Syngenta Fungicides to Control Snow Mold on Putting Greens in Montana and Washington 2012-2013

Syngenta protocol#: F12-DKM-T-16 and FDI803A3-2012US

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Snow mold control trials were conducted at 3 locations in the Intermountain Region of the PNW, on a research green at the WSU Turfgrass and Agronomy Research Center (TARC) in Pullman, WA, a green at Meadow Lake Resort Golf Course in Columbia Falls, MT, and a practice green at the City of McCall Golf Course in McCall, ID. The research green at Pullman is a pure stand of 'T-1' creeping bentgrass grown on an USGA specification constructed putting green, the green at Columbia Falls is a mixed stand of 'Penncross' creeping bentgrass and annual bluegrass, and the practice green at McCall is a mixed stand of creeping bentgrass and annual bluegrass. Individual treatment plots were 6' x 7' with four replications in a randomized complete-block design. Treatments were applied 29 Oct 2012, 2 Nov 2012, and 14 Nov 2012 at McCall, Columbia Falls, and Pullman, respectively. Fungicides were applied at 80 GPA with a bicycle-wheeled CO_2 pressurized (40 psi) sprayer with 11008 flat fan TeeJet nozzles. GPS coordinates for each location is in Table 1. Weather data at time of application at each location is in Table 2. At Pullman, snow cover was intermittent totaling approximately 40 days. Columbia Falls had snow cover totaling approximately 110 days from December 2012 to the third week of March 2013. Continuous snow cover lasted from the beginning of December 2012 through the first week of April 2013 (approx. 130 days) at McCall. Individual plots were evaluated for pink (*Microdochium nivale*) and/or gray (*Typhula spp.*) snow mold disease severity (% area infected) and turfgrass quality rated on a scale from 1 to 9; 9 = excellent and 6 = acceptable on 8 Mar, 28 Mar, and 23 Apr 2013 at Pullman, Columbia Falls, and McCall, respectively. **(Note: A study was put out at the City of McCall Golf Course in McCall, ID but no data were taken since there was no disease in any treatment, including the check. Furthermore, no differences in turfgrass quality were observed)**.

At Pullman, disease pressure was very low, the untreated control had approximately 7% pink snow mold (Table 3.). Many treatments resulted in better disease control compared to the untreated control. Treatments with experimental compounds that did well were X4603 1 fl oz/M + A17856 1.09 fl oz/M + PAR 0.36 fl oz/M, X4601 0.236 fl oz/M + PAR 0.36 fl oz/M, X4603 1 fl oz/M + A7087 0.5 fl oz/M + PAR 0.36 fl oz/M, and X4603 1 fl oz/M + PAR 0.36 fl oz/M. Instrata at 7 or 9.4 fl oz/M resulted in excellent snow mold control, however, adding PAR did result in an increase in turfgrass quality but not significantly. Interface 4 fl oz/M + Triton FLO 0.85 fl oz/M had pink snow mold control and turfgrass quality as good as the best Syngenta treatments in this study. Insignia 0.7 fl oz/M + Trinity 1 fl oz/M resulted in excellent disease control however, had slightly lower turfgrass quality compared to the better Syngenta treatments. A8574 0.218 or 0.42 fl oz/M + PAR 0.36 fl

oz/M did not result in a significant reduction in disease compared to the untreated control. A17856 1.09 fl oz/M + PAR 0.36 fl oz/M resulted in higher disease compared to the untreated control, however, this difference was not significant. Most treatments in which PAR at 0.36 fl oz/M was added resulted in a significant increase in turfgrass quality.

