

Fungicides for Control of Spring Dead Spot Disease in Bermudagrass Turf 2019-20 Report

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Fungicides for Control of Spring Dead Spot Disease in Bermudagrass Turf 2019-20 Report

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The Bottom Line: Nineteen commercial and experimental fungicide treatments were tested against an untreated control for their ability to prevent the development of spring dead spot (SDS) disease caused by *Ophiosphaerella* spp. in bermudagrass (*Cynodon* spp.) turf. Study was conducted on the 15th and 16th fairways at Peach Tree Golf and Country Club in Marysville. All treatments were applied preventively on October 17 and November 15, 2019. In addition, some treatments were applied at green-up on March 4, 2020. Mirage Stressgard at 2.0 oz/M and experimental treatment containing UCR 002 resulted in significantly darker turfgrass color 6 weeks after initial treatment (WAIT) when bermudagrass entered dormancy. Both products contained a green pigment which contributed to the observed color retention. Furthermore, on fairway no. 16 only, Lexicon Intrinsic at 0.47 oz/M and UCR 001 alone (treatment 18) also resulted in improved turf color retention when compared to untreated plots at 6 WAIT, whereas those treatments did not contain pigment. Unfortunately, severe and uniform SDS symptoms did not develop in either fairway study area, resulting in high variability among collected data. Therefore, no significant differences were observed among fungicide treatments for SDS cover. However, several treatments led by a tank-mix of Posterity and Mirage Stressgard appeared to enhance spring green-up of bermudagrass. SDS severity was mapped in adjacent fairway areas and will be used to evaluate fungicide efficacy in 2020-21.

Acknowledgments

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Introduction

Bermudagrass (*Cynodon* spp.) is considered by many to be the “go to” turfgrass species for golf courses, athletic fields, and other turf areas throughout most of California because of its water use efficiency, tolerance to drought, salinity, and traffic, and recovery from wear. Bermudagrass is also tolerant to most pests, especially in California’s Mediterranean climate. However, bermudagrass can be susceptible to spring dead spot (SDS), a root disease caused by three primary species of fungi in the genus *Ophiosphaerella* (*O. narmari*, *O. korrae*, *O. herpotricha*). Typically, SDS occurs on intensively managed bermudagrass turf that is subject to freezing temperatures and winter dormancy. Although the disease is active during the fall and, in some cases, early spring, symptoms of circular dead patches do not appear

until green-up and active growth in spring. Then, turf recovery in affected areas can be very slow and often symptoms reappear in the same vicinity year after year.

Cultural and chemical management of SDS provides no guarantee of complete disease control. However, it is best to avoid late season nitrogen fertilization even though results are mixed. Winter hardy bermudagrass cultivars that are best adapted for the U.S. transition zone tend to be more tolerant to SDS, however, these cultivars are usually not well adapted for use in California. If there is a history of SDS on bermudagrass in California, usually it is best to apply a fungicide or fungicides beginning in September or October followed by a repeat application 30 days after. Historically, the DMI and QoI fungicides have been most effective on SDS. More recent focus has included SDHI fungicides for SDS control. Results from three consecutive years of SDS fungicide trials at North Ridge CC (Sacramento) on SDS caused by *O. narmari* demonstrated synergistic or additive effects of tank-mixing DMI or QoI with SDHI fungicides for enhanced control of SDS. Xzemplar (fluxapyroxad) appeared to have the greatest activity on SDS at North Ridge CC among the SDHI fungicides followed by Velista (penthioopyrad) when applied at the highest label rate. Posterity (pydiflumetofen), a new sub-class of SDHI, provided good SDS control at higher rates or with three applications. A similar trend was observed for Exteris Stressgard (fluopyram + trifloxystrobin), a combination of SDHI and QoI active ingredients. Among the DMI fungicides, Mirage (tebuconazole) provided the most consistent SDS control when applied alone or in combination with SDHI or QoI fungicides. Maxtima (mefentrifluconazole) appeared to provide similar effective control, but it was tested only one season at North Ridge CC. Among treatments containing QoI fungicides, Lexicon (pyraclostrobin + fluxapyroxad) performed well over three years of testing and Navicon (mefentrifluconazole + pyraclostrobin) performed very well in one year of testing.

