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Fungicides for Snow Mold Disease in Cool-Season Turf 2019-20 Report

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Fungicides for Control of Snow Mold Disease in Cool-Season Turf 2019-20 Report

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The Bottom Line: Eleven combinations of commercially available fungicide treatments were tested against an untreated control for their ability to prevent the development of either pink snow mold (*Microdochium nivale*) or gray snow mold (*Typhula* spp.) diseases in a mixed stand of kentucky bluegrass (*Poa pratensis*) and annual bluegrass (*Poa annua*) on both fairway and rough turf at the Martis Camp Club in Truckee, CA. All treatments were applied preventively, once on November 20, 2019. Overall disease cover was greater in rough compared to fairway turf. In rough, a combination of pink and gray snow mold and winter injury contributed to disease cover; whereas, mostly pink snow mold was present on the fairway. All of the fungicide treatments significantly reduced pink snow mold disease cover compared to the untreated control on the fairway and only Tourney + Daconil Weatherstik was less than optimal compared to the other treatments. Civitas Turf Defense improved performance of Tourney + Daconil Action, but did not eliminate disease activity. Similar trends among treatments were observed in the rough. Treatments with Interface Stressgard, Insignia SC Intrinsic + Maxtima + Turfcide 400, and Navicon Intrinsic resulted in slight (numerical) improvements in disease cover and quality and, while turf at Martis Camp typically recovers quickly from snow mold disease, it appeared that treatments containing pyraclostrobin and mefentrifluconazole further hastened recovery in the rough. Overall, results of this study demonstrated several fungicides and combinations that are effective against snow mold diseases on fairway and rough turf.

Acknowledgments

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Introduction

Gray snow mold (GSM) caused by the fungi *Typhula incarnata* or *T. ishikariensis*, is a cool-season turfgrass disease in areas with prolonged snow cover (usually 60 days or longer). Gray snow mold is most severe when heavy snow falls on unfrozen ground. In severe cases, GSM can kill large areas of turf, and recovery can be extremely slow. Typically, disease activity and resultant turf injury are related to the length of snow cover, under which the symptoms of the disease develop. Gray snow mold symptoms usually appear as circular or irregular patches up to 3 feet or more in diameter. Turf within these patches turns

Cover photo taken by P. Petelewicz on May 1, 2019. Truckee, CA.

white or gray and matted together and small, tan or brown fruiting bodies (sclerotia) can be seen on infected leaves or imbedded within foliage. Control of GSM on large areas like golf course fairways with extended snow cover normally involves one timely application before the first significant snowfall event. Pentachloronitrobenzene (PCNB), demethylation inhibitor (DMI), QoI, dicarboximide, and chloronitrile fungicides are typically used to manage this disease.

Pink snow mold (PSM) or *Microdochium* Patch caused by *Microdochium nivale* can also develop during periods of snow cover, with symptoms of the disease becoming evident as the snow melts. However, unlike GSM, snow cover is not necessary for extensive pink snow mold infection. Disease symptoms include roughly circular patches from 2 inches to 1 foot in diameter that are white or light tan in color. A ring of pink-colored growth is present on the outer edge of patches when the disease is actively developing. Infected leaves within the patches are usually collapsed and matted down. Many of the same fungicide classes are effective against both GSM and PSM.

Objectives

This study was conducted to evaluate efficacy of 12 different fungicide treatments to control gray snow mold (*Typhula* spp.) and pink snow mold (*Microdochium nivale*) diseases preventively in kentucky bluegrass (*Poa pratensis*) and annual bluegrass (*Poa annua*) turf maintained as a golf course fairway or rough.

Materials and Methods

The study was conducted on the 4th fairway and repeated in the adjacent rough at the Martis Camp Club in Truckee. Turf was a mix of kentucky bluegrass (*Poa pratensis*) and annual bluegrass (*Poa annua*). Fungicide treatments were applied preventively on November 20, 2019, prior to the forecasted first significant snowfall of the season. Treatments (Table 1) were applied using a CO_2-powered backpack sprayer equipped with TeeJet 8003VS nozzles calibrated to deliver 2 gallons/1000 ft^2 of carrier. Experimental design was a complete randomized block with 4 replications (replicated for each height of cut (HOC)). Plot size was 4 ft × 6 ft with 2-ft alleys.