At Columbia Falls, disease pressure was low, the untreated control had approximately 16% of the plot area infected with both pink and gray snow mold (Table 4). It was estimated that there was approximately 65% pink and 35% gray snow mold in the untreated control. All fungicide treatments in this study resulted in significantly less snow mold compared to the untreated control. Many treatments with experimental compounds that did very well here also did well at Pullman (see above) with the exception of A17856 1.09 fl oz/M + PAR 0.36 fl oz/M. At Pullman, this treatment did not provide any control of pink snow mold, however, at Columbia Falls it resulted in a significant reduction in both pink and gray snow mold. Interface 4 fl oz/M + Triton FLO 0.85 fl oz/M had snow mold control and turfgrass quality the same as the best Syngenta treatments in this study. Insignia 0.7 fl oz/M + Trinity 1 fl oz/M resulted in excellent disease control however, had slightly lower turfgrass quality compared to the better Syngenta treatments. Even though, A8574 at 0.218 or 0.42 fl oz/M + PAR 0.36 fl oz/M and Secure 0.5 fl oz/M + PAR 0.36 fl oz/M significantly reduced snow mold to 5 to 6%, at least numerically, these treatments were not as good compared to the other fungicide treatments.

Overall, many treatment with experimental compounds did well at both locations: X4601 0.236 fl oz/M + PAR 0.36 fl oz/M and X4603 1 fl oz/M + PAR 0.36 fl oz/M or tank mixed with A17856 1.09 fl oz/M or A7087 0.5 fl oz/M (Tables 3 and 4). Snow mold control was not as good with A8574 at 0.218 fl oz/M or 0.42 fl oz/M + PAR 0.36 fl oz/M at either location. Surprisingly, A17856 1.09 fl oz/M + PAR 0.36 fl oz/M did well at Columbia Falls, controlling both pink and gray snow mold but did not do well in controlling pink snow mold in Pullman. The opposite occurred with Secure 0.5 fl oz/M + PAR 0.36 fl oz/M, which did well at Pullman, but not as well at Columbia Falls. As far as the registered fungicide treatments, Instrata at 7 or 9.4 fl oz/M alone or tank mixed with PAR 0.36 fl oz/M resulted in excellent snow mold control at both locations. Instrata tank mixed with PAR 0.36 fl oz/M, for the most part, resulted in increased turfgrass quality. Interface 4 fl oz/M + Triton FLO 0.85fl oz/M, in which each contain Stressguard, resulted in some of the highest disease control and turfgrass quality at both locations. The 4-way mix of Banner MAXX II 2 fl oz/M + Secure 0.5 fl oz/M + Medallion 1 fl oz/M + PAR 0.36 fl oz/M resulted in excellent disease control and turfgrass quality at both locations. This treatment was no different than Instrata 9.4 fl oz/M + PAR 0.36 fl oz/M.

Table 1. GPS coordinates of the study sites at Pullman, Columbia Falls, MT, and McCall, ID.

Location: Pullman, WA. WSU Turfgrass and Agronomy Research Facility.
GPS coordinates: Lat.: 46° 44' 28.3" N
Long.: 117° 08' 55.5" W
Elev. 2573'

Location: Meadow Lake Resort Golf Course. Columbia Falls, MT.
GPS coordinates: Lat.: 48° 23' 19.2" N
Long.: 114° 12' 12.0" W
Elev.: 3164'

Location: McCall, ID. City of McCall Golf Course.
GPS coordinates: Lat.: 44° 54' 56.79" N
Long.: 116° 04' 57.05" W
Elev. 5042'

Table 2. Weather data at time of application.

	Pullman, WA	Columbia Falls, MT	McCall, ID
Application date	14 Nov 2012	2 Nov 2012	29 Oct 2012
Air temperature	5°C	9.4°C	12.2°C
Soil temp (2")	4.4°C	7.8°C	6.4°C
RH	88%	77%	65%
Wind (SW)	0-2 mph	0-2 mph	0-3 mph

Table 3. The effect of fungicides on turfgrass quality and control of pink snow mold on a research green at the WSU Turfgrass and Agronomy Research Facility in Pullman, WA. Rated 8 Mar 2013.

