

AMVAC - Snow Mold Control with Various Fungicide Combinations with Turfcide on Fairways in Washington and Montana 2014-2015

(Final Report)

AMVAC Protocol #: PD142133 2014

Charles T. Golob and William J. Johnston
Dept. Crop and Soil Sciences
Washington State University
June 4, 2015

Snow mold control trials were conducted at 2 locations in the Intermountain Region of the PNW, a fairway at Chewelah Golf and Country Club in Chewelah, WA and a fairway at Meadow Lake Resort Golf Course in Columbia Falls, MT. Grass species present at each location: Kentucky bluegrass, perennial ryegrass, creeping bentgrass, and annual bluegrass. Individual treatment plots were 6' x 7' with four replications in a randomized complete-block design at Chewelah and plots were 6' x 6' with three replications in a randomized complete-block design at Columbia Falls. Treatments were applied 29 Oct 2014 at Chewelah and 31 Oct 2014 at Columbia Falls. Fungicides were applied at 80 GPA with a bicycle-wheeled CO₂ pressurized (40 psi) sprayer with 11008 flat fan TeeJet nozzles. Weather conditions at Chewelah at application on 29 Oct 2014: air temperature: 51°F, soil temperature 2": 49°F, and relative humidity: 84%. Weather conditions at Columbia Falls at application on 30 Oct 2014: air temperature: 45°F, soil temperature 2": 44°F, and relative humidity: 86%. GPS coordinates Chewelah: 48° 18' 50.46"N, 117° 44 '56.06"W, Elevation: 2075'. GPS coordinates Columbia Falls: 48° 23' 18.39"N, 114° 12' 14.27"W, Elevation: 3162'. Individual plots were evaluated for pink (*Microdochium nivale*) and/or gray (*Typhula spp.*) snow mold disease severity (% plot area infected). Turfgrass quality was rated on a scale from 1 to 9; 9 = excellent and 6 = acceptable. Disease severity and turfgrass quality were rated on 9 Mar 2015 at Chewelah and 10 Apr 2015 at Columbia Falls.

Chewelah had snow cover for approximately 51 days from the end of December 2014 to mid-February 2015. This is less than half the number of snow cover days typical for this location. The untreated check had 38% of the plot infected with pink snow mold (Table 1). All treatment combinations with Turfcide resulted in a significant reduction of snow mold compared to the check and had similar turfgrass quality (range 4.5 to 5.1). Daconil WeatherStik 5.5 fl oz/M, compared to the other treatments, had at least numerically, the highest area infected (7%). Fig. 1 - 10 show the various fungicide treatments.

Columbia Falls had snow cover for approximately 120 days from mid-November 2014 to mid-March 2015. Percentage of pink to gray snow mold was 75% pink and 25% gray (both *Typhula incarnata* and *T. ishikariensis* were present). The untreated check had 68% of the plot area infected with snow mold (Table 2). Unfortunately, due to space limitations on the fairway, the replications were reduced from 4 to 3 and the experiment could not be blocked (replicated) in the desired way. The result was that variation across blocks (replications) was not uniform and therefore some treatments resulted in higher or lower snow mold or turfgrass quality ratings due to their location within the block. In addition, there were some ice damaged treatments (Fig. 14). In any event, all treatments in this experiment resulted in a reduction in snow mold severity compared to the check. However, Daconil WeatherStik or Daconil

Ultrax + Banner Maxx + Turfcide + Foursome resulted in treatments that were all over the board from 0 to 17% area infected in snow mold. One would think that the higher rates of these fungicide combinations would result in better control but that was not always the case in this experiment. After looking at these data it was clear that the way this experiment was forced to be blocked (replicated) contributed to these odd results. Fig. 11 - 20 show the various fungicide treatments.

Overall, with moderate disease pressure at Chewelah, all treatment combinations with Turfcide resulted in very good to excellent snow mold control. However, due to space limitations at Columbia Falls the experiment could not be laid out in the manner desired which resulted in confusing snow mold control among the treatments. As a result it is difficult to determine which fungicide combinations and rates really worked best.

Table 1. The effect of various combinations of fungicide with Turfcide to control pink and gray snow mold on a fairway at the Chewelah Golf and Country Club. Chewelah, WA. Rated 9 Mar 2015.