Objectives

This study was conducted to evaluate efficacy of 20 different fungicide treatments to control spring dead spot (*Ophiosphaerella* spp.) disease preventively in bermudagrass (*Cynodon* spp.) turf maintained as a golf course fairway.

Materials and Methods

The study was conducted on the 15th and 16th fairways at Peach Tree GCC in Marysville. Turf was bermudagrass (*Cynodon* spp.) with a history of SDS caused by *Ophiosphaerella* spp. fungi. Fungicide treatments were applied preventively on October 17 and November 15, 2019. In addition, some treatments were applied at turf green-up on March 4, 2020. Treatments were applied using a CO₂-powered backpack sprayer equipped with TeeJet 8003VS nozzles calibrated to deliver 2 gallons/1000 ft² of carrier. Experimental design was a complete randomized block with 5 replications on each fairway. Plot size was 6 ft × 8 ft with 2-ft alleys.

Starting from October 16, 2019 plots were evaluated biweekly (until November 27, 2019) for turfgrass visual quality (1-9; 9=best), turfgrass visual color (1-9; 9=best), injury caused by treatments (phytotoxicity; 0-10; 10 = highest) and for normalized difference vegetation index (NDVI) using GreenSeeker. On March 4 plots were evaluated for dormant turf cover (0-100%), due to absence of distinct disease symptoms and for turfgrass visual quality (1-9; 9=best). No data were collected during the week of March 16, due to the COVID-19 outbreak and travel restrictions implemented by UCR. On April 2 and 14, 2020 plots were evaluated for spring dead spot disease cover (0-100%) as well as for turfgrass visual quality (1-9; 9=best).

Data collected throughout the study were analyzed using analysis of variance for each evaluated trait, rating event and study area (fairway) separately and the means were compared using the Fisher's protected least significant difference (LSD) test at the 0.05 probability level ($P \leq 0.05$).

Results

None of the treatments caused turf phytotoxicity or had a significant impact on NDVI readings throughout the study (data not shown).

On November 27, 2019, when bermudagrass was slowly turning dormant, all treatments containing Mirage Stressgard or UCR 002 resulted in significantly darker visually estimated turfgrass color on fairway no. 15, although, this might be partially attributed to the presence of pigments in the products. Similarly, on fairway no. 16, treatments containing Mirage Stressgard or UCR 002 (Figure 2) generally exhibited darker green turf color when compared to the untreated control at 2, 4 and 6 weeks after initial treatment (WAIT), with the exception of Mirage Stressgard alone and UCR 001 + UCR 002 on November 15, 2019. Although UCR 001 alone (treatment 15) was not statistically comparable to Mirage Stressgard or UCR 002 treatments, it also displayed significantly darker green turf when compared to untreated control at 2 WAIT. Lexicon Intrinsic and UCR 001 alone (treatment 18) also resulted in improved turf color when compared to untreated plots 6 WAIT (Table 1).

At last rating event in the fall of 2019 (6 WAIT), Posterity alone at 0.32 oz/M and UCR 001 (treatment 18) were the only treatments which resulted in improved visual turfgrass quality when compared to untreated plots on fairway no. 16 (Table 1). On April 2, 2020 the highest turfgrass visual quality was observed with Xzemplar and Mirage Stressgard tank-mix, although, it was not significantly different from other treatments containing either Xzemplar or Mirage Stressgard alone or as a tank-mix constituents, as well as from Maxtima alone, Navicon Intrinsic alone or followed by Lexicon Intrinsic, Posterity alone at 0.32 oz/M, and from UCR 001 alone (treatment 18) and tank-mixed with UCR 002 (Table 2). No other significant differences regarding turfgrass visual quality were observed on either of the fairways throughout the study (data not shown).

