

Evaluating Fungicides for Snow Mold Control on Putting Greens and Fairways in the Intermountain West 2010-11 Results

IEGCSA 2011 Pesticide Short Course

Nov. 14, 2011

Hayden Lake Country Club. Hayden Lake, ID

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Washington State University
Pullman, WA

Overview

- Snow mold ID
- Fungicides
- 2010-11 Trials
 - PAR (Proprietary pigment concentrate)
 - Fairways: Reduced rates of 2 or 3-way fungicide combinations (Chewelah)
 - Greens: Combinations with Interface, Reserve, or Tartan (Pullman, Chewelah, and McCall)

Snow molds

- **Pink snow mold**
 - *Microdochium nivale*
- **Gray snow molds**
 - *Typhula incarnata*
 - *Typhula ishikariensis*

Pink Snow Mold

(AKA: Microdochium or Fusarium patch)

(Microdochium nivale)

- Cool moist conditions 30-60 °F (Spring, Fall, Winter)
- Does not require snow cover
- Circular patches, light gray to reddish bronze, up to 20" diameter
- Pink fungal spores build-up on leaves

Early stages of pink snow mold development



Pink snow mold



Gray Snow Molds

Typhula incarnata

Typhula ishikariensis

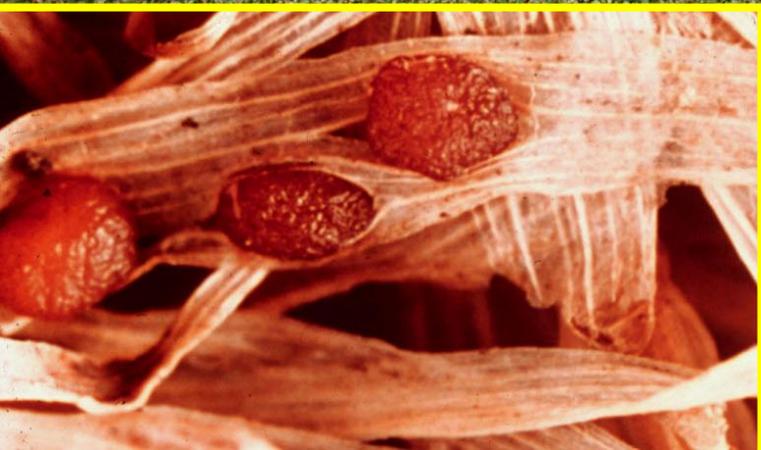
Typhula incarnata

- >60 days continuous snow cover
- Unfrozen ground (34-36 °F)
- Circular patches of gray/white matted turf
- **Sclerotia**: spherical up to 5 mm diameter red/brown embedded in dead leaf tissue (spring). Over summer on the soil surface.
- **Sporocarps**: pink fleshy club-shaped upright structures 20 mm tall (fall only)
- Less destructive

Typhula incarnata



Sclerotia



T. incarnata sporocarps in
low cut turf in the fall



Typhula ishikariensis

- >100 days continuous snow cover
- Unfrozen ground (34-36 °F)
- Circular patches of gray/white matted turf or a bleached crust of mycelium after drying
- **Sclerotia**: <2 mm dark brown/black visible on crust (spring). Over summer on soil surface.
- **Sporocarps**: silvery-white fleshy club-shaped; very small <15 mm tall (very rare) (fall only)
- Destructive

Typhula ishikariensis



Sclerotia

The image shows a close-up of a plant stem with several dark, circular sclerotia. Two yellow arrows point to these structures, which are characteristic of the fungus Typhula ishikariensis. The stem is light-colored and shows some signs of decay or damage.