Product	Active Ingredient	Formulation	Product/A	lb A/A	Product /1,000 sqft	Snow mold (% area infected)	*Turfgrass quality
Torque	tebuconazole	3.6EC	39.2 floz.	1.1	0.9 floz.	0.1 c**	4.9 abc
26/36	iprodione	3.8EC	1.36 gal	2.59	4 floz.		
Interface	thiophanate-methyl	2.27SC	1.02 gal	2.59	3 floz.	0.3 c	5.1 a
	iprodione			2.18			
Triton	trifloxystrobin			0.133			
Triton	triconazole	3F	32.67 floz.	0.77	0.75 floz.		
Concert II	chlorothalonil	4.3L	2.89 gal	11.57	8.5 floz.	0.3 c	5.0 ab
	propiconazole			0.87			
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	7.49 pints	5.615	2.75 floz.	0.3 c	5.0 ab
Banner Maxx	propiconazole	1.3ME	65.34 floz.	0.66	1.5 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Interface	iprodione	2.27SC	1.02 gal	2.18	3 floz.	0.3 c	4.9 abc
	trifloxystrobin			0.133			
Turfcide	PCNB	4F	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Chipco 26GT	iprodione	2SC	1.36 gal	2.72	4 floz.		
Daconil Ultrex	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.	0.3 c	4.9 abc
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	7.49 pints	5.615	2.75 floz.	0.3 c	4.9 abc
Banner Maxx	propiconazole	1.3ME	87.12 floz.	0.88	2 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.	0.3 c	4.8 abc
Banner Maxx	propiconazole	1.3ME	65.34 floz.	0.66	1.5 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.4 gal	8.42	4.125 floz.	0.4 c	5.0 ab
Banner Maxx	propiconazole	1.3ME	87.12 floz.	0.88	2 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Insignia	pyraclostrobin	2.08SC	30.5 floz.	0.495	0.7 floz.	0.5 bc	5.0 ab
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.4 gal	8.42	4.125 floz.	0.5 bc	5.0 ab
Banner Maxx	propiconazole	1.3ME	65.34 floz.	0.66	1.5 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.	0.5 bc	4.9 abc
Banner Maxx	propiconazole	1.3ME	87.12 floz.	0.88	2 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Torque	tebuconazole	3.6EC	39.2 floz.	1.1	0.9 floz.	0.5 bc	4.9 abc
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.	0.6 bc	5.0 ab
Banner Maxx	propiconazole	1.3ME	45.56 floz.	0.44	1 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil Ultrex	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.	0.6 bc	4.9 abc
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Insignia	pyraclostrobin	2.08SC	30.5 floz.	0.495	0.7 floz.	0.6 bc	4.8 abc
Trinity	triconazole	1.69L	43.56 floz.	0.575	1 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.4 gal	8.42	4.125 floz.	0.8 bc	5.0 ab
Banner Maxx	propiconazole	1.3ME	45.56 floz.	0.44	1 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	7.49 pints	5.615	2.75 floz.	1.0 bc	5.0 ab
Banner Maxx	propiconazole	1.3ME	45.56 floz.	0.44	1 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Turfcide	PCNB	400 (4F)	4.08 gal	16.34	12 floz.	1.0 bc	5.0 ab
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.	1.1 bc	5.0 ab
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Turfcide	PCNB	400 (4SC)	5.45 gal	21.78	16.0 floz.	1.5 bc	4.9 abc
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Concert II	chlorothalonil	4.3L	2.89 gal	11.57	8.5 floz.	1.5 bc	4.9 abc
	propiconazole			0.87			
Banner Maxx	propiconazole	1.3ME	43.56 floz.	0.44	1 floz.		
Chipco 26GT	iprodione	2SC	1.36 gal	2.72	4 floz.	1.9 bc	4.6 bc
Chipco 26GT	iprodione	2SC	1.36 gal	2.72	4 floz.	3.4 bc	4.6 bc
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.	6.9 b	4.5 c
Untreated	---	---	---	---	---	37.5 a	2.8 d

*Turfgrass quality rated 1 to 9; 9=excellent.

**Means within columns followed by the same letter are not significantly different. LSD (P = 0.05).

Fig. 1. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.