Unfortunately, SDS pressure was not widespread within the study areas on both fairways in the spring of 2020, even though severe symptoms were observed in other sections of the fairways. Turfgrass on fairway no. 15 tend to green up slower than no. 16, and no distinct disease symptoms were present on either of fairways, therefore disease cover ratings on March 4, 2020 were substituted with dormant turf cover ratings. Moreover, high variability among replications was observed for data collected from both fairways, especially from fairway no. 15 resulting in lack of significant differences (Table 3). However, some significant differences regarding dormant turf cover were observed on March 4, 2020 on fairway no. 16. Kabuto applied once and Posterity at 0.16 oz/M applied twice, either as a standalone product or as a tank-mix with Banner Maxx II were the only treatments that did not differ from untreated plots. All remaining treatments showed less dormant grass cover than the untreated control, although no significant differences were shown among them. However, the lowest numeric dormant bermudagrass cover on this date was observed on plots that received a tank-mix of Posterity at 0.16 oz/M with Mirage Stressgard (Table 4). No other statistically significant differences were observed among treatments for dormant bermudagrass cover and actual SDS cover throughout the study (Tables 3 and 4). In the areas outside of the 2019-20 studies, which were severely affected by SDS, 400 new plots were established on April 29, 2020 on 2 fairways, yielding 72 plots with satisfactory SDS pressure for the 2020-21 study (Figure 3).

Tables and Figures

Table 1. Fungicide treatments tested in the spring dead spot disease control study in Marysville, CA. 2019-20.

No.	Treatment	Active ingredient	Company	Rate (oz/1000 ft ²)	Timing
1	Untreated Control	-	-	-	-
2	Kabuto	isofetamid	PBI-Gordon	3.20	A
3	Mirage Stressgard	tebuconazole	Bayer	2.00	ABC
4	Maxtima	mefentrifluconazole	BASF	0.80	ABC
5	Xzemplar	fluxapyroxad	BASF	0.26	AB
6	Navicon Intrinsic	mefentrifluconazole, pyraclostrobin	BASF	0.85	AB
7	Lexicon Intrinsic	fluxapyroxad, pyraclostrobin	BASF	0.47	AB
8	Xzemplar	fluxapyroxad	BASF	0.26	AB
	Mirage Stressgard	tebuconazole	Bayer	2.00	
9	Xzemplar	fluxapyroxad	BASF	0.26	AB
	Maxtima	mefentrifluconazole	BASF	0.80	
10	Navicon Intrinsic	mefentrifluconazole, pyraclostrobin	BASF	0.85	A
	Lexicon Intrinsic	fluxapyroxad, pyraclostrobin	BASF	0.47	
11	Posterity	pydiflumetofen	Syngenta	0.16	AB
12	Posterity	pydiflumetofen	Syngenta	0.32	AB
13	Posterity	pydiflumetofen	Syngenta	0.16	AB
	Banner Maxx II	propiconazole	Syngenta	2.00	
14	Posterity	pydiflumetofen	Syngenta	0.16	AB
	Mirage Stressgard	tebuconazole	Bayer	2.00	
15	UCR 001	<i>classified</i>	-	-	AB
16	UCR 001	<i>classified</i>	-	-	ABC
17	UCR 001	<i>classified</i>	-	-	ABC
	UCR 002	<i>classified</i>	-	-	
18	UCR 001	<i>classified</i>	-	-	AB
19	UCR 003	<i>classified</i>	-	-	AB
20	UCR 003	<i>classified</i>	-	-	AB

Application codes (timing):

A – 10/17/2019

B – 11/15/2019

C – 03/04/2020

Table 2. Effects of fungicide treatments on turfgrass visual color (Color; 1-9; 9 = best) on November 27 (6 WAIT**) on fairway no. 15 and on October 31 (2 WAIT), November 15 (4 WAIT) and November 27 (6 WAIT) on fairway no. 16, as well as on turfgrass visual quality (VQ; 1-9; 9 = best) on November 27 on fairway no. 16, evaluated on bermudagrass (*Cynodon* spp.). Marysville, CA, 2019.

