

AMVAC - Snow Mold Control with Various Fungicide Combinations with AMV4820-G or Turfcide 400 on Fairways in Washington and Montana 2015-2016

(Final Report)

AMVAC Protocol #: PD152107

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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 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. Treatments were applied 6 Nov 2015 at Chewelah and 27 Oct 2015 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 6 Nov 2015: air temperature: 42°F, soil temperature 2": 42°F, and relative humidity: 79%. Weather conditions at Columbia Falls at application on 27 Oct 2015: air temperature: 53°F, soil temperature 2": 48°F, and relative humidity: 81%. GPS coordinates Chewelah: 48° 18' 52.67"N, 117° 44' 54.89"W, Elevation: 2075'. GPS coordinates Columbia Falls: 48° 23' 18.28"N, 114° 12' 14.74"W, Elevation: 3161'. 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 21 Mar 2016 at Chewelah and 29 Mar 2016 at Columbia Falls.

Chewelah had snow cover for approximately 100 days from the first of December 2015 to first week of March 2016. The untreated check had 31% of the plot infected with a mixture of pink (50%) and gray (50%) snow mold (Table 1). The type of *Typhula* spp. present could not be determined since no sclerotia were found. All treatment combinations with AMV4820-G or Turfcide 400 resulted in a significant reduction of snow mold compared to the check. However, there were no significant differences among any of the fungicide combinations. All fungicide combinations resulted in very good disease control (<3.8%). There were, however, significant differences in turfgrass quality among the fungicide treatments. It is hard to determine a pattern in any of fungicide combinations that result in better turfgrass quality other than the addition of Foursome 0.5 fl oz. Two of the lowest turfgrass quality ratings were Insignia + Trinity and Concert II + Banner MAXX both of which did not have Foursome added. Figures 1 - 6 are photos of the various fungicide treatments in rep 1. Figure 7 is a photo of rep 1.

Columbia Falls, like Chewelah, had snow cover for approximately 100 days from the first of December to the first week March 2016. Percentage of pink to gray snow mold was 75% pink and 25% gray (*Typhula incarnata* sclerotia were present, no *T. ishikarensis* sclerotia were found). Disease pressure was very high, the untreated check had 87% of the plot area infected with snow mold (Table 2). All treatments in

this experiment resulted in a reduction in snow mold severity compared to the check. Compared to AMV4820-G 8, 10, or 12 fl oz alone, adding Daconil WS significantly improved disease control. Fungicide combinations with AMV4820-G 8, 10, or 12 fl oz + Daconil WS + Foursome resulted very good disease control with snow mold severity $\leq 2\%$. AMV4820-G 8 fl oz + Daconil WS, at a reduced rate of 4 fl oz, + Foursome also had good disease control with only 6.5 % of the area infected with snow mold. Turfcide 400 8 fl oz + Concert II 5 or 8.5 fl oz + Foursome also resulted in very good disease control ($\leq 4.3\%$) and had better disease control compared to Concert II 8.5 fl oz + Banner MAXX 1 fl oz (28%). Torque 0.6 or 0.9 fl oz + Turfcide 400 8 fl oz + Foursome did not perform very well, disease severity was over 21%. Turfcide 400 8 fl oz + Insignia 0.7 fl oz + Foursome numerically had the least amount of disease (1.3%) and the highest turfgrass quality (5.5) and resulted in much better disease control compared to Insignia 0.7 fl oz + Trinity 1 fl oz (17%). Turfcide 400 10 or 12 fl oz alone + Foursome resulted in better disease control compared to AMV4820-G 10 or 12 fl oz alone + Foursome. Figures 8 - 19 are photos of the various fungicide combinations in reps 3 and 4. Figure 20 is a photo of the entire study.

Overall, at Chewelah there were no significant differences among any of the fungicide combination in terms of disease control. However, there were significant differences among the fungicide combinations in terms of turfgrass quality, with no distinct trend other than the addition Foursome may result in slightly greater quality.

At Columbia Falls the addition of Daconil WS with AMV4820-G resulted very good disease control and better disease control compared to AMV4820-G alone. Combining Concert II with Turfcide 400 also resulted in good control. Insignia + Turfcide numerically resulted in the highest disease control and turfgrass quality and was better compared to Insignia + Trinity. Mixing Torque + Turfcide did not result in good control. The higher rates of Turfcide 400 alone resulted in better disease control compared to AMV4820-G alone.

Table 1. The effect of various combinations of fungicide with AMV4820-G or Turfcide 400 to control pink and gray snow mold on a fairway at the Chewelah Golf and Country Club. Chewelah, WA. Rated 21 Mar 2016.

Product	Active Ingredient	Formulation	Product/A	Product/ 1,000 sqft	Snow mold	
					(% area infected)	*Turfgrass quality
AMV4820-G	PCNB	4.2SC	2.72 gal	10 fl.oz.	0.5 b**	5.9 a
	tebuconazole					
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Daconil WeatherStik	chlorothalonil	6F	1.36 gal	4 fl.oz.		
Interface	iprodione	2.27SC	1.7 gal	5 fl.oz.	0.3 b	5.8 a
	trifloxystrobin					
Mirage	tebuconazole	2SC	87.12 fl.oz.	2 fl.oz.		
Torque	tebuconazole	3.6EC	39.2 fl.oz.	0.9 fl.oz.	0.3 b	5.6 ab
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	4.08 gal	12 fl.oz.	0.5 b	5.6 ab
	tebuconazole					
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Concert II	chlorothalonil	4.3L	2.89 gal	8.5 fl.oz.	0.5 b	5.5 abc
	propiconazole					
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	8 fl.oz.	0.8 b	5.5 abc
	tebuconazole					
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Secure	fluzinam	4.17SC	21 78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	10 fl.oz.	1.0 b	5.4 abc
	tebuconazole					
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Turfcide 400	PCNB	400 (4F)	4.08 gal	12 fl.oz.	1.3 b	5.4 abc
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Torque	tebuconazole	3.6EC	26.1 fl.oz.	0.6 fl.oz.	0.5 b	5.3 abcd
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Concert II	chlorothalonil	4.3L	1.87 gal	5.5 fl.oz.	0.8 b	5.3 abcd
	propiconazole					
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	8 fl.oz.	1.3 b	5.3 abcd
	tebuconazole					
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	8 fl.oz.	1.3 b	5.3 abcd
	tebuconazole					
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	5.5 fl.oz.		
Insignia	pyraclostrobin	2.08SC	30.5 fl.oz.	0.7 fl.oz.	2.3 b	5.3 abcd
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	4.08 gal	12 fl.oz.	1.3 b	5.1 abcde
	tebuconazole					
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Daconil WeatherStik	chlorothalonil	6F	1.36 gal	4 fl.oz.		
Interface	iprodione	2.27SC	1.7 gal	5 fl.oz.	2.0 b	5.1 abcde
	trifloxystrobin					
Turfcide	PCNB	4F	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Turfcide 400	PCNB	400 (4SC)	5.45 gal	16.0 fl.oz.	1.8 b	4.9 bcde
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.	1.8 b	4.8 cde
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Insignia	pyraclostrobin	2.08SC	30.5 fl.oz.	0.7 fl.oz.	2.3 b	4.5 def
Trinity	triticonazole	1.69L	43.56 fl.oz.	1 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	8 fl.oz.	3.8 b	4.4 ef
	tebuconazole					
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Daconil WeatherStik	chlorothalonil	6F	1.36 gal	4 fl.oz.		
Concert II	chlorothalonil	4.3L	2.89 gal	8.5 fl.oz.	2.0 b	3.9 f
	propiconazole					
Banner Maxx	propiconazole	1.3ME	43.56 fl.oz.	1 fl.oz.		
Untreated	---	---	---	0	31.3 a	1.8 g

*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 21 Mar 2016.



Fig. 2. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 21 Mar 2016.