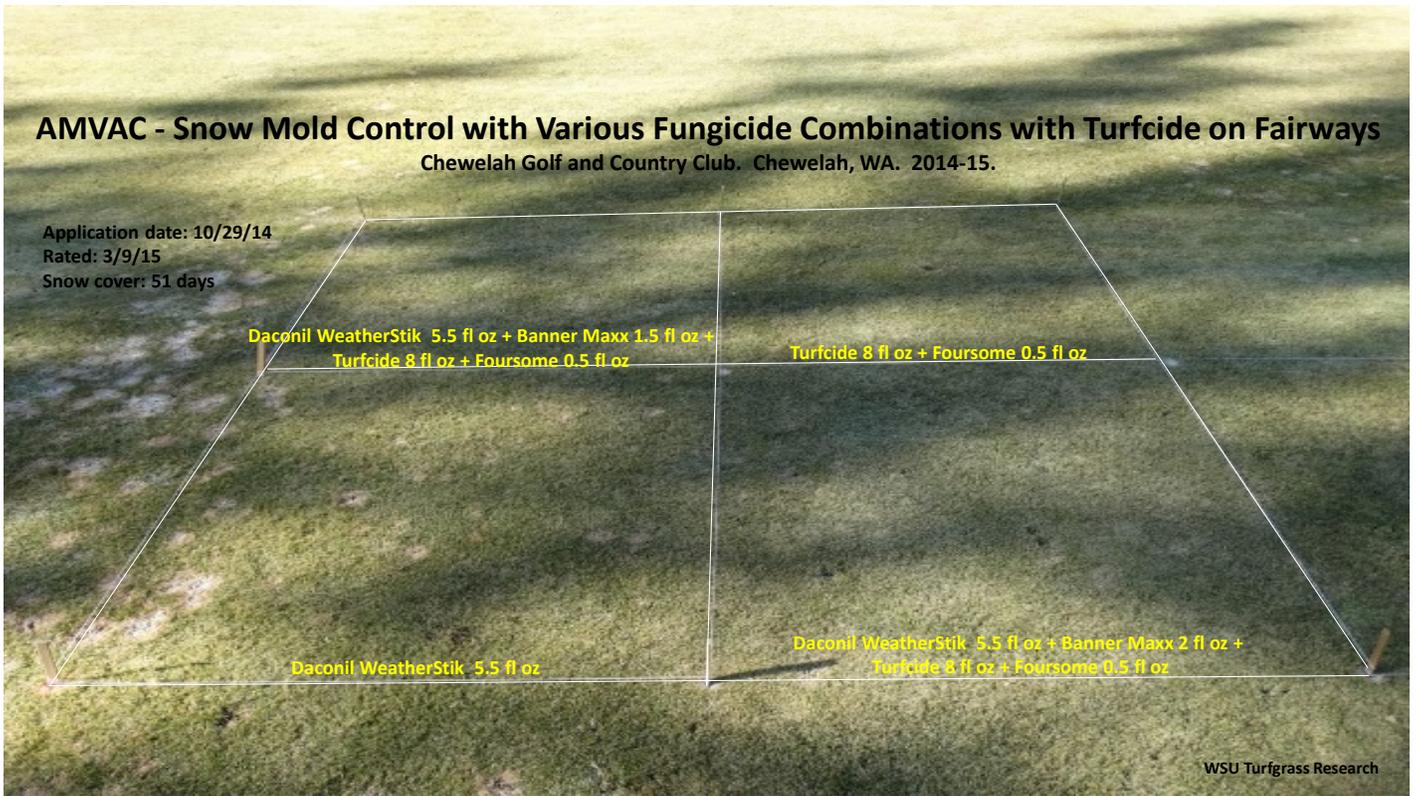


Fig. 2. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.



Fig. 3. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.



Fig. 4. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.

