2	Jul 30			
	Secure	0.5 fl oz/1000 ft2	Jul 30			
	Xzemplar	0.26 fl oz/1000 ft2	Aug 13			
	Pinpoint	0.31 fl oz/1000 ft2	Sep 10			
	26 GT	4 fl oz/1000 ft2	Oct 8			
	Banner Maxx	2 fl oz/1000 ft2	Oct 22			
3	Smith-Kerns model: Standard			1.0b	0.0b	0.8b
	Emerald	0.18 oz/1000 ft2	28 day			
	Banner Maxx	2 fl oz/1000 ft2	21 day			
	Interface	4 fl oz/1000 ft2	14 day			
	Velista	0.5 oz/1000 ft2	14 day			
	Secure	0.5 fl oz/1000 ft2				
	Xzemplar	0.26 fl oz/1000 ft2	28 day			
	Pinpoint	0.31 fl oz/1000 ft2	28 day			
	26 GT	4 fl oz/1000 ft2	14 day			
	Banner Maxx	2 fl oz/1000 ft2	14 day			
4	Smith-Kerns model: Clarke Correction			1.3b	0.0b	4.0b
	Emerald	0.18 oz/1000 ft2	28 day			
	Banner Maxx	2 fl oz/1000 ft2	21 day			
	Interface	4 fl oz/1000 ft2	14 day			
	Velista	0.5 oz/1000 ft2	14 day			
	Secure	0.5 fl oz/1000 ft2				
	Xzemplar	0.26 fl oz/1000 ft2	28 day			
	Pinpoint	0.31 fl oz/1000 ft2	28 day			
	26 GT	4 fl oz/1000 ft2	14 day			
	Banner Maxx	2 fl oz/1000 ft2	14 day			
			LSD P=.05	24.31	27.7	32.6

[a]Dollar spot was visually assessed as number of dollar spot infection centers per plot. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD). Means followed by dashes indicate no significant differences were observed among any of the treatments.

Table 3. Mean turf quality ratings per treatment at the OJ Noer Turfgrass Research and Education Facility in Madison, WI in 2019.

	Treatment	Rate	Application Date/Interval	Turf Quality[a]		
				Jul 10	Aug 21	Sep 18
1	Non-treated control			5.0b	4.5b	4.8b
2	Standard Program	Emerald	0.18 oz/1000 ft2	May 28	7.3a	7.0a	7.0a
		Banner Maxx	2 fl oz/1000 ft2	Jun 25			
		Interface	4 fl oz/1000 ft2	Jul 16			
		Velista	0.5 oz/1000 ft2	Jul 30			
		Secure	0.5 fl oz/1000 ft2	Jul 30			
		Xzemplar	0.26 fl oz/1000 ft2	Aug 13			
		Pinpoint	0.31 fl oz/1000 ft2	Sep 10			
		26 GT	4 fl oz/1000 ft2	Oct 8			
		Banner Maxx	2 fl oz/1000 ft2	Oct 22			
3	Smith-Kerns model: Standard	Emerald	0.18 oz/1000 ft2	28 day	7.3a	6.8a	7.0a
		Banner Maxx	2 fl oz/1000 ft2	21 day			
		Interface	4 fl oz/1000 ft2	14 day			
		Velista	0.5 oz/1000 ft2	14 day			
		Secure	0.5 fl oz/1000 ft2				
		Xzemplar	0.26 fl oz/1000 ft2	28 day			
		Pinpoint	0.31 fl oz/1000 ft2	28 day			
		26 GT	4 fl oz/1000 ft2	14 day			
		Banner Maxx	2 fl oz/1000 ft2	14 day			
4	Smith-Kerns model: Clarke Correction	Emerald	0.18 oz/1000 ft2	28 day	7.5a	7.0a	6.5a
		Banner Maxx	2 fl oz/1000 ft2	21 day			
		Interface	4 fl oz/1000 ft2	14 day			
		Velista	0.5 oz/1000 ft2	14 day			
		Secure	0.5 fl oz/1000 ft2				
		Xzemplar	0.26 fl oz/1000 ft2	28 day			
		Pinpoint	0.31 fl oz/1000 ft2	28 day			
		26 GT	4 fl oz/1000 ft2	14 day			
		Banner Maxx	2 fl oz/1000 ft2	14 day			
				LSD P=.05	0.75	0.55	0.67

[a]Turfgrass quality was rated visually on a 1 – 9 scale with 6 being acceptable. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD). Means followed by dashes indicate no significant differences were observed among any of the treatments.