Disease Severity

Snow cover

Diseases

100 days

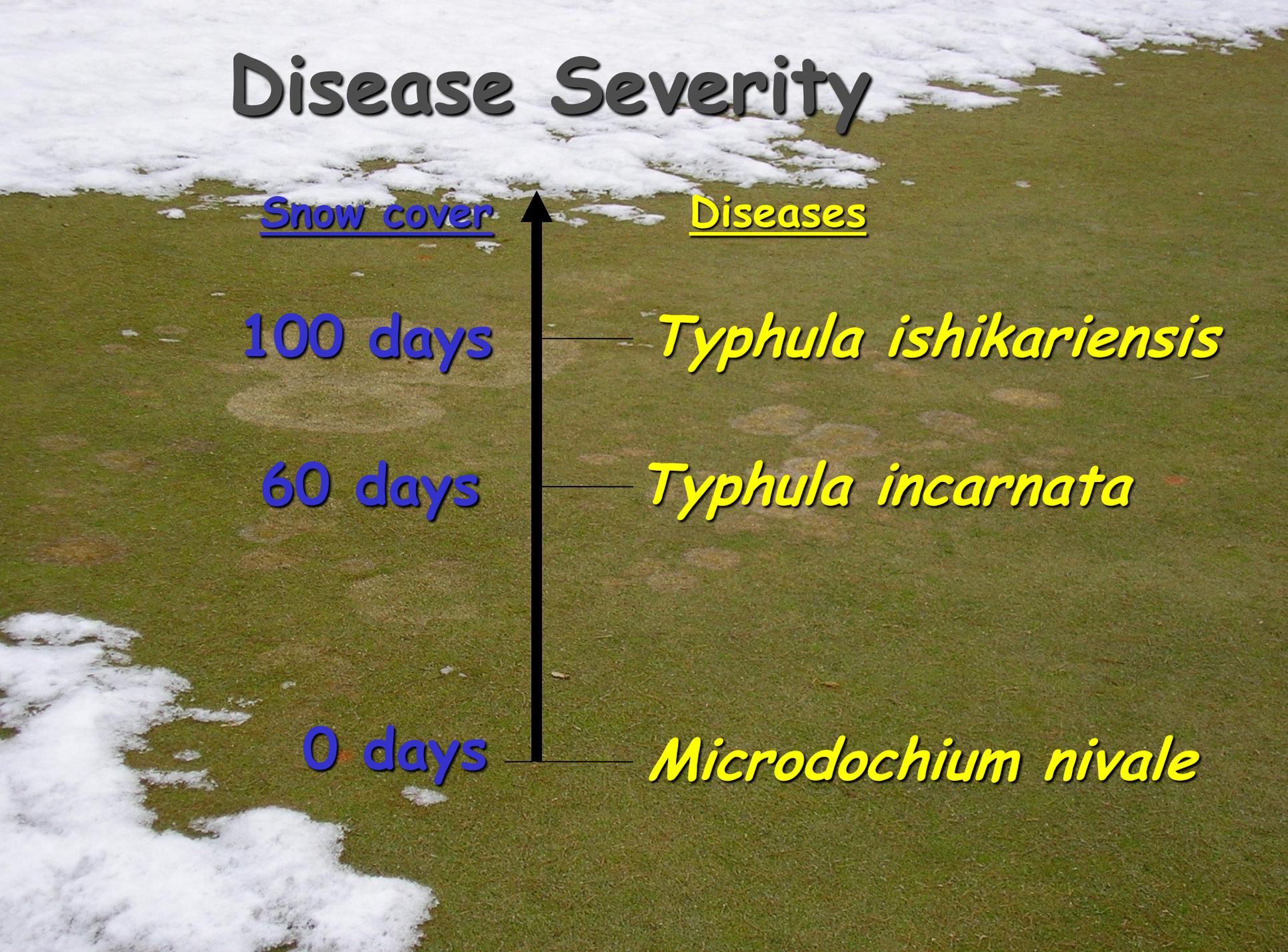
Typhula ishikariensis

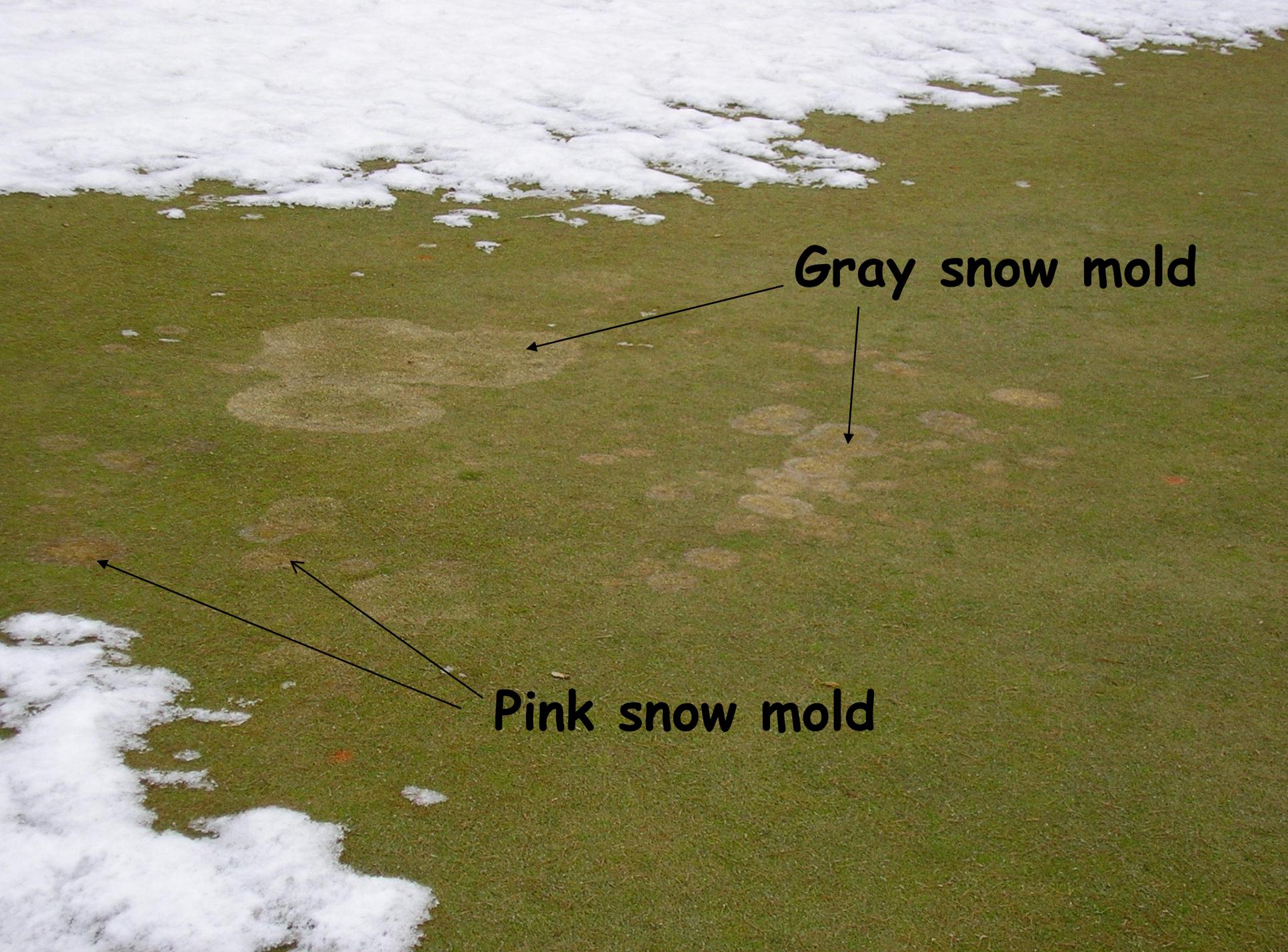
60 days

Typhula incarnata

0 days

Microdochium nivale





Gray snow mold

Pink snow mold

DMI Fungicides

(broad spectrum, systemic, resistance potential: medium)

- **Banner MAXX, Spectator Ultra**

• propiconazole

- **Trinity, Triton FLO**

• triticonazole

- ~~Lynx~~, **Torque**

• tebuconazole

- **Bayleton**

• triadimefon

Strobilurin Fungicides

(broad spectrum, systemic, single-site MOA, resistance potential: high)

- **Heritage**
 - azoxystrobin
- **Compass**
 - trifloxystrobin
- **Insignia**
 - pyraclostrobin

Contact Fungicides

(broad spectrum, multi-site MOA, resistance potential: Low)

- **Daconil, Docket, Manicure Ultra**
 - chlorothalonil
- **Medallion** (inhibits germination of fungal spores)
 - fludioxonil
- **Terraclor, Turfcide 400, Revere 4000, FFII 14-3-3**
 - PCNB, Quintozene

Fungicides

- **26GT, 18 Plus**
 - iprodione
- **Cleary's 3336**
 - thiophanate-methyl

Single formulations with 2 to 3 fungicides

- **Syngenta**

- **Instrata** (propiconazole + fludioxonil + chlorothalonil)
- **Headway** (propiconazole + azoxystrobin)
- **Concert** (propiconazole + chlorothalonil)
- **Renown** (azoxystrobin + chlorothalonil)