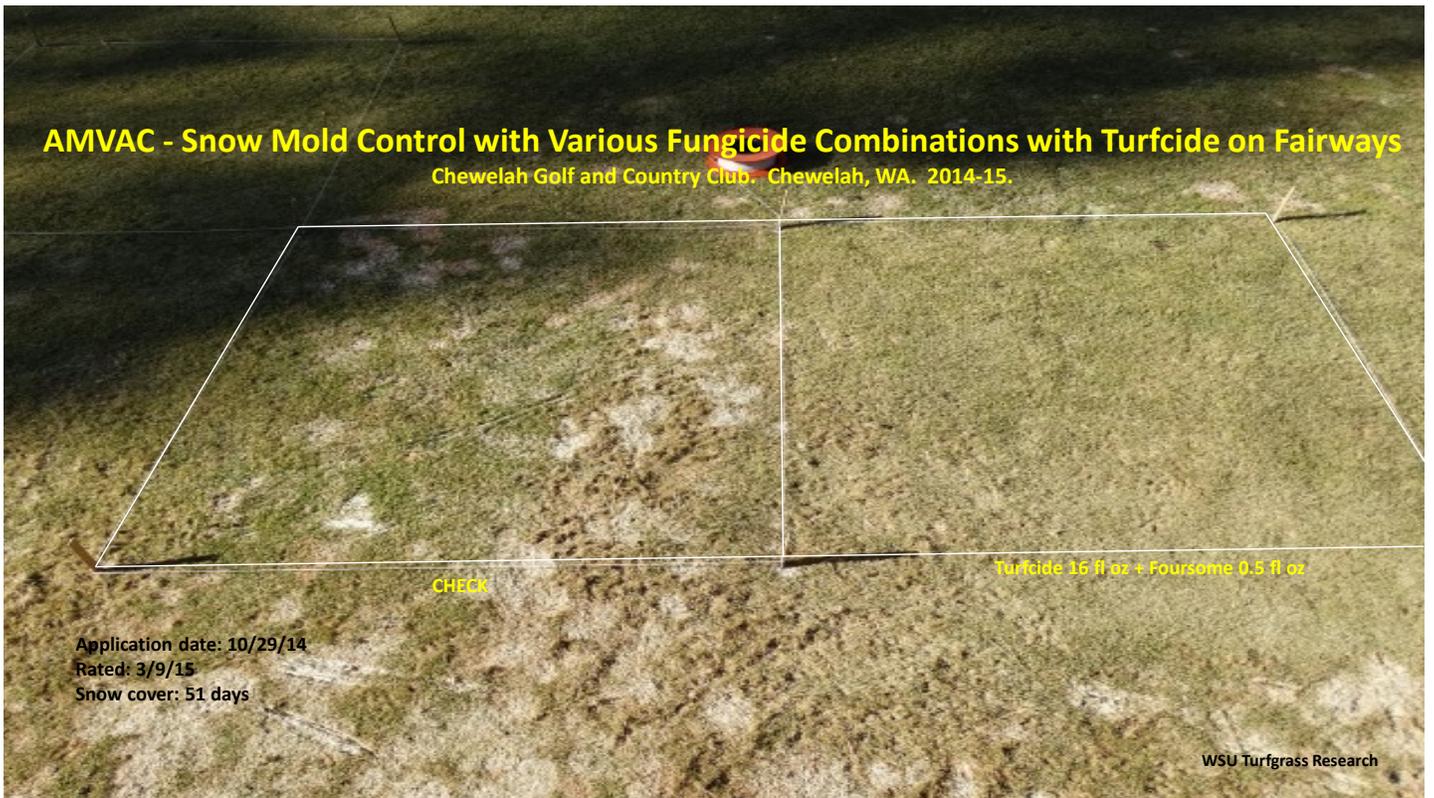


Fig. 5. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.



Fig. 6. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.



Fig. 7. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.



Fig. 8. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.



Fig. 9. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.



Fig. 10. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Mar 2015.



Table 2. The effect of various combinations of fungicide with Turfcide to control pink and gray snow mold on a fairway at Meadowlake Resort Golf Course. Columbia Falls, MT. Rate 10 Apr 2015.