Treatment	RATE (fl oz/M)	Snow mold (% area infected)	*Turfgrass quality
Banner MAXX II (propiconazole) +	2	0.0 d **	5.4 ab
Secure (fluazinam) +	0.5		
Medallion TL (fludioxonil) +	1		
PAR (proprietary pigment concentrate)	0.37		
Instrata (propiconazole + fludioxonil + chlorothalonil)	9.4	0.0 d	4.6 bcde
PAR (proprietary pigment concentrate)	0.36		
Insignia SC (pyraclostrobin) +	0.7	0.0 d	4.5 cde
Trinity (triticonazole)	1		
X4603 +	1	0.3 d	5.5 a
A17856 +	1.09		
PAR (proprietary pigment concentrate)	0.36		
Secure (fluazinam) +	0.5	0.3 d	5.4 ab
PAR (proprietary pigment concentrate)	0.37		
Instrata (propiconazole + fludioxonil + chlorothalonil)	7	0.3 d	4.0 e
Instrata (propiconazole + fludioxonil + chlorothalonil)	9.4	0.3 d	3.9 e
Interface (iprodione + trifloxystrobin) +	4	0.5 d	5.4 ab
Triton FLO (triticonazole)	0.85		
X4601 +	0.236	0.9 cd	4.9 abcd
PAR (proprietary pigment concentrate)	0.36		
X4603 +	1	1.1 cd	5.0 abc
A7087 +	0.5		
PAR (proprietary pigment concentrate)	0.36		
X4603 +	1	1.8 cd	5.0 abc
PAR (proprietary pigment concentrate)	0.36		
Banner MAXX (propiconazole)	2	2.8 bcd	4.9 abcd
PAR (proprietary pigment concentrate)	0.36		
A8574 +	0.218	3.0 bcd	5.1 abc
PAR (proprietary pigment concentrate)	0.36		
A8574 +	0.42	5.5 abc	4.5 cde
PAR (proprietary pigment concentrate)	0.36		
Check	0	6.8 ab	2.9 f
A17856 +	1.09	9.3 a	4.1 de
PAR (proprietary pigment concentrate)	0.36		

*Turfgrass quality was rated on a scale from 1 to 9; with 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 'T-1' creeping bentgrass green at the WSU Turfgrass and Agronomy Research Facility in Pullman, WA. 8 Mar 2013.