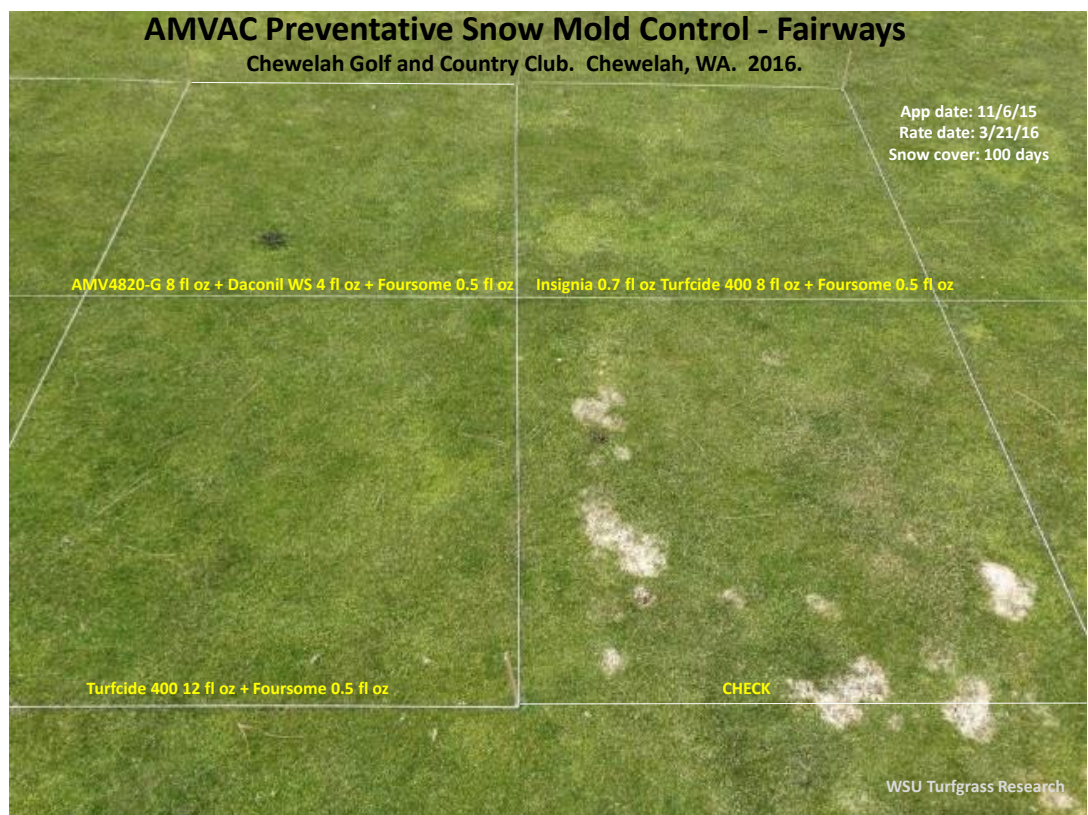


Fig. 3. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 21 Mar 2016.

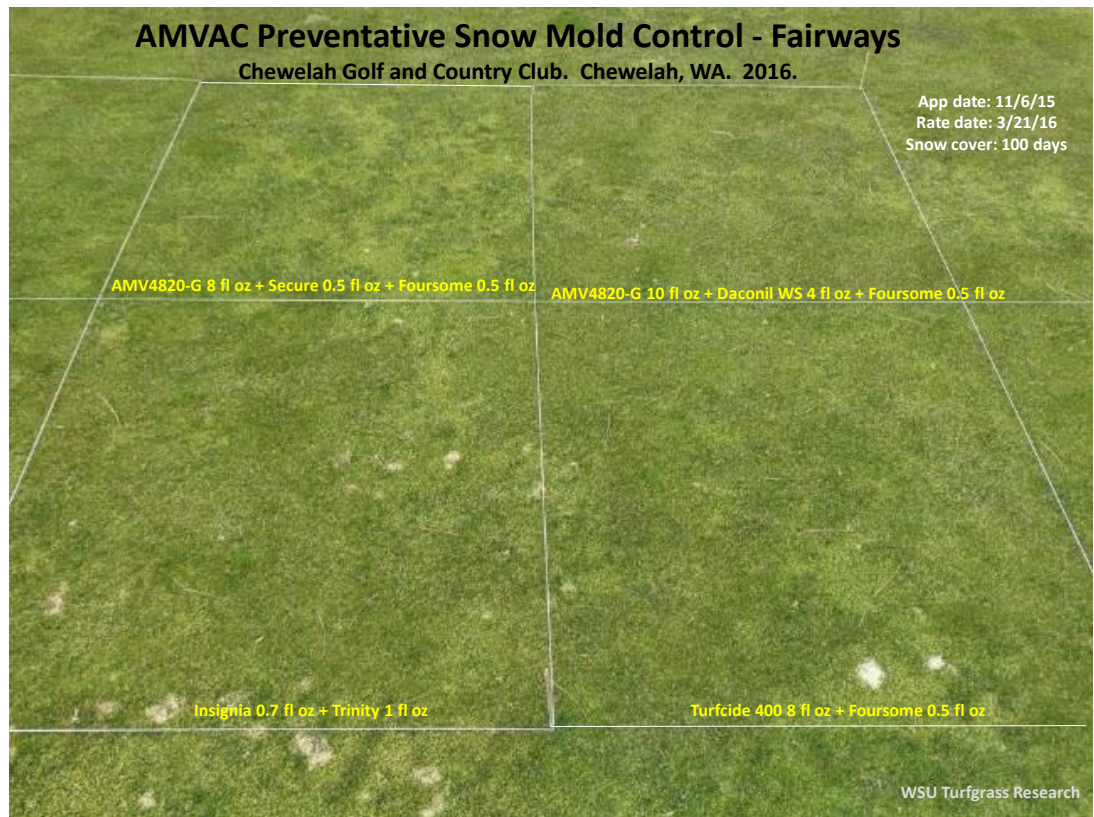


Fig. 4. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 21 Mar 2016.

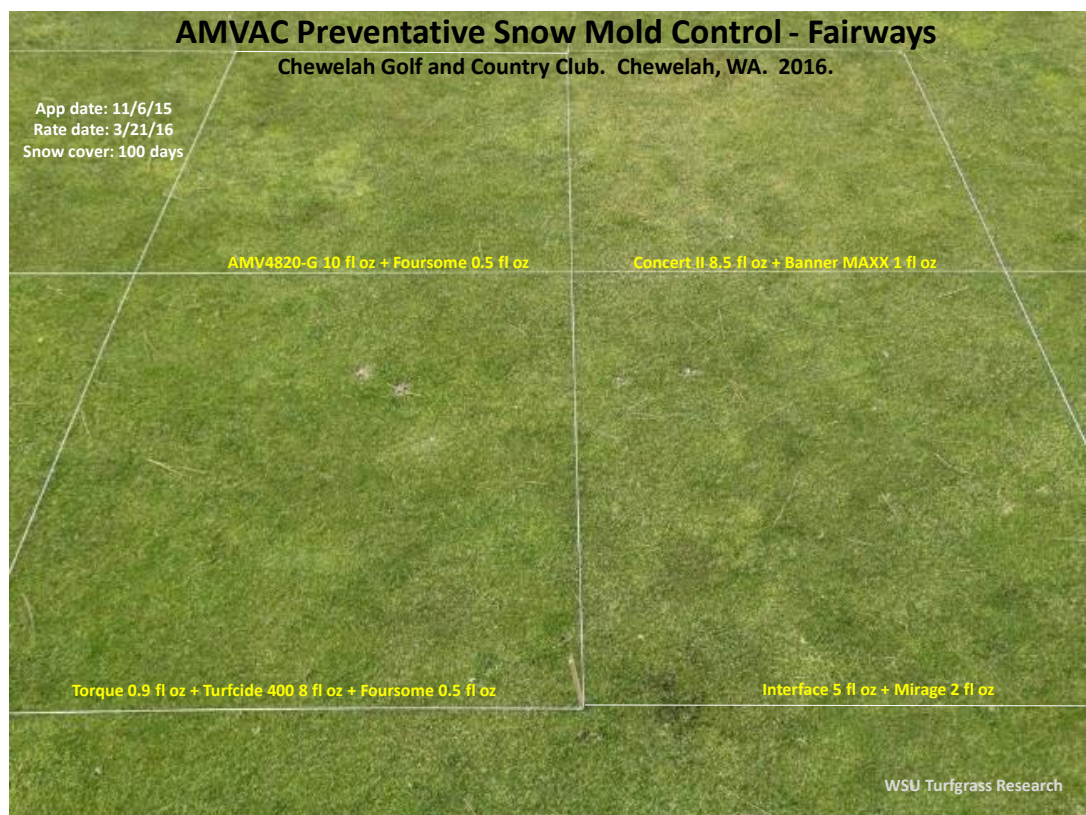


Fig. 5. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 21 Mar 2016.