Product	Active Ingredient	Formulation	Product/A	lb A/A	Product/ 1,000 sqft	Snow mold (% area infected)	*Turfgrass quality
Daconil WeatherStik	chlorothalonil	6F	7.49 pints	5.615	2.75 floz.	0.0 e**	6.8 a
Banner Maxx	propiconazole	1.3ME	87.12 floz.	0.88	2 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.	1.3 e	6.7 a
Insignia	pyraclostrobin	2.08SC	30.5 floz.	0.495	0.7 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.	1.3 e	6.5 ab
Daconil Ultrex	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.	1.3 e	5.8 abcd
Torque	tebuconazole	3.6EC	39.2 floz.	1.1	0.9 floz.		
26/36	iprodione	3.8EC	1.36 gal	2.59	4 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.4 gal	8.42	4.125 floz.	1.5 e	6.5 ab
Banner Maxx	propiconazole	1.3ME	45.56 floz.	0.44	1 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.	2.0 de	6.7 a
Turfcide	PCNB	400 (4SC)	5.45 gal	21.78	16.0 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	7.49 pints	5.615	2.75 floz.	3.3 de	5.5 abcde
Banner Maxx	propiconazole	1.3ME	45.56 floz.	0.44	1 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.	3.7 de	6.2 abc
Interface	iprodione	2.27SC	1.02 gal	2.18	3 floz.		
Turfcide	trifloxystrobin	0.133		0.133			
Foursome	PCNB	4F	2.72 gal	10.89	8 floz.	3.7 de	6.2 abc
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Concert II	chlorothalonil	4.3L	2.89 gal	11.57	8.5 floz.		
Turfcide	propiconazole	0.87		0.87		3.7 de	6.2 abc
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.	4.7 cde	6.2 abc
Banner Maxx	propiconazole	1.3ME	45.56 floz.	0.44	1 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.	5.0 cde	5.8 abcd
Chipco 26GT	iprodione	2SC	1.36 gal	2.72	4 floz.		
Daconil Ultrex	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.	6.7 bcde	5.8 abcd
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.	6.7 bcde	5.8 abcd
Banner Maxx	propiconazole	1.3ME	87.12 floz.	0.88	2 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.	8.3 bcde	5.7 abcd
Daconil WeatherStik	chlorothalonil	6F	1.4 gal	8.42	4.125 floz.		
Banner Maxx	propiconazole	1.3ME	87.12 floz.	0.88	2 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.	9.0 bcde	5.8 abcd
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Interface	iprodione	2.27SC	1.02 gal	2.18	3 floz.	9.3 bcde	5.0 cde
Triton	trifloxystrobin	0.133		0.133			
Triton	triconazole	3F	32.67 floz.	0.77	0.75 floz.		
Chipco 26GT	iprodione	2SC	1.36 gal	2.72	4 floz.	10.0 bcde	5.5 abcde
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Insignia	pyraclostrobin	2.08SC	30.5 floz.	0.495	0.7 floz.	11.0 bcde	5.1 bcde
Trinity	triconazole	1.69L	43.56 floz.	0.575	1 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.4 gal	8.42	4.125 floz.	13.5 bcde	5.0 cde
Banner Maxx	propiconazole	1.3ME	65.34 floz.	0.66	1.5 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.	14.0 bcde	5.5 abcde
Daconil WeatherStik	chlorothalonil	6F	7.49 pints	5.615	2.75 floz.		
Banner Maxx	propiconazole	1.3ME	65.34 floz.	0.66	1.5 floz.		
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.	17.0 bcd	5.0 cde
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	11.23	5.5 floz.		
Banner Maxx	propiconazole	1.3ME	65.34 floz.	0.66	1.5 floz.	19.0 bc	4.2 e
Turfcide	chlorothalonil	4.3L	2.89 gal	11.57	8.5 floz.		
Banner Maxx	propiconazole	0.87		0.87			
Torque	tebuconazole	3.6EC	39.2 floz.	1.1	0.9 floz.	20.7 b	4.5 de
Turfcide	PCNB	400 (4F)	2.72 gal	10.89	8 floz.		
Foursome	pigment	100%	21.78 floz.	NA	0.5 floz.		
Untreated	---	---	---	---	---	68.3 a	2.3 f
Chipco 26GT	iprodione	2SC	1.36 gal	2.72	4 floz.	No data	No data

*Turfgrass quality rated 1 to 9; 9=excellent.

**Means within columns followed by the same letter are not significantly different. LSD (P = 0.05).

Fig. 11. Snow mold fungicide treatments on a fairway at Meadow Lake Resort Golf Course. Columbia Falls, MT. Rated 10 Apr 2015.



Fig. 12. Snow mold fungicide treatments on a fairway at Meadow Lake Resort Golf Course. Columbia Falls, MT. Rated 10 Apr 2015.



Fig. 13. Snow mold fungicide treatments on a fairway at Meadow Lake Golf and Country Club. Columbia Falls, MT. Rated 10 Apr 2015.