Table 4. Mean number of dollar spot infection centers per treatment at University Ridge 7 fairway in Madison, WI in 2019.

		Treatment	Rate	Application Date/Interval	Dollar spot severity[a]		
					Jul 10	Aug 21	Sep 5
1		Non-treated control			13.0-	110.5a	176.3a
2	Standard Program	Emerald	0.18 oz/1000 ft2	May 28	2.0-	12.5b	33.8b
		Banner Maxx	2 fl oz/1000 ft2	Jun 25			
		Interface	4 fl oz/1000 ft2	Jul 16			
		Velista	0.5 oz/1000 ft2	Jul 30			
		Secure	0.5 fl oz/1000 ft2	Jul 30			
		Xzemplar	0.26 fl oz/1000 ft2	Aug 13			
		Pinpoint	0.31 fl oz/1000 ft2	Sep 10			
		26 GT	4 fl oz/1000 ft2	Oct 8			
		Banner Maxx	2 fl oz/1000 ft2	Oct 22			
3	Smith-Kerns model: Standard	Emerald	0.18 oz/1000 ft2	28 day	1.3-	6.8b	31.0b
		Banner Maxx	2 fl oz/1000 ft2	21 day			
		Interface	4 fl oz/1000 ft2	14 day			
		Velista	0.5 oz/1000 ft2	14 day			
		Secure	0.5 fl oz/1000 ft2				
		Xzemplar	0.26 fl oz/1000 ft2	28 day			
		Pinpoint	0.31 fl oz/1000 ft2	28 day			
		26 GT	4 fl oz/1000 ft2	14 day			
		Banner Maxx	2 fl oz/1000 ft2	14 day			
				LSD P=.05	13.34	79.96	114.23

[a]Dollar spot was visually assessed as number of dollar spot infection centers per plot. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD). Means followed by dashes indicate no significant differences were observed among any of the treatments.

Table 5. Mean turf quality ratings per treatment at University Ridge 7 fairway in Madison, WI in 2019.

	Treatment	Rate	Application Date/Interval	Turf Quality[a]		
				Jul 10	Aug 21	Sep 18
1	Non-treated control			5.5b	5.0b	3.8b
2	Standard Program					
	Emerald	0.18 oz/1000 ft2	May 28			
	Banner Maxx	2 fl oz/1000 ft2	Jun 25			
	Interface	4 fl oz/1000 ft2	Jul 16			
	Velista	0.5 oz/1000 ft2	Jul 30			
	Secure	0.5 fl oz/1000 ft2	Jul 30	8.0a	7.0a	5.5a
	Xzemplar	0.26 fl oz/1000 ft2	Aug 13			
	Pinpoint	0.31 fl oz/1000 ft2	Sep 10			
	26 GT	4 fl oz/1000 ft2	Oct 8			
	Banner Maxx	2 fl oz/1000 ft2	Oct 22			
3	Smith-Kerns model: Standard					
	Emerald	0.18 oz/1000 ft2	28 day			
	Banner Maxx	2 fl oz/1000 ft2	21 day			
	Interface	4 fl oz/1000 ft2	14 day			
	Velista	0.5 oz/1000 ft2	14 day			
	Secure	0.5 fl oz/1000 ft2		7.5a	7.0a	5.5a
	Xzemplar	0.26 fl oz/1000 ft2	28 day			
	Pinpoint	0.31 fl oz/1000 ft2	28 day			
	26 GT	4 fl oz/1000 ft2	14 day			
	Banner Maxx	2 fl oz/1000 ft2	14 day			
			LSD P=.05	0.82	1.15	1.38

[a]Turfgrass quality was rated visually on a 1 – 9 scale with 6 being acceptable. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD). Means followed by dashes indicate no significant differences were observed among any of the treatments.