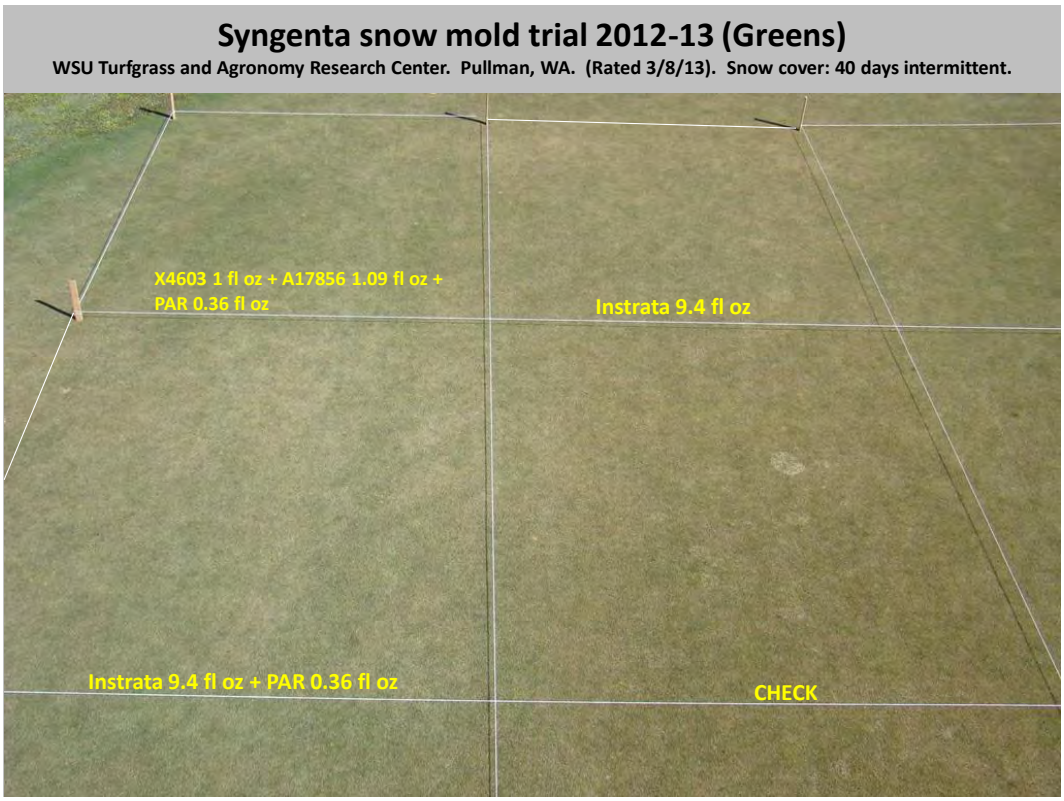

Fig. 2. Snow mold fungicide treatments on a 'T-1' creeping bentgrass green at the WSU Turfgrass and Agronomy Research Facility in Pullman, WA. 8 Mar 2013.

Fig. 3. Snow mold fungicide treatments on a 'T-1' creeping bentgrass green at the WSU Turfgrass and Agronomy Research Facility in Pullman, WA. 8 Mar 2013.

Fig. 4. Snow mold fungicide treatments on a 'T-1' creeping bentgrass green at the WSU Turfgrass and Agronomy Research Facility in Pullman, WA. 8 Mar 2013.

Fig. 5. Snow mold fungicide treatments on a 'T-1' creeping bentgrass green at the WSU Turfgrass and Agronomy Research Facility in Pullman, WA. 8 Mar 2013.

Fig. 6. Snow mold fungicide treatments on a 'T-1' creeping bentgrass green at the WSU Turfgrass and Agronomy Research Facility in Pullman, WA. 8 Mar 2013.

Table 4. The effect of fungicides on turfgrass quality, color, and control of pink and gray mold on a green at Meadow Lake Resort Golf Course in Columbia Falls, MT. Rated 28 Mar 2013.

Treatment	RATE (fl oz/M)	Snow mold (% area infected)	*Turfgrass quality
X4603 + A17856 + PAR (proprietary pigment concentrate)	1 1.09 0.36	0.0 b**	7.0 a
Interface (iprodione + trifloxystrobin) + Triton FLO (triticonazole)	4 0.85	0.0 b	7.0 a
Instrata (propiconazole + fludioxonil + chlorothalonil)	9.4	0.0 b	4.8 d
Instrata (propiconazole + fludioxonil + chlorothalonil)	7	0.0 b	4.8 d
Instrata (propiconazole + fludioxonil + chlorothalonil) + PAR (proprietary pigment concentrate)	9.4 0.36	0.2 b	7.0 a
Banner MAXX II (propiconazole) + Secure (fluazinam) + Medallion TL (fludioxonil) + PAR (proprietary pigment concentrate)	2 0.5 1 0.37	0.2 b	6.8 ab
X4603 + PAR (proprietary pigment concentrate)	1 0.36	0.3 b	6.7 abc
X4601 + PAR (proprietary pigment concentrate)	0.236 0.36	0.7 b	6.7 abc
A17856 + PAR (proprietary pigment concentrate)	1.09 0.36	0.7 b	6.7 abc
X4603 + A7087 + PAR (proprietary pigment concentrate)	1 0.5 0.36	0.8 b	6.8 ab
Insignia SC (pyraclostrobin) + Trinity (triticonazole)	0.7 1	1.2 b	5.5 cd
Banner MAXX (propiconazole) PAR (proprietary pigment concentrate)	2 0.36	3.0 b	5.8 abcd
A8574 + PAR (proprietary pigment concentrate)	0.218 0.36	5.0 b	5.7 bcd
A8574 + PAR (proprietary pigment concentrate)	0.42 0.36	5.0 b	5.3 d
Secure (fluazinam) + PAR (proprietary pigment concentrate)	0.5 0.37	6.0 b	5.7 bcd
Untreated control	0	15.7 a	2.3 e

*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. 7. Snow mold fungicide treatments on a 'Penncross' creeping bentgrass/annual bluegrass putting green at Meadow Lake Resort Golf Course in Columbia Falls, MT. Rated 28 Mar2013.

