Precision Dollar Spot Management

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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 calendar 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 AI8004VS 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 call 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. The custom weather stations were developed by Walker Olson and Josh Friell of Toro. 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, turfgrass quality, and Smith-Kerns model numbers from all locations can be found in the following tables.

RESULTS AND DISCUSSION

Due to disease pressure being similar between the three weather stations, there were no differences in application timings among the three locations. However, there were clearly differences in dollar spot pressure among the three locations that indicates that precision dollar spot management could be an effective way to more efficiently manage dollar spot. Hole 18 had the most dollar spot during much of the first part of the season and had the highest SK Model numbers during those periods. 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 13 days over the course of the summer.

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

	Jul 8	Aug 5	Sep 2
OJ Noer	270.0	485.0	541.0
7 Fwy	49.0	320.8	714.3
18 Fwy	223.0	5.5	74.5

Table 2. Mean number of dollar spot infection centers per treatment at the OJ Noer Turfgrass Research and Education Facility in Madison, WI in 2020.

		Treatment	Rate	Application Date/Interval	Dollar spot severity[a]		
					Jul 8	Aug 5	Sep 2
1		Non-treated control			270.0a	485.0a	541.0a
2	Standard Program	Emerald	0.18 OZ/1000 FT2	May 29	27.3b	5.3b	7.8b
		Banner Maxx	2.0 FL OZ/1000 FT2	Jun 25			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	Oct 8			
		Banner Maxx	2.0 FL OZ/1000 FT2	Oct 22			
3	Smith-Kerns model: Standard	Emerald	0.18 OZ/1000 FT2	28 day	75.3b	5.5b	8.5b
		Banner Maxx	2.0 FL OZ/1000 FT2	21 day			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	14 day			
		Banner Maxx	2.0 FL OZ/1000 FT2	14 day			
4	Smith-Kerns model: Clarke Correction	Emerald	0.18 OZ/1000 FT2	28 day	57.8b	29.0b	8.5b
		Banner Maxx	2.0 FL OZ/1000 FT2	21 day			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	14 day			
		Banner Maxx	2.0 FL OZ/1000 FT2	14 day			
				LSD P=.05	54.31	115.31	167.55

[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 2020.

	Treatment	Rate	Application Date/Interval	Turf Quality[a]		
				Jul 8	Aug 5	Sep 2
1	Non-treated control			4.0c	3.8b	4.0b
2	Standard Program	Emerald	0.18 OZ/1000 FT2	May 29	6.8a	7.0a	6.8a
		Banner Maxx	2.0 FL OZ/1000 FT2	Jun 25			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	Oct 8			
		Banner Maxx	2.0 FL OZ/1000 FT2	Oct 22			
3	Smith-Kerns model: Standard	Emerald	0.18 OZ/1000 FT2	28 day	5.3b	7.0a	6.5a
		Banner Maxx	2.0 FL OZ/1000 FT2	21 day			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	14 day			
		Banner Maxx	2.0 FL OZ/1000 FT2	14 day			
4	Smith-Kerns model: Clarke Correction	Emerald	0.18 OZ/1000 FT2	28 day	5.3b	6.8a	7.0a
		Banner Maxx	2.0 FL OZ/1000 FT2	21 day			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	14 day			
		Banner Maxx	2.0 FL OZ/1000 FT2	14 day			
				LSD P=.05	0.77	0.6	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 2020.

	Treatment		Rate	Application Date/Interval	Dollar spot severity[a]		
					Jul 8	Aug 5	Sep 2
1		Non-treated control			49.0a	320.8a	714.3a
2	Standard Program	Emerald	0.18 OZ/1000 FT2	May 29	5.5a	131.0a	2.8b
		Banner Maxx	2.0 FL OZ/1000 FT2	Jun 25			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	Oct 8			
		Banner Maxx	2.0 FL OZ/1000 FT2	Oct 22			
3	Smith-Kerns model: Standard	Emerald	0.18 OZ/1000 FT2	28 day	18.5a	160.8a	6.3b
		Banner Maxx	2.0 FL OZ/1000 FT2	21 day			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	14 day			
		Banner Maxx	2.0 FL OZ/1000 FT2	14 day			
				LSD P=.05	66.88	266.31	145.14

[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 2020.

	Treatment		Rate	Application Date/Interval	Turf Quality[a]		
					Jul 8	Aug 5	Sep 2
1		Non-treated control			5.5b	4.5b	4.3b
2	Standard Program	Emerald	0.18 OZ/1000 FT2	May 29	7.0a	7.0a	7.0a
		Banner Maxx	2.0 FL OZ/1000 FT2	Jun 25			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	Oct 8			
		Banner Maxx	2.0 FL OZ/1000 FT2	Oct 22			
3	Smith-Kerns model: Standard	Emerald	0.18 OZ/1000 FT2	28 day	6.5a	7.0a	7.0a
		Banner Maxx	2.0 FL OZ/1000 FT2	21 day			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	14 day			
		Banner Maxx	2.0 FL OZ/1000 FT2	14 day			
				LSD P=.05	0.82	0.58	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.

Table 6. Mean number of dollar spot infection centers per treatment at University Ridge 18 fairway in Madison, WI in 2020.