No.	Treatment	Fairway No. 15		Fairway No. 16		
		Color	Color	Color	Color	VQ
		11/27	10/31	11/15	11/27	11/27
1	Untreated Control	6.0 DE*	6.2 E	6.4 BC	5.0 F-H	5.2 BC
2	Kabuto (3.20 oz/M) A*	5.6 E	6.6 C-E	6.4 BC	5.8 C-F	5.6 AB
3	Mirage Stressgard (2.00 oz/M) ABC	7.0 AB	7.4 AB	7.0 AB	7.8 A	5.8 AB
4	Maxtima (0.80 oz/M) ABC	5.8 DE	6.8 B-E	6.4 BC	5.4 D-G	5.4 A-C
5	Xzemplar (0.26 oz/M) AB	5.8 DE	6.6 C-E	6.0 C	5.4 D-G	5.4 A-C
6	Navicon Intrinsic (0.85 oz/M) AB	6.2 CD	6.4 DE	6.0 C	5.6 D-F	5.6 AB
7	Lexicon Intrinsic (0.47 oz/M) AB	6.2 CD	6.6 C-E	6.6 BC	6.0 C-E	5.6 AB
8	Xzemplar (0.26 oz/M) + Mirage Stressgard (2.00 oz/M) AB	6.6 BC	7.8 A	7.6 A	6.6 BC	5.2 BC
9	Xzemplar (0.26 oz/M) + Maxtima (0.80 oz/M) AB	6.0 DE	6.4 DE	6.2 BC	4.6 GH	4.8 CD
10	Navicon Intrinsic (0.85 oz/M) A fb. Lexicon Intrinsic (0.47 oz/M) B	6.0 DE	6.6 C-E	6.0 C	5.0 F-H	5.2 BC
11	Posterity (0.16 oz/M) AB	6.2 CD	6.6 C-E	6.2 BC	5.0 F-H	5.4 A-C
12	Posterity (0.32 oz/M) AB	6.0 DE	6.6 C-E	6.0 C	4.4 H	4.4 D
13	Posterity (0.16 oz/M) + Banner Maxx II (2.00 oz/M) AB	5.8 DE	6.4 DE	6.0 C	5.4 D-G	5.4 A-C
14	Posterity (0.16 oz/M) + Mirage Stressgard (2.00 oz/M) AB	7.2 A	7.4 AB	7.6 A	7.8 A	5.8 AB
15	UCR 001 AB	5.8 DE	7.0 B-D	6.4 BC	5.8 C-F	5.6 AB
16	UCR 001 ABC	6.0 DE	6.4 DE	6.2 BC	5.2 E-H	5.2 BC
17	UCR 001 + UCR 002 ABC	6.6 BC	7.4 AB	7.0 AB	7.2 AB	5.4 A-C
18	UCR 001 AB	6.2 CD	7.2 A-C	6.4 BC	6.2 CD	6.0 A
19	UCR 003 AB	5.6 E	6.4 DE	6.6 BC	5.8 C-F	5.8 AB
20	UCR 003 AB	6.0 DE	6.8 B-E	6.2 BC	5.6 D-F	5.8 AB

* Means followed by the same letter or by no letter in a column are not significantly different (P=0.05).

** WAIT – weeks after initial treatment.

*** Applications: A – 10/16/2019; B – 11/15/2019; C – 03/04/2020.



Figure 1. General view of the studies located on fairway no. 15 (A) and fairway no. 16 (B). Photos taken by P. Petelewicz on October 15, 2019. Marysville, CA.