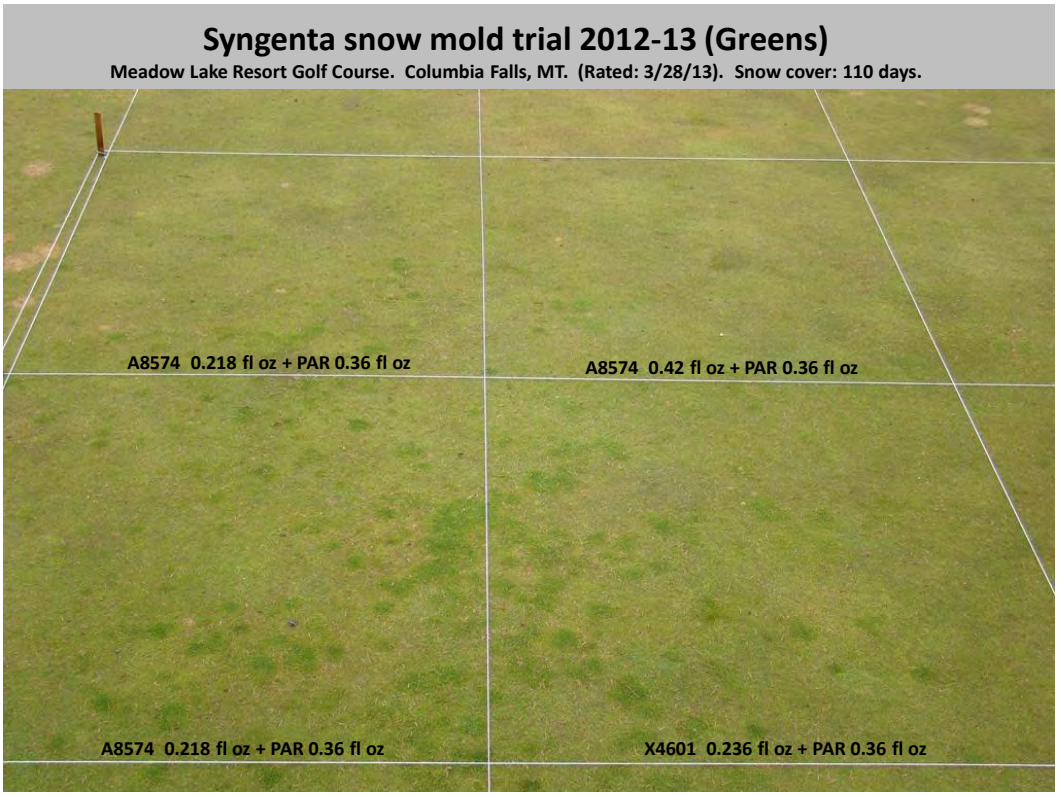

Fig. 8. Snow mold fungicide treatments on a 'Penncross' creeping bentgrass/annual bluegrass putting green at Meadow Lake Resort Golf Course in Columbia Falls, MT. Rated 28 Mar2013.

Fig. 9. Snow mold fungicide treatments on a 'Penncross' creeping bentgrass/annual bluegrass putting green at Meadow Lake Resort Golf Course in Columbia Falls, MT. Rated 28 Mar2013.

Fig. 10. Snow mold fungicide treatments on a 'Penncross' creeping bentgrass/annual bluegrass putting green at Meadow Lake Resort Golf Course in Columbia Falls, MT. Rated 28 Mar2013.