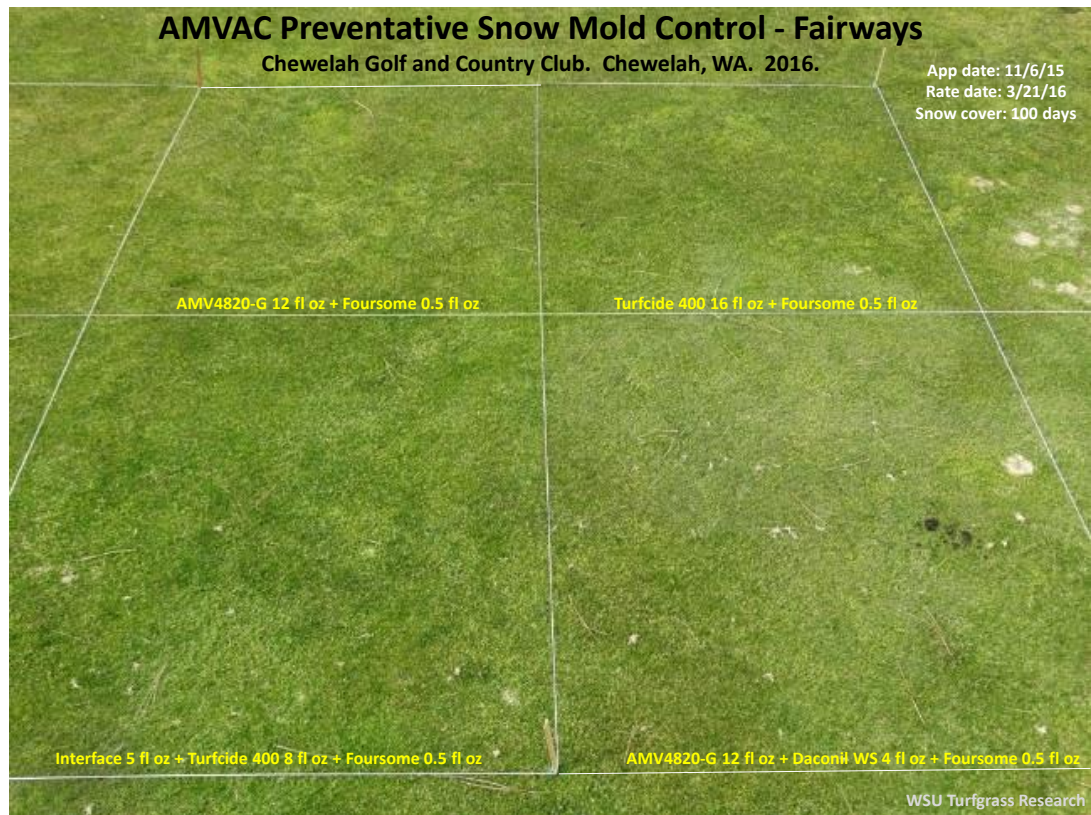


Fig. 6. Snow mold fungicide treatments on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 21 Mar 2016.

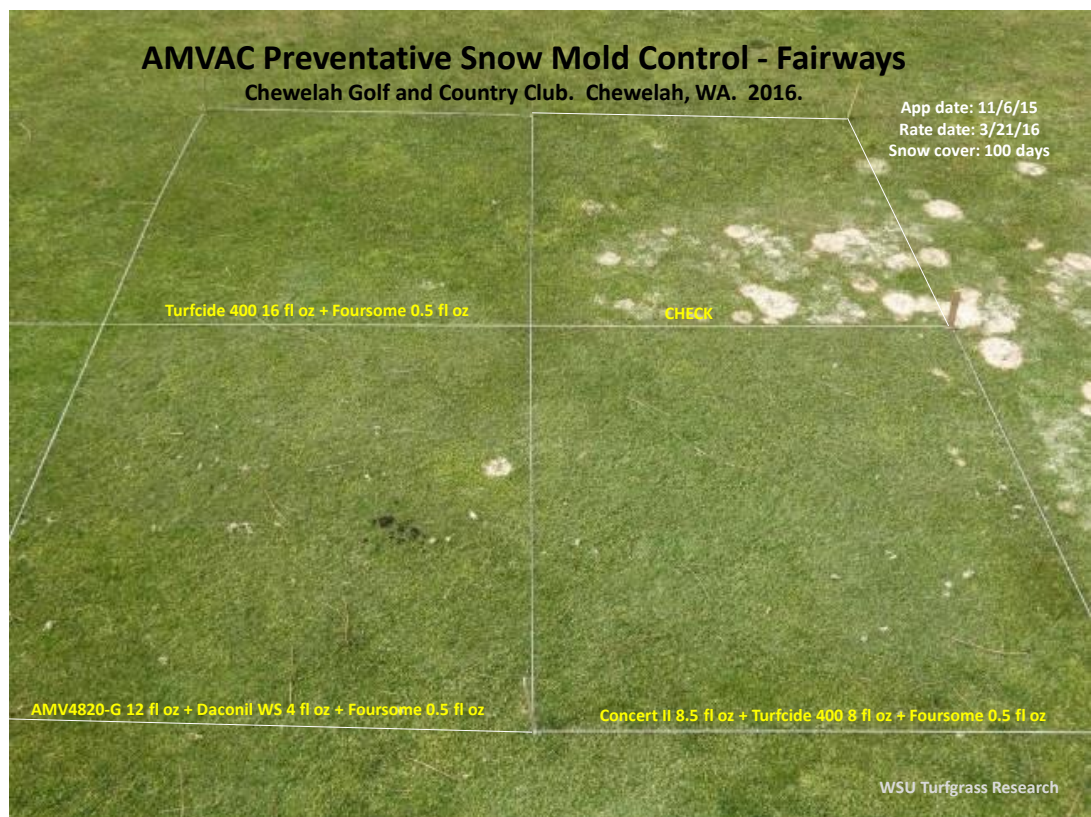


Fig. 7. Snow mold fungicide treatments (Rep 1) on a fairway at Chewelah Golf and Country Club in Chewelah, WA. Rated 21 Mar 2016.

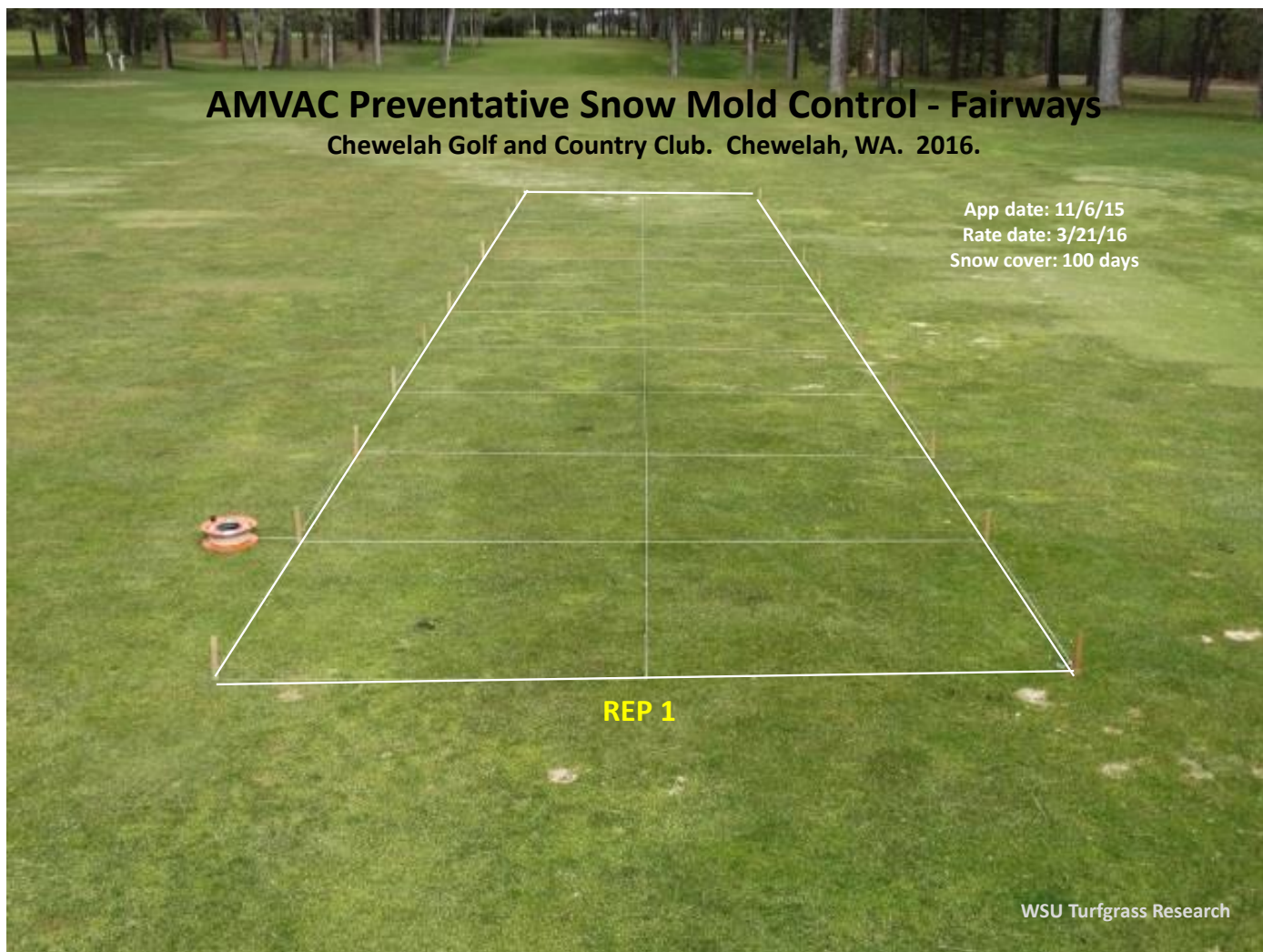


Table 2. The effect of various combinations of fungicide with AMV4820-G or Turfcide 400 to control pink and gray snow mold on a fairway at Meadowlake Resort Golf Course. Columbia Falls, MT. Rated 29 Mar 2016.