Table 3. Effects of fungicide treatments on dormant turf cover (0-100%) and/or overall disease cover (0-100%) and turfgrass visual quality (1-9; 9=best), on March 4 (20 WAIT**), April 2 (24 WAIT), and April 14 (26 WAIT) evaluated on bermudagrass (BG; *Cynodon* spp.) on fairway no. 15. Marysville, CA, 2020.

No.	Treatment	Dormant BG Cover	Overall Disease Cover	
		3/4	4/2	4/14
1	Untreated Control	36.0*	8.8	6.0
2	Kabuto (3.20 oz/M) A***	40.0	1.4	2.0
3	Mirage Stressgard (2.00 oz/M) ABC	30.0	1.2	1.0
4	Maxtima (0.80 oz/M) ABC	28.0	1.2	1.0
5	Xzemplar (0.26 oz/M) AB	36.0	2.6	0.6
6	Navicon Intrinsic (0.85 oz/M) AB	21.0	2.0	1.0
7	Lexicon Intrinsic (0.47 oz/M) AB	36.0	2.2	1.6
8	Xzemplar (0.26 oz/M) + Mirage Stressgard (2.00 oz/M) AB	46.0	0.4	1.2
9	Xzemplar (0.26 oz/M) + Maxtima (0.80 oz/M) AB	28.0	0.4	0.4
10	Navicon Intrinsic (0.85 oz/M) A fb. Lexicon Intrinsic (0.47 oz/M) B	24.0	0.0	0.6
11	Posterity (0.16 oz/M) AB	27.0	0.8	0.8
12	Posterity (0.32 oz/M) AB	46.0	2.2	1.4
13	Posterity (0.16 oz/M) + Banner Maxx II (2.00 oz/M) AB	40.0	2.8	1.6
14	Posterity (0.16 oz/M) + Mirage Stressgard (2.00 oz/M) AB	26.0	0.4	0.6
15	UCR 001 AB	33.0	0.8	1.4
16	UCR 001 ABC	28.0	1.2	1.2
17	UCR 001 + UCR 002 ABC	23.0	1.2	0.8
18	UCR 001 AB	28.0	1.8	0.6
19	UCR 003 AB	35.0	1.2	0.8
20	UCR 003 AB	28.0	0.8	0.2

No.	Treatment	Visual Quality		
		3/4	4/2	4/14
1	Untreated Control	4.2*	5.6	5.2
2	Kabuto (3.20 oz/M) A***	3.8	5.8	5.4
3	Mirage Stressgard (2.00 oz/M) ABC	4.4	6.4	5.4
4	Maxtima (0.80 oz/M) ABC	4.2	5.8	6.0
5	Xzemplar (0.26 oz/M) AB	4.2	5.4	5.2
6	Navicon Intrinsic (0.85 oz/M) AB	5.2	6.2	5.8
7	Lexicon Intrinsic (0.47 oz/M) AB	3.6	5.6	5.8
8	Xzemplar (0.26 oz/M) + Mirage Stressgard (2.00 oz/M) AB	3.6	4.8	5.4
9	Xzemplar (0.26 oz/M) + Maxtima (0.80 oz/M) AB	4.2	6.0	5.8
10	Navicon Intrinsic (0.85 oz/M) A fb. Lexicon Intrinsic (0.47 oz/M) B	4.2	6.0	5.6
11	Posterity (0.16 oz/M) AB	4.6	6.4	6.2
12	Posterity (0.32 oz/M) AB	3.8	5.2	5.6
13	Posterity (0.16 oz/M) + Banner Maxx II (2.00 oz/M) AB	3.8	5.6	5.4
14	Posterity (0.16 oz/M) + Mirage Stressgard (2.00 oz/M) AB	4.8	6.2	6.2
15	UCR 001 AB	3.4	5.4	5.8
16	UCR 001 ABC	4.4	5.8	5.6
17	UCR 001 + UCR 002 ABC	4.6	6.0	5.8
18	UCR 001 AB	4.8	5.4	5.6
19	UCR 003 AB	4.4	6.0	5.8
20	UCR 003 AB	4.4	6.8	6.6

* Means followed by the same letter or by no letter in a column are not significantly different (P=0.05).