Fig. 11. Snow mold fungicide treatments on a 'Penncross' creeping bentgrass/annual bluegrass putting green at Meadow Lake Resort Golf Course in Columbia Falls, MT. Rated 28 Mar2013.

Fig. 12. Snow mold fungicide treatments on a 'Penncross' creeping bentgrass/annual bluegrass putting green at Meadow Lake Resort Golf Course in Columbia Falls, MT. Rated 28 Mar2013.

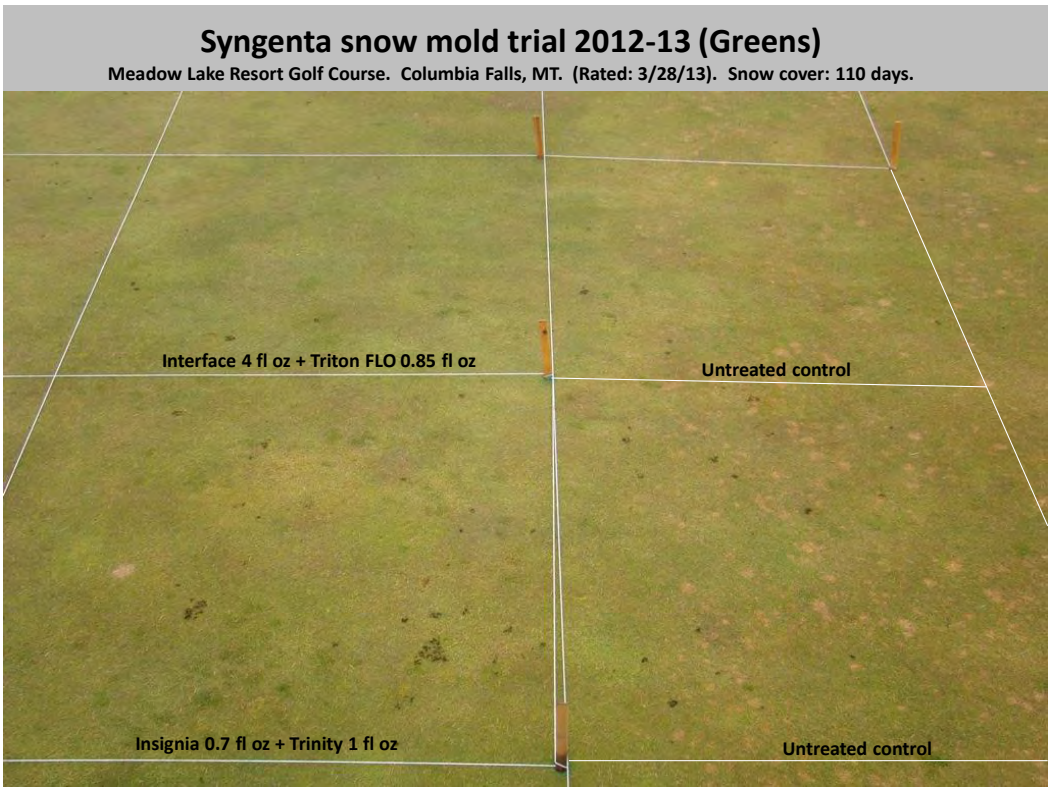

Fig. 13. Snow mold fungicide treatments on a 'Penncross' creeping bentgrass/annual bluegrass putting green at Meadow Lake Resort Golf Course in Columbia Falls, MT. Rated 28 Mar2013. Overview of entire study.