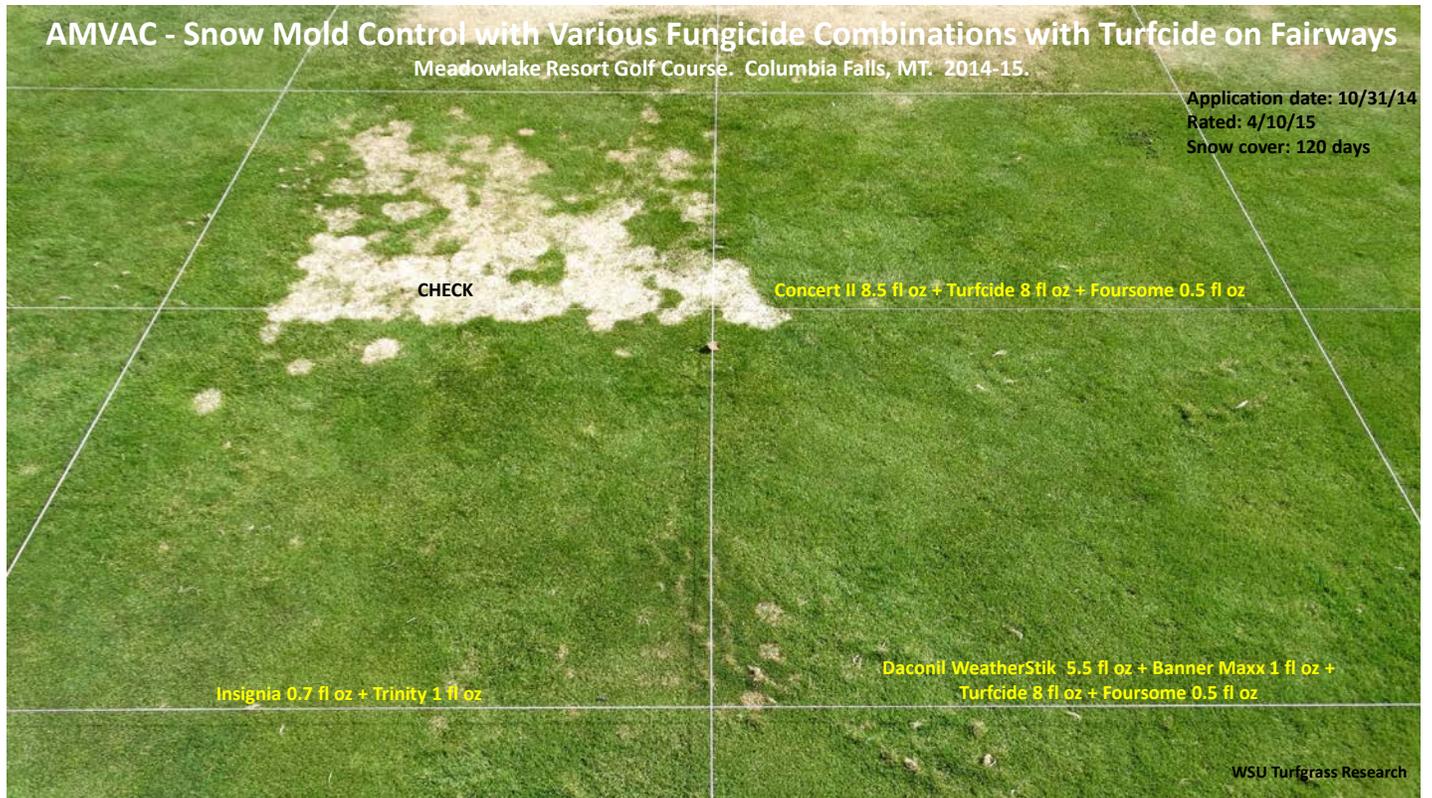


Fig. 14. Snow mold fungicide treatments on a fairway at Meadow Lake Resort Golf Course. Columbia Falls, MT. Rated 10 Apr 2015. Ice damage injury on these 4 treatments.