Plots became visible after initial winter snow melt on March 11, but then additional significant snowfall occurred shortly after and plots were not visible again until subsequent ratings on April 14 and April 28, 2020. Plots were evaluated for overall disease cover (0-100%) as well as for turfgrass visual quality (1-9; 9=best). Data were analyzed using analysis of variance for each evaluated trait and rating event 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

Significant snowfall was delayed following fungicide application in November and most of the season's snowfall and extended periods of snow cover occurred during late winter and early spring (data not shown). Overall disease cover was greater in rough compared to fairway turf (Table 2), and corresponded with turf quality (Table 3). In rough, a combination of PSM, GSM, and winter injury contributed to disease cover; whereas, mostly PSM was present on the fairway (Figures 1 and 2). All of the fungicide treatments significantly reduced PSM disease cover compared to the untreated control on the fairway and only Tourney + Daconil Weatherstik was less than optimal compared to the other treatments. Civitas Turf Defense improved performance of Tourney + Daconil Action, but did not eliminate disease activity.

Similar trends among treatments were observed in the rough (Tables 2 and 3). Treatments with Interface Stressgard, Insignia + Maxtima + Turfcide, and Navicon resulted in slight (numerical) improvements in disease cover and quality and, while turf at Martis Camp typically recovers quickly from snow mold disease, it appeared that treatments containing pyraclostrobin and mefentrifluconazole further hastened recovery in the rough. Overall, results of this study demonstrated several fungicides and combinations that are effective against snow mold diseases on fairway and rough turf.

Tables and Figures

Table 1. Fungicide treatments tested in the gray snow mold and pink snow mold diseases control study in Truckee, CA. 2019.

No.	Treatment	Active ingredient	Company	Rate		Timing
1	Untreated Control	-	-			-
2	Daconil WeatherStik	chlorothalonil	Syngenta	5.50	oz/M	A
	Interface Stressgard	iprodione, trifloxystrobin	Bayer	6.00	oz/M	
	Mirage Stressgard	tebuconazole	Bayer	2.00	oz/M	
3	Interface Stressgard	iprodione, trifloxystrobin	Bayer	3.00	oz/M	A
	Tartan Stressgard	trifloxystrobin, triadimefon	Bayer	1.00	oz/M	
	Turfcide 400	pentachloronitrobenzene (PCNB)	AMVAC	4.00	oz/M	
4	Interface Stressgard	iprodione, trifloxystrobin	Bayer	6.00	oz/M	A
	Mirage Stressgard	tebuconazole	Bayer	2.00	oz/M	
	Turfcide 400	pentachloronitrobenzene (PCNB)	AMVAC	4.00	oz/M	
5	Interface Stressgard	iprodione, trifloxystrobin	Bayer	4.00	oz/M	A
	Mirage Stressgard	tebuconazole	Bayer	1.50	oz/M	
	Turfcide 400	pentachloronitrobenzene (PCNB)	AMVAC	4.00	oz/M	
6	Concert II	chlorothalonil, propiconazole	Syngenta	8.30	oz/M	
7	Instrata	chlorothalonil, propiconazole, fludioxonil	Syngenta	7.00	oz/M	A
8	Insignia SC Intrinsic	pyraclostrobin	BASF	0.70	oz/M	A
	Trinity	triticonazole	BASF	1.00	oz/M	
	Turfcide 400	pentachloronitrobenzene (PCNB)	AMVAC	6.00	oz/M	
9	Insignia SC Intrinsic	pyraclostrobin	BASF	0.70	oz/M	A
	Maxtima	mefentrifuconazole	BASF	0.80	oz/M	
	Turfcide 400	pentachloronitrobenzene (PCNB)	AMVAC	6.00	oz/M	
10	Navicon Intrinsic	mefentrifuconazole, pyraclostrobin	BASF	0.85	oz/M	A
11	Tourney	metconazole	Valent	1.00	lb/A	A
	Daconil WeatherStik	chlorothalonil	Syngenta	5.50	oz/M	
12	Tourney	metconazole	Valent	1.00	lb/A	A
	Daconil WeatherStik	chlorothalonil	Syngenta	5.50	oz/M	
	CIVITAS TURF DEFENSE	mineral oil	Intelligro	17.00	oz/M	

Application codes (timing):
A – 11/20/2019

Table 2. Effects of height of cut (HOC) and fungicide treatments on overall disease cover (0-100%) on March 11 (16 WAIT[**]), April 14 (21 WAIT), and April 28 (23 WAIT) evaluated on mixed stand of kentucky bluegrass (*Poa pratensis*) and annual bluegrass (*Poa annua*). Truckee, CA, 2020.