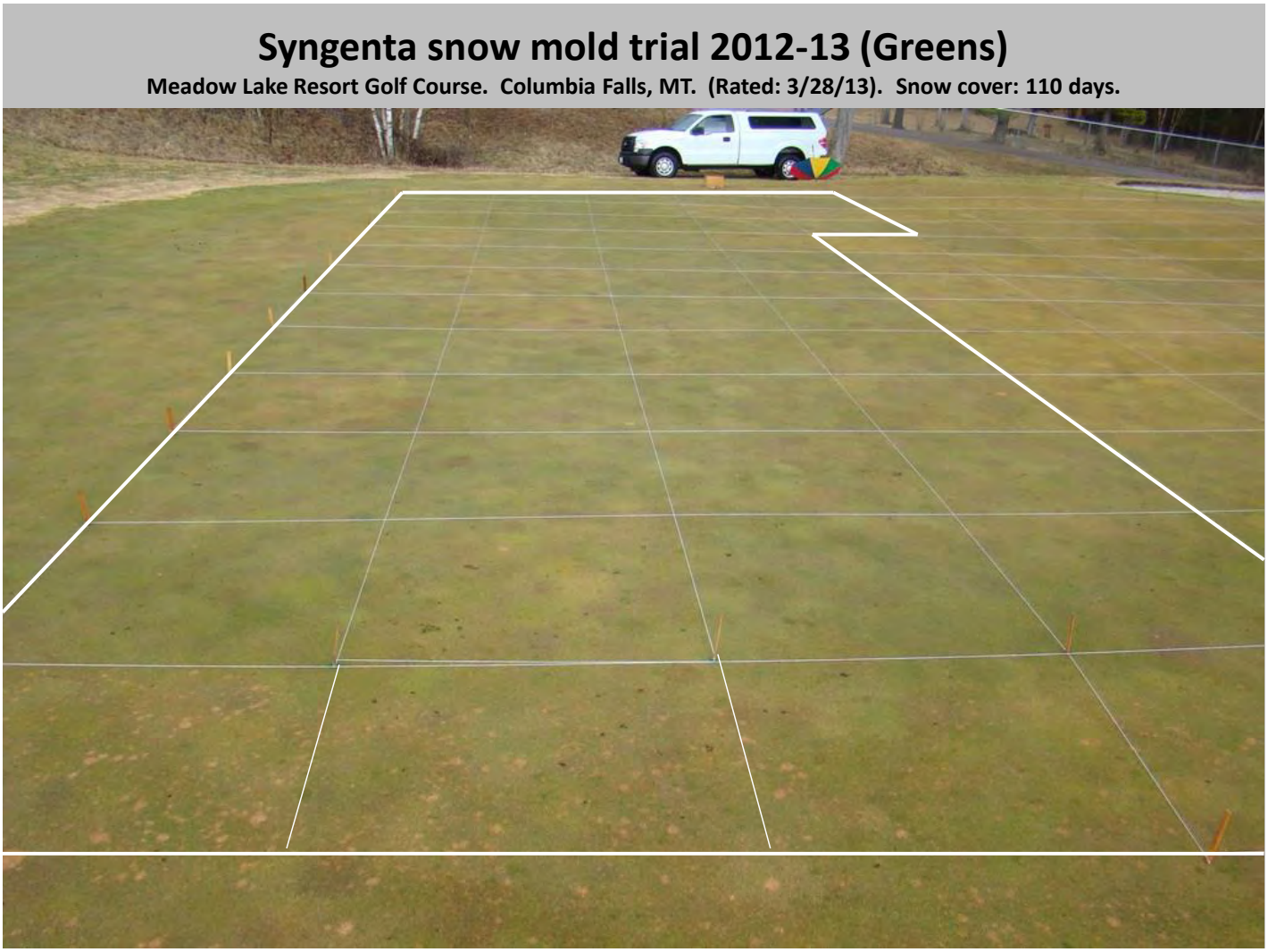

Fig. 11. Snow mold fungicide treatments on a 'Penncross' creeping bentgrass/annual bluegrass putting green at Meadow Lake Resort Golf Course in Columbia Falls, MT 6 Apr 2012.

Fig. 12. Snow mold fungicide treatments on a 'Penncross' creeping bentgrass/annual bluegrass putting green at Meadow Lake Resort Golf Course in Columbia Falls, MT 6 Apr 2012.

Table 3. The effect of fungicides on turfgrass quality, color and control of pink and gray mold on a green at Chewelah Golf and Country Club in Chewelah, WA. Rated 9 Apr 2012.