Treatment	Active Ingredient	Formulation	Product/A	Product/ 1,000 sqft	Snow mold (% area infected)	*Turfgrass quality
Insignia	pyraclostrobin	2.08SC	30.5 fl.oz.	0.7 fl.oz.	1.3 f**	5.5 a
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	10 fl.oz.	1.5 f	5.4 a
Foursome	tebuconazole					
	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Daconil WeatherStik	chlorothalonil	6F	1.36 gal	4 fl.oz.		
AMV4820-G	PCNB	4.2SC	4.08 gal	12 fl.oz.	1.8 f	5.1 ab
Foursome	tebuconazole					
	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Daconil WeatherStik	chlorothalonil	6F	1.36 gal	4 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	8 fl.oz.	2.0 f	5.3 ab
Foursome	tebuconazole					
	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Daconil WeatherStik	chlorothalonil	6F	1.87 gal	5.5 fl.oz.		
Concert II	chlorothalonil	4.3L	2.89 gal	8.5 fl.oz.	3.0 f	4.9 abc
Turfcide 400	propiconazole					
	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Concert II	chlorothalonil	4.3L	1.87 gal	5.5 fl.oz.	4.3 f	4.9 abc
Turfcide 400	propiconazole					
	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Turfcide 400	PCNB	400 (4SC)	5.45 gal	16.0 fl.oz.	5.8 ef	4.6 abcd
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Turfcide 400	PCNB	400 (4F)	4.08 gal	12 fl.oz.	5.8 ef	4.5 abcde
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	8 fl.oz.	6.5 ef	4.3 abcdef
Foursome	tebuconazole					
	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Daconil WeatherStik	chlorothalonil	6F	1.36 gal	4 fl.oz.		
Interface	iprodione	2.27SC	1.7 gal	5 fl.oz.	7.8 def	4.4 abcdef
Turfcide 400	trifloxystrobin					
	PCNB	4F	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	8 fl.oz.	12.8 cdef	3.8 cdefg
Foursome	tebuconazole					
	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Secure	fluzazinam	4.17SC	21.78 fl.oz.	0.5 fl.oz.		
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.	13.5 cdef	3.4 defgh
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
AMV4820-G	PCNB	4.2SC	4.08 gal	12 fl.oz.	13.8 cdef	3.6 cdefg
Foursome	tebuconazole					
	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Insignia	pyraclostrobin	2.08SC	30.5 fl.oz.	0.7 fl.oz.	17.0 cdef	3.1 fgh
Trinity	triticonazole	1.69L	43.56 fl.oz.	1 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	8 fl.oz.	21.0 cdef	4.0 bcdef
Foursome	tebuconazole					
	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Torque	tebuconazole	3.6EC	39.2 fl.oz.	0.9 fl.oz.	21.8 cdef	3.3 efgh
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Torque	tebuconazole	3.6EC	26.1 fl.oz.	0.6 fl.oz.	26.3 bcde	2.3 hij
Turfcide 400	PCNB	400 (4F)	2.72 gal	8 fl.oz.		
Foursome	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Concert II	chlorothalonil	4.3L	2.89 gal	8.5 fl.oz.	28.0 bcd	2.6 ghi
propiconazole						
Banner Maxx	propiconazole	1.3ME	43.56 fl.oz.	1 fl.oz.		
AMV4820-G	PCNB	4.2SC	2.72 gal	10 fl.oz.	32.5 bc	2.6 ghi
Foursome	tebuconazole					
	pigment	100%	21.78 fl.oz.	0.5 fl.oz.		
Interface	iprodione	2.27SC	1.7 gal	5 fl.oz.	42.5 b	1.6 ij
Mirage	trifloxystrobin					
	tebuconazole	2SC	87.12 fl.oz.	2 fl.oz.		
Untreated	---	---	---	0	87.3 a	1.0 j

*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. 8. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