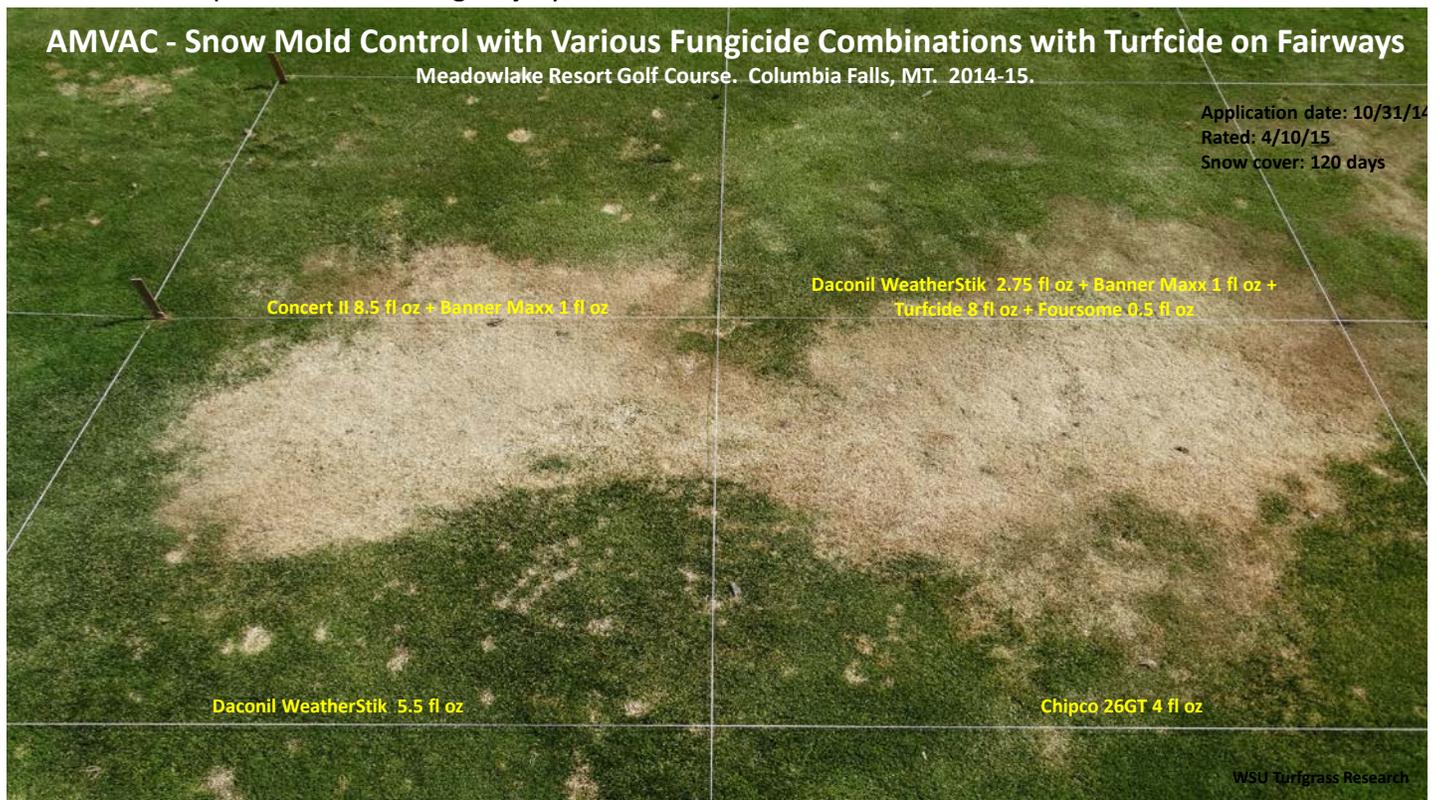


Fig. 15. Snow mold fungicide treatments on a fairway at Meadow Lake Resort Golf Course. Columbia Falls, MT. Rated 10 Apr 2015.



Fig. 16. Snow mold fungicide treatments on a fairway at Meadow Lake Resort Golf Course. Columbia Falls, MT. Rated 10 Apr 2015.



Fig. 17. Snow mold fungicide treatments on a fairway at Meadow Lake Resort Golf Course. Columbia Falls, MT. Rated 10 Apr 2015.



Fig. 18. Snow mold fungicide treatments on a fairway at Meadow Lake Resort Golf Course. Columbia Falls, MT. Rated 10 Apr 2015.



Fig. 19. Snow mold fungicide treatments on a fairway at Meadow Lake Resort Golf Course. Columbia Falls, MT. Rated 10 Apr 2015.



Fig. 20. Snow mold fungicide treatments on a fairway at Meadow Lake Resort Golf Course. Columbia Falls, MT. Rated 10 Apr 2015.