No.	Height of Cut	Overall Disease Cover		
		3/11	4/14	4/28
1	Fairway	5.0 B[*]	8.3 B	6.1 B
2	Rough	20.9 A	19.2 A	12.6 A
Fairway				
1	Untreated Control	30.0 A[*]	50.0 A	31.3 A
2	Daconil WeatherStik[***] + Interface Stressgard + Mirage Stressgard	0.0 D	0.0 C	1.0 C
3	Interface Stressgard + Tartan Stressgard + Turfcide 400	0.0 D	0.0 C	0.8 C
4	Interface Stressgard + Mirage Stressgard + Turfcide 400	0.0 D	0.0 C	0.5 C
5	Interface Stressgard + Mirage Stressgard + Turfcide 400	0.0 D	0.0 C	1.0 C
6	Concert II	3.8 CD	7.5 C	4.0 C
7	Instrata	0.0 D	0.0 C	1.5 C
8	Insignia SC Intrinsic + Trinity + Turfcide 400	0.0 D	0.0 C	1.0 C
9	Insignia SC Intrinsic + Maxtima + Turfcide 400	0.0 D	0.0 C	2.0 C
10	Navicon Intrinsic	8.8 BC	7.5 C	2.0 C
11	Tourney + Daconil WeatherStik	15.0 B	23.8 B	20.0 B
12	Tourney + Daconil WeatherStik + CIVITAS TURF DEFENSE	2.5 CD	11.3 BC	8.3 C
Rough				
1	Untreated Control	45.0 A[*]	62.5 A	28.8 A
2	Daconil WeatherStik[***] + Interface Stressgard + Mirage Stressgard	17.5 B	10.0 C	8.3 BC
3	Interface Stressgard + Tartan Stressgard + Turfcide 400	23.8 AB	11.3 C	9.5 BC
4	Interface Stressgard + Mirage Stressgard + Turfcide 400	15.0 B	7.5 C	10.5 BC
5	Interface Stressgard + Mirage Stressgard + Turfcide 400	10.0 B	6.3 C	12.0 BC
6	Concert II	15.0 B	16.3 BC	10.0 BC
7	Instrata	25.0 AB	21.3 BC	17.5 AB
8	Insignia SC Intrinsic + Trinity + Turfcide 400	26.3 AB	20.0 BC	10.0 BC
9	Insignia SC Intrinsic + Maxtima + Turfcide 400	12.5 B	11.3 C	6.8 BC
10	Navicon Intrinsic	20.0 B	13.8 C	3.8 C
11	Tourney + Daconil WeatherStik	22.5 B	32.5 B	18.3 AB
12	Tourney + Daconil WeatherStik + CIVITAS TURF DEFENSE	18.8 B	17.5 BC	15.8 BC

[*] Means followed by the same letter in a column for each mowing height are not significantly different (P=0.05).
[**] WAIT – weeks after initial treatment.
[***] Fungicide rates listed in Table 1.

Table 3. Effects of height of cut (HOC) and fungicide treatments on turfgrass visual quality (1-9; 9=best) on March 11 (16 WAIT[**]), April 14 (21 WAIT), and April 28 (23 WAIT) evaluated on mixed stand of kentucky bluegrass (*Poa pratensis*) and annual bluegrass (*Poa annua*). Truckee, CA, 2020.

No.	Treatment	Visual Quality		
		3/11	4/14	4/28
1	Fairway	6.2 A[*]	6.0 A	6.5 A
2	Rough	4.6 B	4.8 B	5.7 B
Fairway				
1	Untreated Control	3.5 D[*]	2.8 E	4.0 E
2	Daconil WeatherStik[***] + Interface Stressgard + Mirage Stressgard	6.8 A	7.3 A	7.0 AB
3	Interface Stressgard + Tartan Stressgard + Turfcide 400	6.8 A	7.5 A	7.3 A
4	Interface Stressgard + Mirage Stressgard + Turfcide 400	7.3 A	7.5 A	7.5 A
5	Interface Stressgard + Mirage Stressgard + Turfcide 400	6.8 A	7.3 A	7.3 A
6	Concert II	6.3 AB	5.3 BCD	6.8 ABC
7	Instrata	7.0 A	6.5 AB	6.8 ABC
8	Insignia SC Intrinsic + Trinity + Turfcide 400	6.5 A	6.5 AB	7.0 AB
9	Insignia SC Intrinsic + Maxtima + Turfcide 400	6.8 A	6.3 ABC	6.8 ABC
10	Navicon Intrinsic	5.3 BC	5.0 CD	6.3 BC
11	Tourney + Daconil WeatherStik + Tourney	5.0 C	4.3 D	5.3 D
12	Tourney + Daconil WeatherStik + CIVITAS TURF DEFENSE	6.3 AB	5.8 BC	6.0 CD
Rough				
1	Untreated Control	3.0 C[*]	2.8 C	4.0 C
2	Daconil WeatherStik[***] + Interface Stressgard + Mirage Stressgard	5.8 A	5.5 A	6.0 AB
3	Interface Stressgard + Tartan Stressgard + Turfcide 400	4.8 AB	5.5 A	5.8 AB
4	Interface Stressgard + Mirage Stressgard + Turfcide 400	5.8 A	5.8 A	6.0 AB
5	Interface Stressgard + Mirage Stressgard + Turfcide 400	5.3 A	5.8 A	6.3 A
6	Concert II	4.8 AB	4.5 AB	6.0 AB
7	Instrata	3.5 BC	4.5 AB	5.3 ABC
8	Insignia SC Intrinsic + Trinity + Turfcide 400	4.3 ABC	5.0 AB	5.8 AB
9	Insignia SC Intrinsic + Maxtima + Turfcide 400	5.0 AB	5.0 AB	6.5 A
10	Navicon Intrinsic	4.5 ABC	5.0 AB	6.3 A
11	Tourney + Daconil WeatherStik + Tourney	4.3 ABC	4.0 BC	4.8 BC
12	Tourney + Daconil WeatherStik + CIVITAS TURF DEFENSE	4.5 ABC	4.8 AB	6.3 A