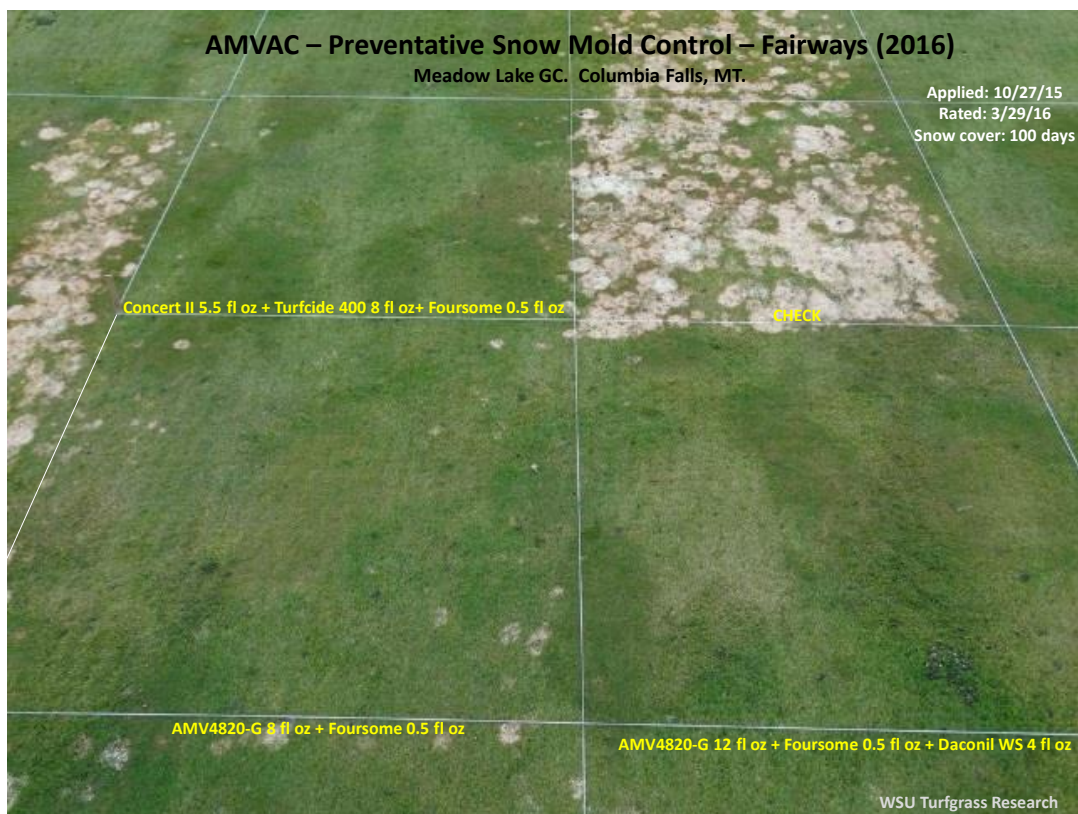


Fig. 9. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

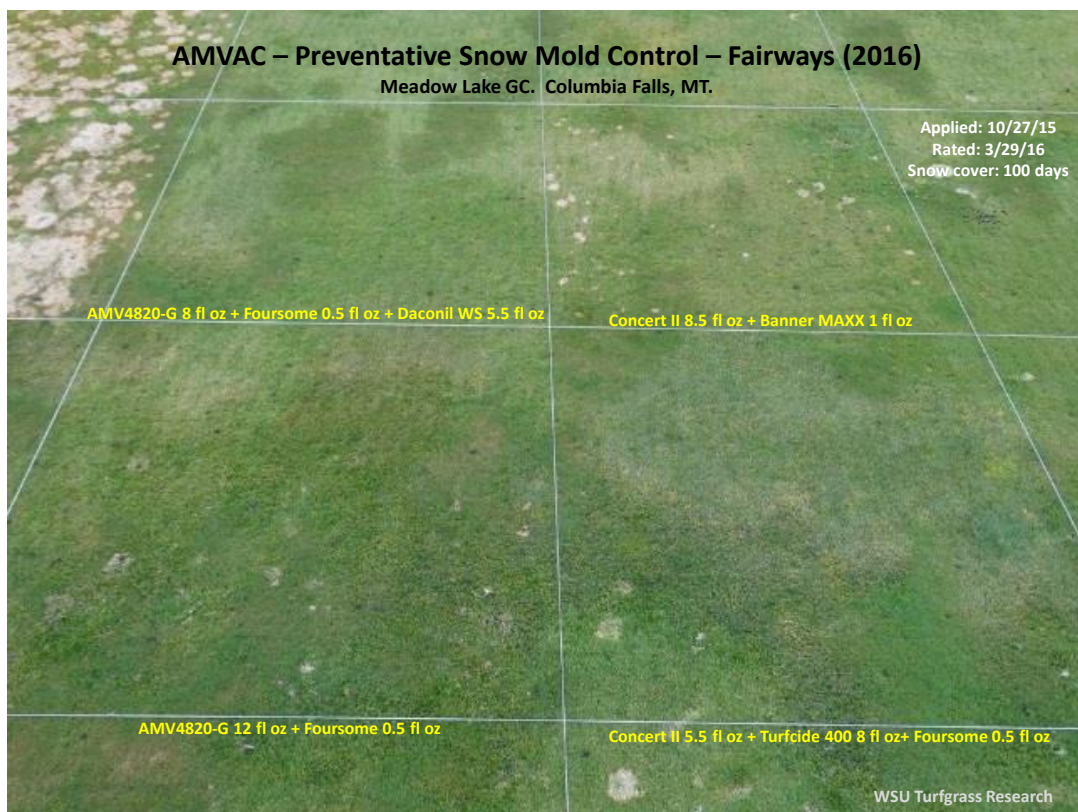


Fig. 10. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

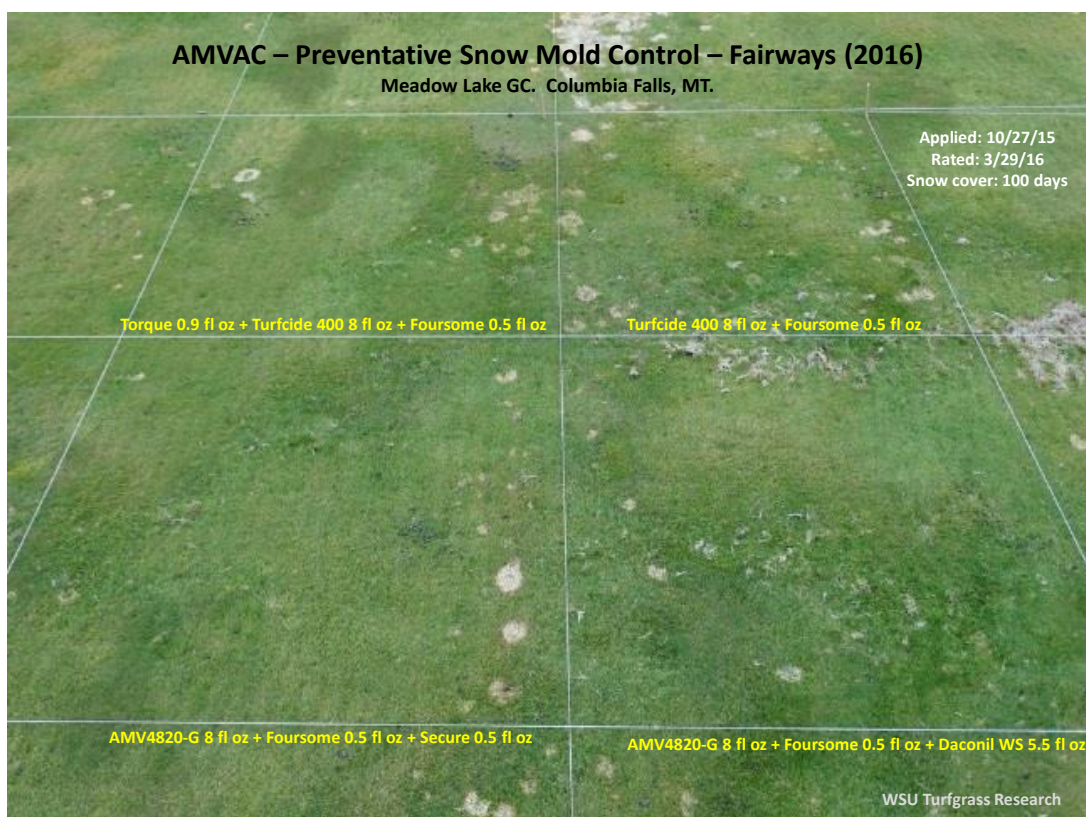


Fig. 11. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

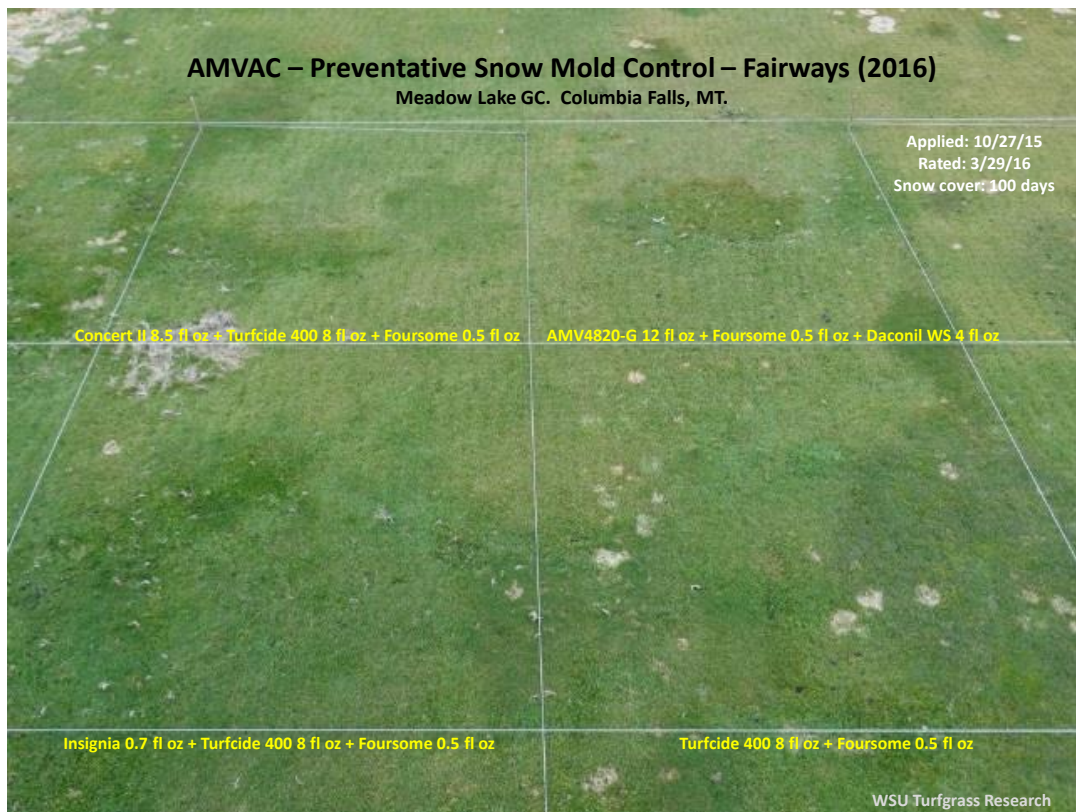