	Treatment		Rate	Application Date/Interval	Dollar spot severity[a]		
					Jul 8	Aug 5	Sep 2
1		Non-treated control			223.0a	5.5a	74.5a
2	Standard Program	Emerald	0.18 OZ/1000 FT2	May 29	18.3a	0.0a	0.0b
		Banner Maxx	2.0 FL OZ/1000 FT2	Jun 25			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	Oct 8			
		Banner Maxx	2.0 FL OZ/1000 FT2	Oct 22			
3	Smith-Kerns model: Standard	Emerald	0.18 OZ/1000 FT2	28 day	33.8a	0.0a	0.0b
		Banner Maxx	2.0 FL OZ/1000 FT2	21 day			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	14 day			
		Banner Maxx	2.0 FL OZ/1000 FT2	14 day			
				LSD P=.05	175.93	10.99	55.18

[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 2020.

	Treatment		Rate	Application Date/Interval	Turf Quality[a]		
					Jul 8	Aug 5	Sep 2
1		Non-treated control			4.5b	5.5b	5.8b
2	Standard Program	Emerald	0.18 OZ/1000 FT2	May 29	6.8a	7.0a	7.0a
		Banner Maxx	2.0 FL OZ/1000 FT2	Jun 25			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	Oct 8			
		Banner Maxx	2.0 FL OZ/1000 FT2	Oct 22			
3	Smith-Kerns model: Standard	Emerald	0.18 OZ/1000 FT2	28 day	6.5a	7.0a	7.0a
		Banner Maxx	2.0 FL OZ/1000 FT2	21 day			
		Interface	4.0 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	4.0 FL OZ/1000 FT2	14 day			
		Banner Maxx	2.0 FL OZ/1000 FT2	14 day			
				LSD P=.05	1.38	0.58	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.
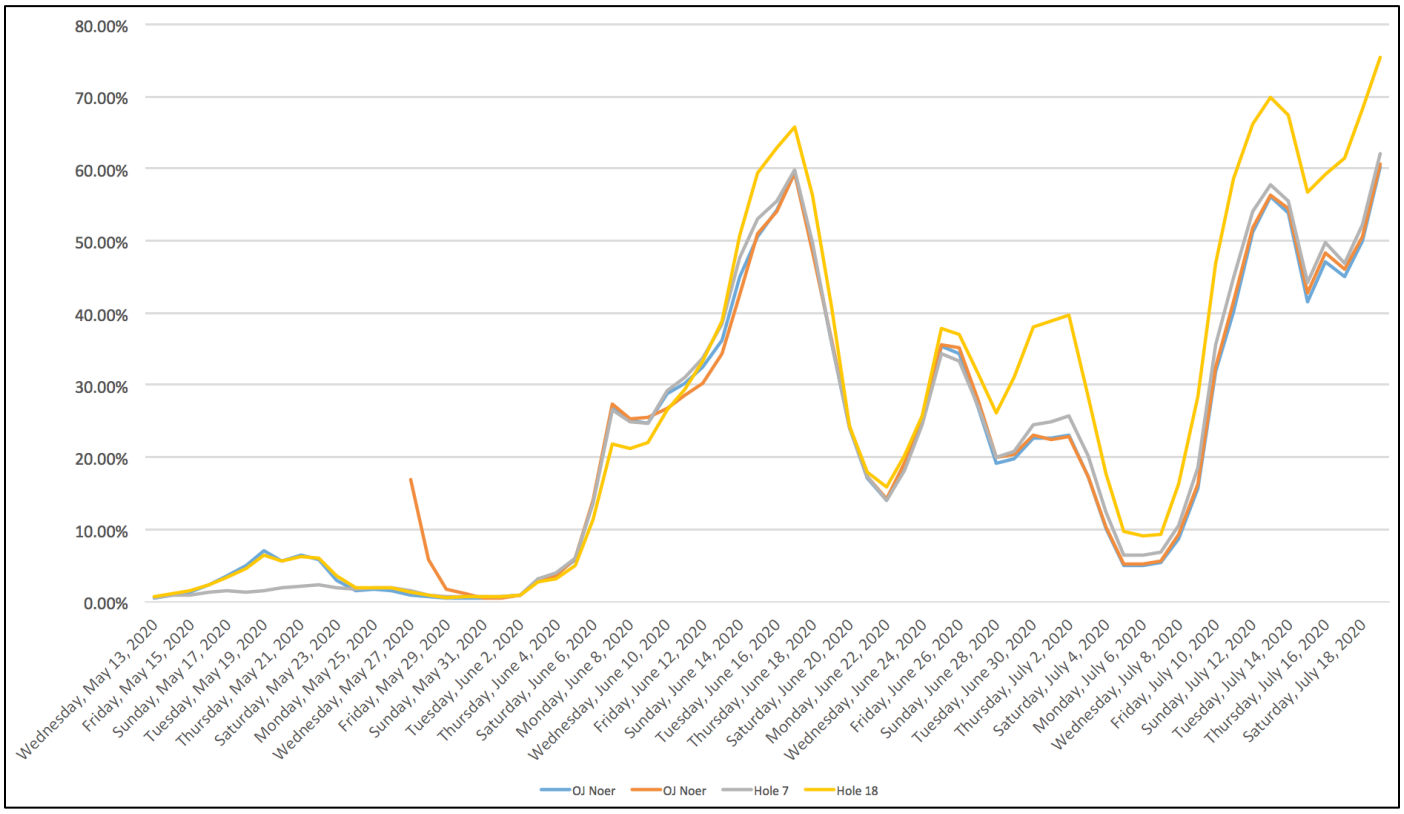
Figure 1. Smith-Kerns Dollar Spot Model Probabilities at the OJ Noer Center and Hole 7 and 18 at University Ridge GC in Madison, WI during the summer of 2020.