Table 6. Mean number of dollar spot infection centers per treatment at University Ridge 18 fairway in Madison, WI in 2019.

		Treatment	Rate	Application Date/Interval	Dollar spot severity[a]		
					Jul 10	Aug 21	Sep 5
1		Non-treated control			0.0-	38.3a	51.5-
2	Standard Program	Emerald	0.18 oz/1000 ft2	May 28	0.0-	0.0b	8.3-
		Banner Maxx	2 fl oz/1000 ft2	Jun 25			
		Interface	4 fl oz/1000 ft2	Jul 16			
		Velista	0.5 oz/1000 ft2	Jul 30			
		Secure	0.5 fl oz/1000 ft2	Jul 30			
		Xzemplar	0.26 fl oz/1000 ft2	Aug 13			
		Pinpoint	0.31 fl oz/1000 ft2	Sep 10			
		26 GT	4 fl oz/1000 ft2	Oct 8			
		Banner Maxx	2 fl oz/1000 ft2	Oct 22			
3	Smith-Kerns model: Standard	Emerald	0.18 oz/1000 ft2	28 day	0.0-	0.0b	8.3-
		Banner Maxx	2 fl oz/1000 ft2	21 day			
		Interface	4 fl oz/1000 ft2	14 day			
		Velista	0.5 oz/1000 ft2	14 day			
		Secure	0.5 fl oz/1000 ft2				
		Xzemplar	0.26 fl oz/1000 ft2	28 day			
		Pinpoint	0.31 fl oz/1000 ft2	28 day			
		26 GT	4 fl oz/1000 ft2	14 day			
		Banner Maxx	2 fl oz/1000 ft2	14 day			
				LSD P=.05	NA	22.89	64.33

[a]Dollar spot was visually assessed as number of dollar spot infection centers per plot. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD). Means followed by dashes indicate no significant differences were observed among any of the treatments.

Table 7. Mean turf quality ratings per treatment at University Ridge 18 fairway in Madison, WI in 2019.

	Treatment	Rate	Application Date/Interval	Turf Quality[a]		
				Jul 10	Aug 21	Sep 18
1	Non-treated control			6.3-	5.3b	4.8b
2	Standard Program					
	Emerald	0.18 oz/1000 ft2	May 28			
	Banner Maxx	2 fl oz/1000 ft2	Jun 25			
	Interface	4 fl oz/1000 ft2	Jul 16			
	Velista	0.5 oz/1000 ft2	Jul 30			
	Secure	0.5 fl oz/1000 ft2	Jul 30	7.0-	7.0a	6.0a
	Xzemplar	0.26 fl oz/1000 ft2	Aug 13			
	Pinpoint	0.31 fl oz/1000 ft2	Sep 10			
	26 GT	4 fl oz/1000 ft2	Oct 8			
	Banner Maxx	2 fl oz/1000 ft2	Oct 22			
3	Smith-Kerns model: Standard					
	Emerald	0.18 oz/1000 ft2	28 day			
	Banner Maxx	2 fl oz/1000 ft2	21 day			
	Interface	4 fl oz/1000 ft2	14 day			
	Velista	0.5 oz/1000 ft2	14 day			
	Secure	0.5 fl oz/1000 ft2		7.0-	7.0a	5.8a
	Xzemplar	0.26 fl oz/1000 ft2	28 day			
	Pinpoint	0.31 fl oz/1000 ft2	28 day			
	26 GT	4 fl oz/1000 ft2	14 day			
	Banner Maxx	2 fl oz/1000 ft2	14 day			
			LSD P=.05	0.96	0.5	

[a]Turfgrass quality was rated visually on a 1 – 9 scale with 6 being acceptable. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD). Means followed by dashes indicate no significant differences were observed among any of the treatments.