Fig. 12. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

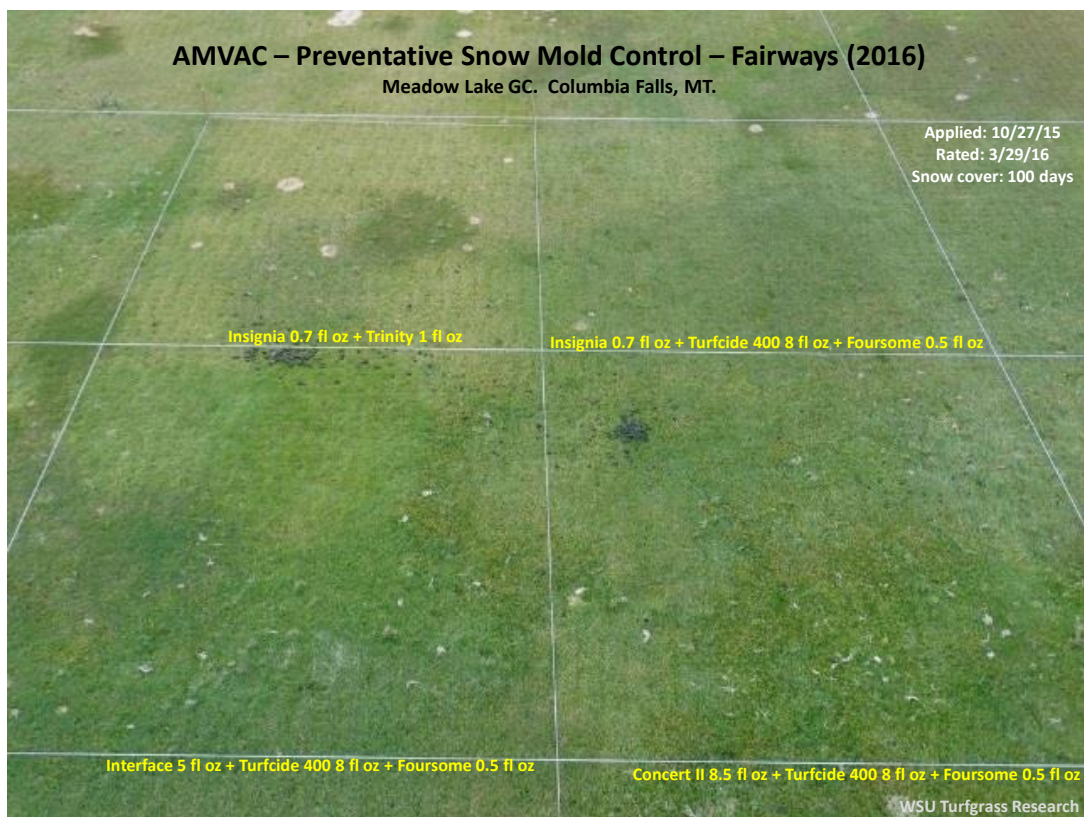


Fig. 13. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

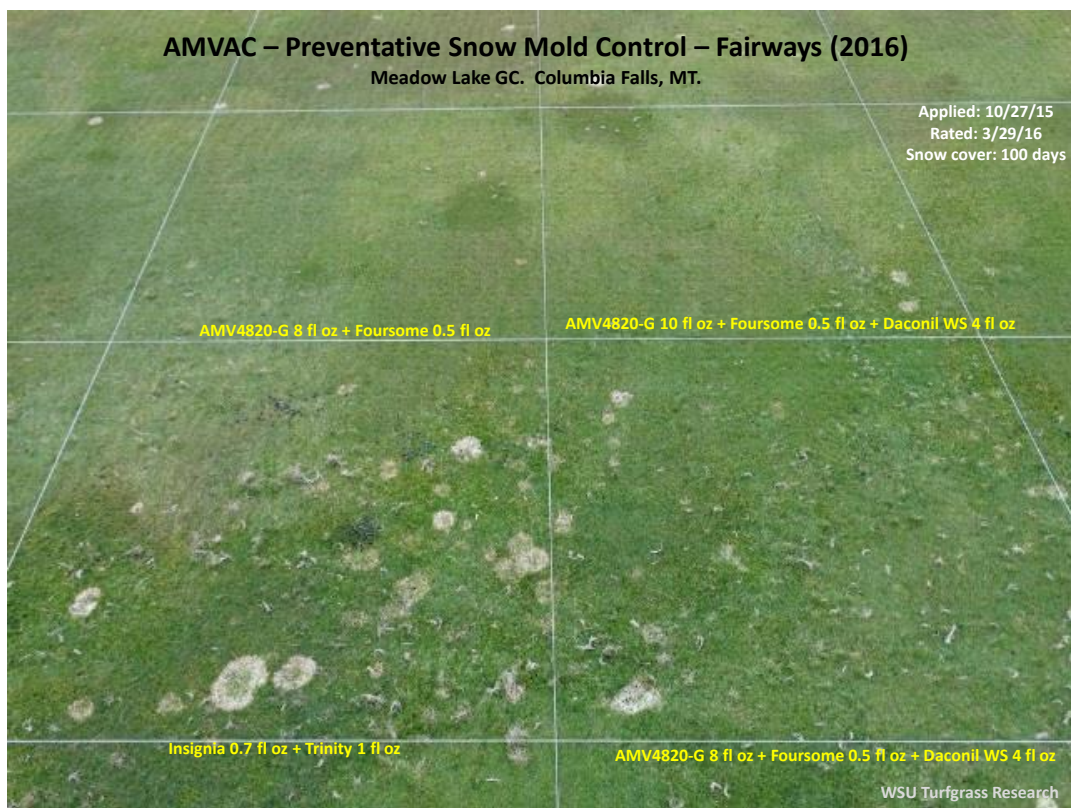


Fig. 14. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

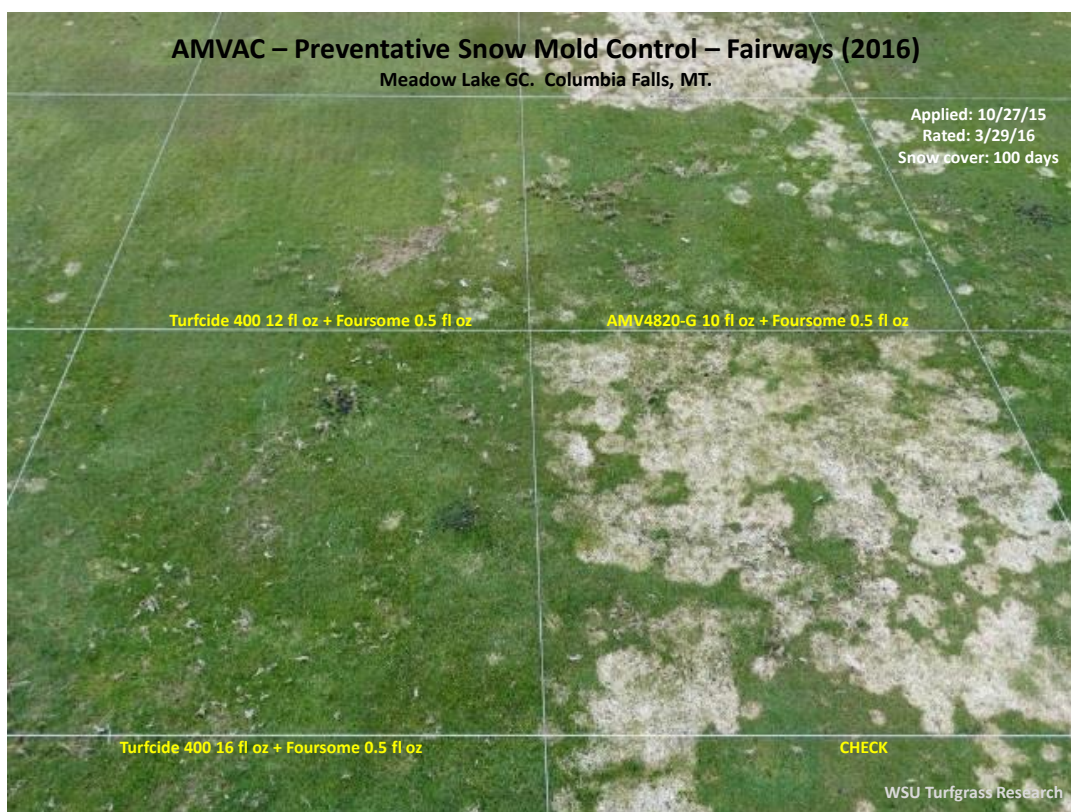


Fig. 15. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

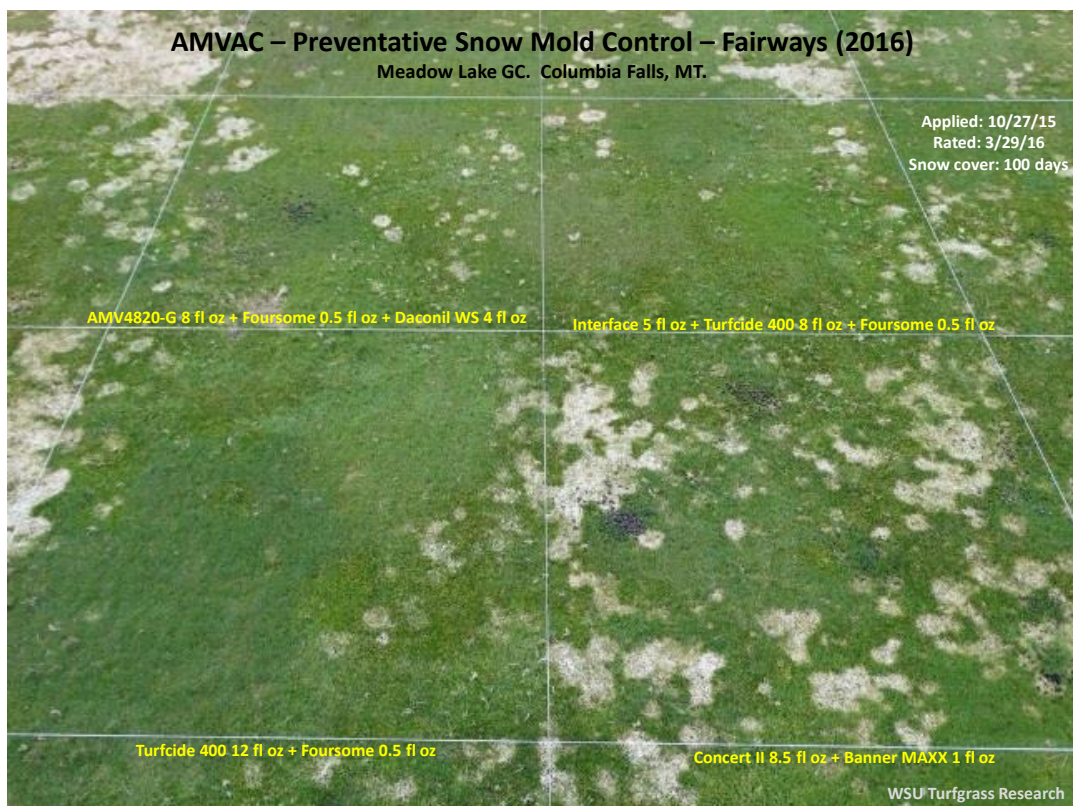