[*] Means followed by the same letter in a column for each mowing height are not significantly different (P=0.05).
[**] WAIT – weeks after initial treatment.
[***] Fungicide rates listed in Table 1.

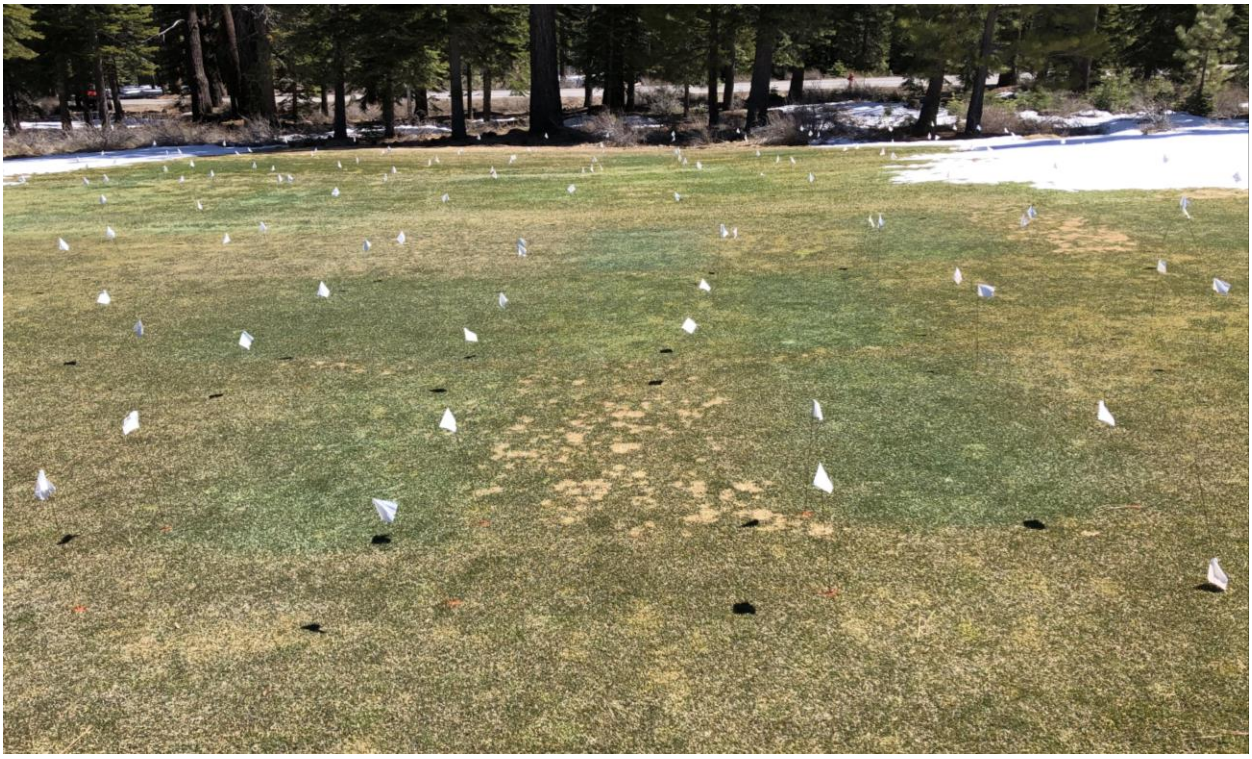

Figure 1. Pink snow mold disease on untreated control plot surrounded by effective fungicide treatments on the 4th fairway at Martis Camp Club, Truckee, CA. Photo taken by J. Baird on April 14, 2020.

Figure 2. Snow mold disease pressure in rough adjacent to the 4th fairway at Martis Camp Club, Truckee, CA. Photo taken by J. Baird on April 14, 2020.