** WAIT – weeks after initial treatment.

*** Applications: A – 10/16/2019; B – 11/15/2019; C – 03/04/2020.

Table 4. Effects of fungicide treatments on dormant turf cover (0-100%) and/or overall disease cover (0-100%) and turfgrass visual quality (1-9; 9=best), on March 4 (20 WAIT**), April 2 (24 WAIT), and April 14 (26 WAIT) evaluated on bermudagrass (BG; *Cynodon* spp.) on fairway no. 16. Marysville, CA, 2020.

No.	Treatment	Dormant BG Cover	Overall Disease Cover	
		3/4	4/2	4/14
1	Untreated Control	23.6 AB	6.0	3.0
2	Kabuto (3.20 oz/M) A***	11.8 B-D	3.6	1.4
3	Mirage Stressgard (2.00 oz/M) ABC	2.0 CD	0.0	0.0
4	Maxtima (0.80 oz/M) ABC	4.0 CD	0.6	0.0
5	Xzemplar (0.26 oz/M) AB	6.4 CD	0.2	0.0
6	Navicon Intrinsic (0.85 oz/M) AB	2.2 CD	0.0	0.4
7	Lexicon Intrinsic (0.47 oz/M) AB	3.0 CD	0.0	0.0
8	Xzemplar (0.26 oz/M) + Mirage Stressgard (2.00 oz/M) AB	3.6 CD	0.4	0.0
9	Xzemplar (0.26 oz/M) + Maxtima (0.80 oz/M) AB	3.4 CD	0.0	0.0
10	Navicon Intrinsic (0.85 oz/M) A fb. Lexicon Intrinsic (0.47 oz/M) B	5.0 CD	0.2	0.0
11	Posterity (0.16 oz/M) AB	13.6 A-C	3.0	0.8
12	Posterity (0.32 oz/M) AB	8.4 CD	0.2	0.6
13	Posterity (0.16 oz/M) + Banner Maxx II (2.00 oz/M) AB	24.2 A	0.6	0.0
14	Posterity (0.16 oz/M) + Mirage Stressgard (2.00 oz/M) AB	0.6 D	0.0	0.0
15	UCR 001 AB	2.8 CD	0.0	0.4
16	UCR 001 ABC	10.2 CD	0.6	0.0
17	UCR 001 + UCR 002 ABC	4.6 CD	0.0	0.0
18	UCR 001 AB	7.6 CD	0.0	0.4
19	UCR 003 AB	9.2 CD	0.2	0.0
20	UCR 003 AB	3.8 CD	0.4	0.0

No.	Treatment	Visual Quality		
		3/4	4/2	4/14
1	Untreated Control	3.6	5.4 C	5.4
2	Kabuto (3.20 oz/M) A***	4.6	5.8 BC	6.0
3	Mirage Stressgard (2.00 oz/M) ABC	4.8	6.4 AB	6.6
4	Maxtima (0.80 oz/M) ABC	4.4	6.4 AB	6.6
5	Xzemplar (0.26 oz/M) AB	4.8	6.6 AB	6.6
6	Navicon Intrinsic (0.85 oz/M) AB	5.0	6.4 AB	6.4
7	Lexicon Intrinsic (0.47 oz/M) AB	4.6	6.2 A-C	6.4
8	Xzemplar (0.26 oz/M) + Mirage Stressgard (2.00 oz/M) AB	4.6	6.8 A	6.6
9	Xzemplar (0.26 oz/M) + Maxtima (0.80 oz/M) AB	4.4	6.4 AB	6.4
10	Navicon Intrinsic (0.85 oz/M) A fb. Lexicon Intrinsic (0.47 oz/M) B	4.4	6.4 AB	6.2
11	Posterity (0.16 oz/M) AB	4.2	5.8 BC	6.2
12	Posterity (0.32 oz/M) AB	4.4	6.4 AB	6.4
13	Posterity (0.16 oz/M) + Banner Maxx II (2.00 oz/M) AB	3.8	5.4 C	5.4
14	Posterity (0.16 oz/M) + Mirage Stressgard (2.00 oz/M) AB	4.8	6.6 AB	6.8
15	UCR 001 AB	4.2	6.2 A-C	6.6
16	UCR 001 ABC	4.4	6.0 A-C	6.4
17	UCR 001 + UCR 002 ABC	5.0	6.6 AB	6.4
18	UCR 001 AB	4.4	6.6 AB	6.6
19	UCR 003 AB	4.2	6.0 A-C	6.0
20	UCR 003 AB	4.8	6.4 AB	6.4