Fig. 16. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

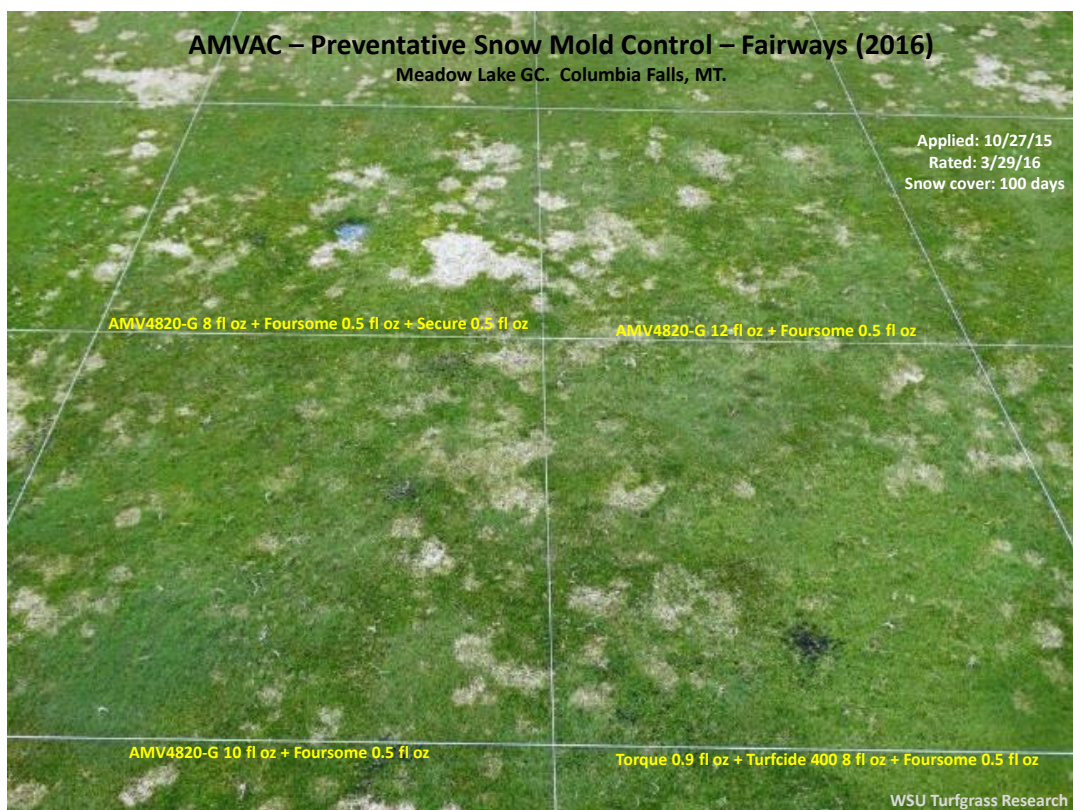


Fig. 17. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

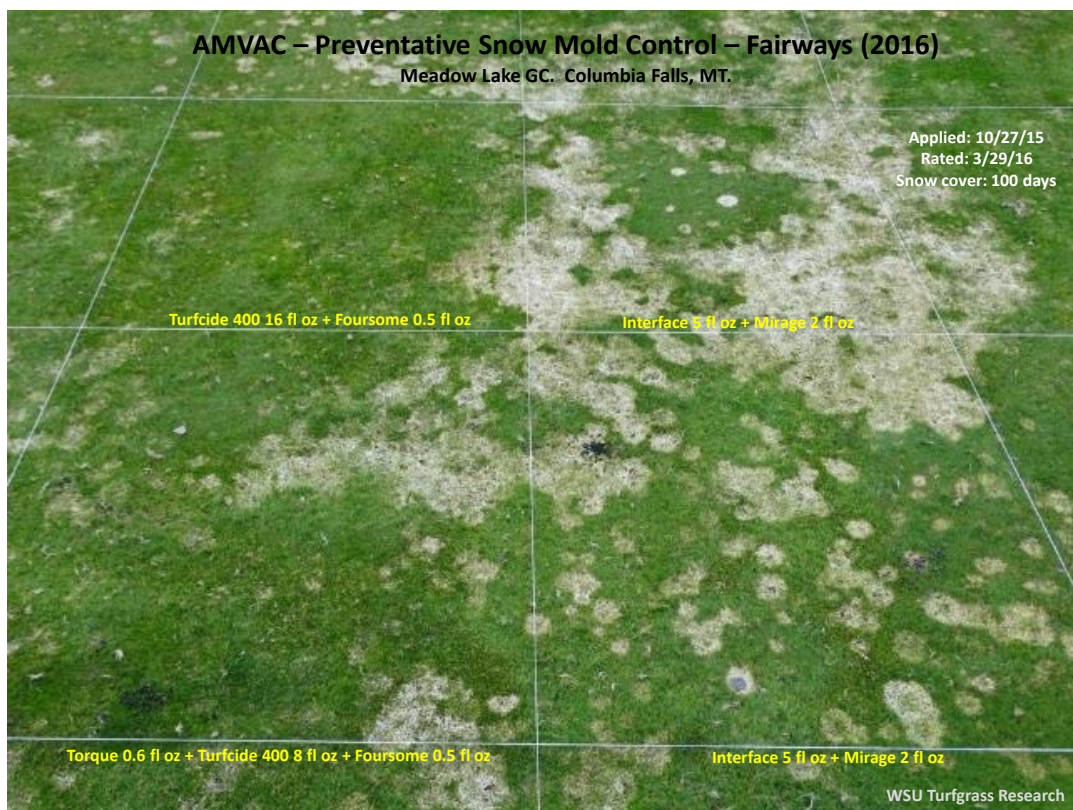


Fig. 18. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

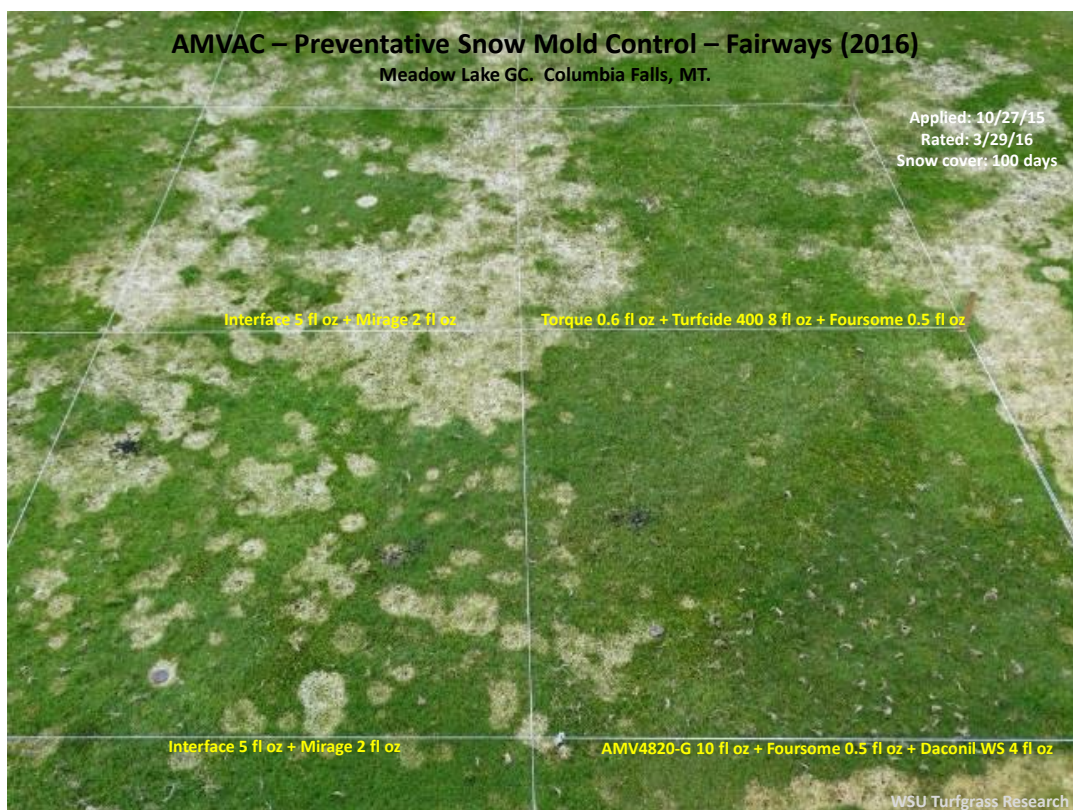


Fig. 19. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.

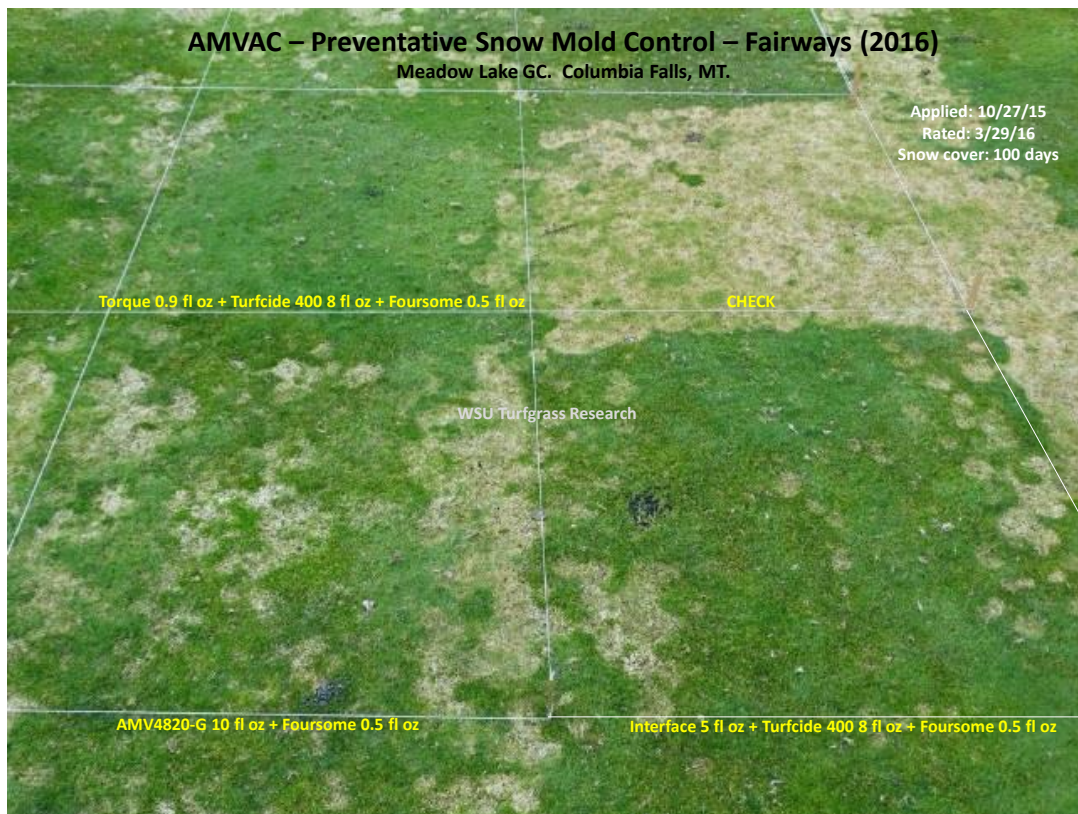
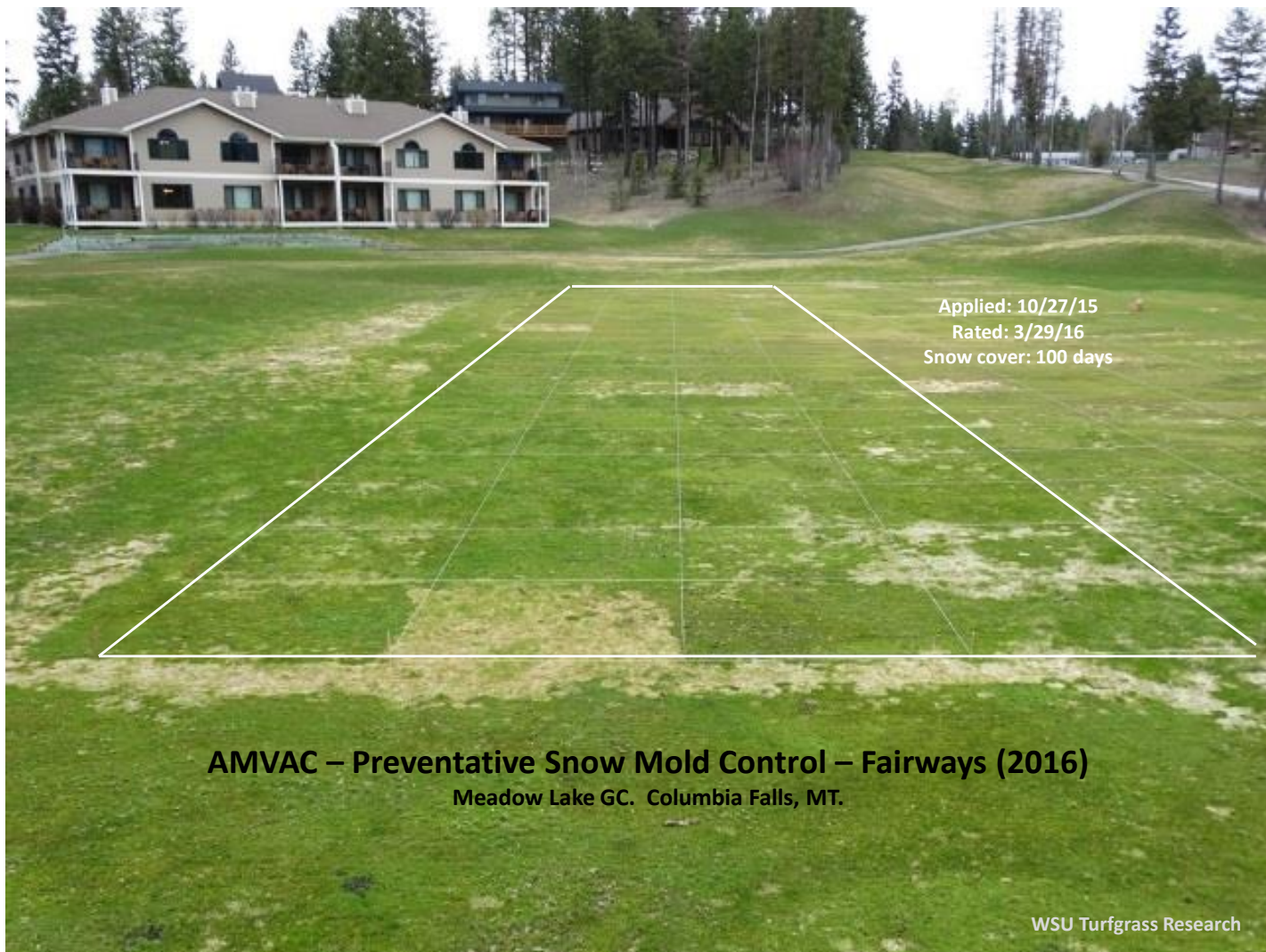


Fig. 20. Snow mold fungicide treatments on a fairway at Meadowlake Golf and Country Club. Columbia Falls, MT. Rated 29 Mar 2016.



Applied: 10/27/15
Rated: 3/29/16
Snow cover: 100 days

AMVAC – Preventative Snow Mold Control – Fairways (2016)
Meadow Lake GC. Columbia Falls, MT.

WSU Turfgrass Research