* Means followed by the same letter or by no letter in a column are not significantly different (P=0.05).

** WAIT – weeks after initial treatment.

*** Applications: A – 10/16/2019; B – 11/15/2019; C – 03/04/2020.

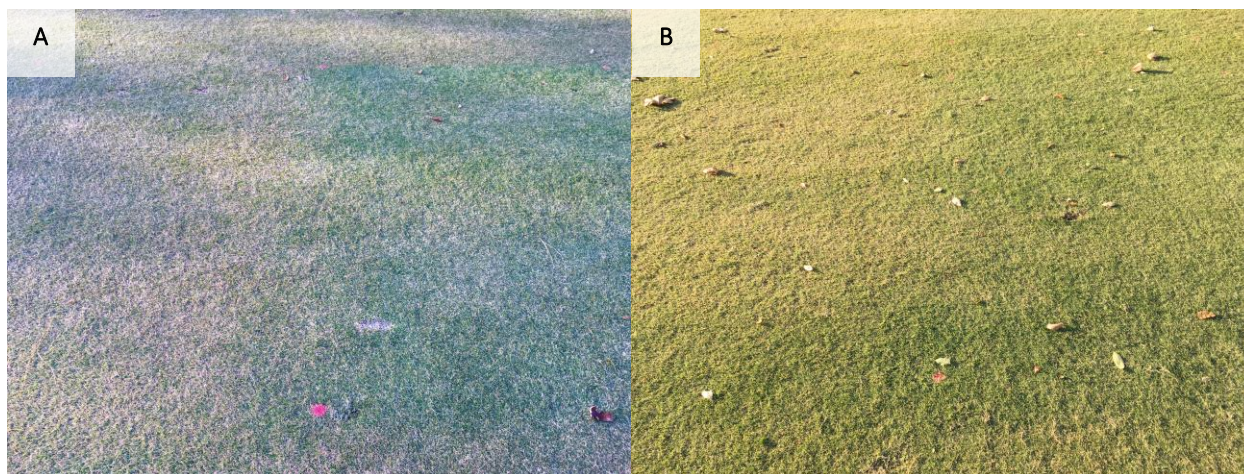


Figure 2. Comparison of (A) plot treated with Kabuto at 3.2 oz/M (1 app; left) to plot treated with Mirage Stressgard at 2.0 oz/M (2 apps; 4-wk interval; right) and (B) plot treated with UCR 001 (treatment 16; 2 apps to date; 4-wk interval; right) to plot treated with tank-mix of UCR 001 and UCR 002 (2 apps; 4-wk interval; right) at 6 WAIT on fairway no. 16. Photos taken by P. Petelewicz on November 27, 2019. Marysville, CA.

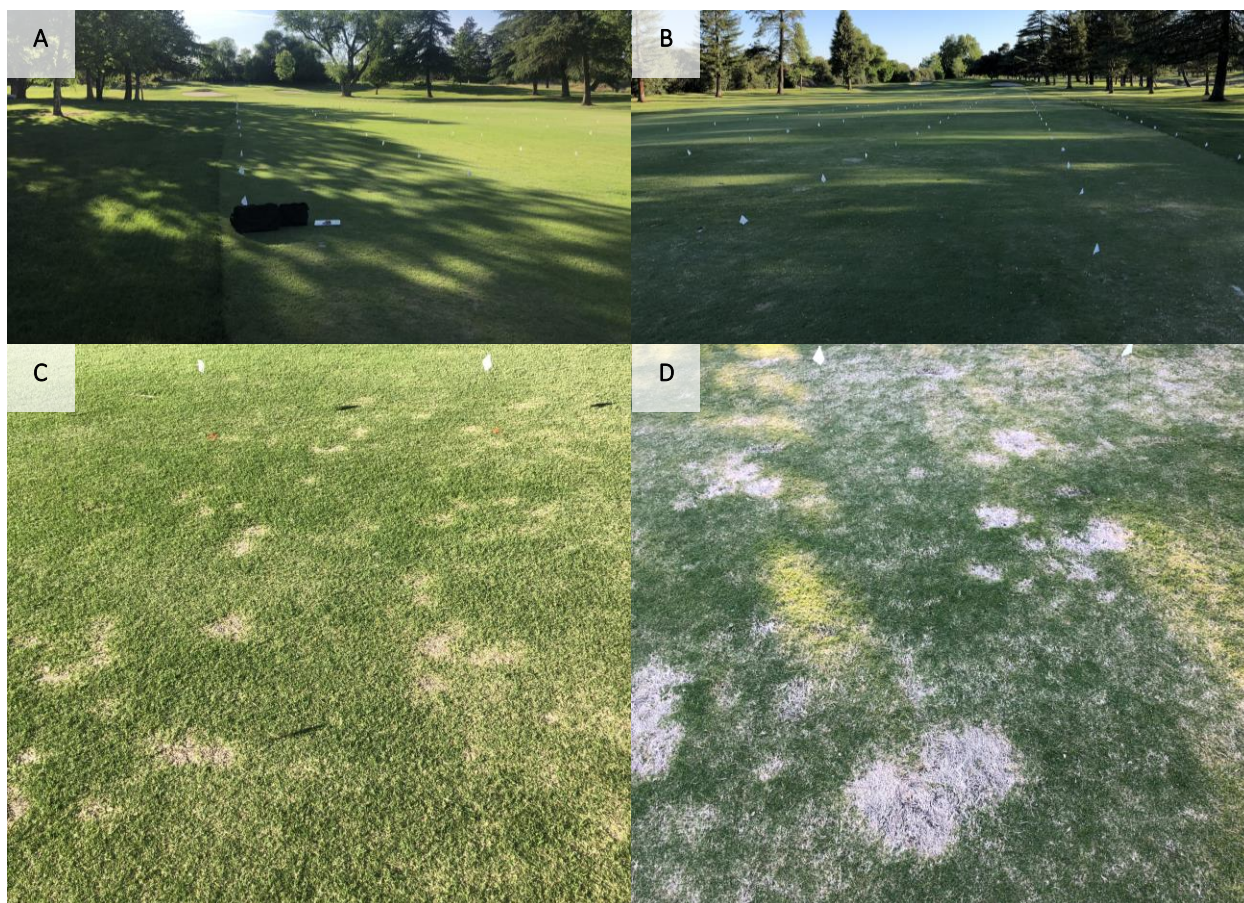


Figure 3. (A,B) General view of the newly established study areas located on bermudagrass (*Cynodon* spp.) fairways with severe spring dead spot (SDS, *Ophiosphaerella* spp.) pressure, which are going to be utilized for 2020-21 study, and (C,D) examples of SDS cover in individual plots. Photos taken by J. Baird on April 29, 2020. Marysville, CA.