Single formulations with 2 fungicides

- **Bayer**

- **Interface** (iprodione + trifloxystrobin) w/ StressGard

- **Tartan** (triadimefon + trifloxystrobin) w/ StressGard

- **Reserve** (triticonazole + chlorothalonil) w/ StressGard

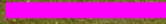
- *StressGard formulated products deliver superior turfgrass quality, improved health, vigor, density and color

Trial application timing

- Close to permanent snow cover
- McCall, ID: >150 days snow cover
- Oct 20 - 27
- Chewelah, WA: >100 days <150 days
- Oct 25 - Nov 1
- Pullman, WA: <60 days snow cover
- Nov 15 - 25

Application Timing

Trials



Jul Aug Sept Oct Nov Dec Jan Feb Mar Apr May Jun

Additional pink snow mold control

Ratings

- **Disease** (% area infected)
- **Turfgrass quality** (rated 1-9; 9 = excellent)
- **Color** (rated 1-9; 9 = dark green)

Trial results

- **PAR** (Proprietary pigment concentrate)
- **Fairways:** Reduced rates of 2 or 3-way fungicide combinations (Chewelah)
- **Greens:** Combinations with Interface, Reserve, or Tartan (Pullman, Chewelah, and McCall)

PAR (proprietary pigment concentrate)



Simplot

Dark green pigment

Mixed with Fall applied fungicides for snow mold control, what effects will this have on the turf the following spring?

City of McCall Golf Course
10/27/10

Instrata 9.3 fl oz + PAR

Instrata 9.3 fl oz

(Interface 6 fl oz + Triton FLO) w/StressGard



Instrata + PAR

Treatment	Rate (prod/M)	<u>Pullman</u>		<u>Chewelah</u>		<u>McCall</u>	
		Disease (% area)	Color	Disease (% area)	Color	Disease (% area)	Quality
INSTRATA	7 fl oz	0.0	3.3	---	---	---	---
INSTRATA + PAR	7 fl oz 0.37 fl oz	0.0	4.5	---	---	---	---
INSTRATA	9.3 fl oz	---	---	7.3	4.8	1.0	4.7
INSTRATA + PAR	9.3 fl oz 0.37 fl oz	---	---	2.3	7.0	0.0	7.8

(Reserve 5.4 fl oz + Interface 6 fl oz) + SG

Instrata 9.3 fl oz

Rated 5/2/11

Instrata 9.3 fl oz + PAR 0.37 fl oz

Instrata 11 fl oz

Instrata + PAR

Rated: 3/30/11
125 days snow cover

Instrata + PAR

PAR 0.37 fl oz

Instrata 9.3 fl oz + PAR 0.37 fl oz

Chewelah Golf and Country Club
3/30/11

Bottom line

- Tank mixing PAR 0.37 fl oz with Instrata increased turfgrass quality and color, when rated soon after snow melt, compared to Instrata alone

Fairway Trial Chewelah 2010-11

Kentucky bluegrass
perennial ryegrass
creeping bentgrass
annual bluegrass

App date: 10/29/10
Rated: 3/30/11
125 days snow cover
70% gray/30% pink

Rep 2

Rep 1

Fairway Trial 2010-11 (Chewelah)

125 days snow cover
70% gray/30% pink
Rated: March 30, 2011

Fungicide treatment	Rate (prod/M)	Disease (% area infected)	Turf Quality
Interface (iprodione + trifloxystrobin) + <i>SG</i>	6 fl oz	0.3 d	7.5 a
Instrata (propiconazole + fludioxonil + chlorothalonil)	9 fl oz	0.8 d	6.0 b
Concert (propiconazole + chlorothalonil) + Medallion (fludioxonil)	5 fl oz 0.25 oz	1.8 d	5.8 bc
Renown (azoxystrobin + chlorothalonil)	4.5 fl oz	2.5 d	5.6 bc
Instrata (propiconazole + fludioxonil + chlorothalonil)	5 fl oz	2.8 d	5.5 bcd
Concert (propiconazole + chlorothalonil) + Banner MAXX (propiconazole)	5 fl oz 1 fl oz	3.5 cd	4.8 cd
Concert (propiconazole + chlorothalonil) + Banner MAXX (propiconazole)	8.5 fl oz 1 fl oz	4.3 cd	4.8 cd
Concert (propiconazole + chlorothalonil)	8.5 fl oz	5.3 cd	4.5 ce
Concert (propiconazole + chlorothalonil)	5 fl oz	10.8 bc	3.5 e
Headway G (propiconazole + azoxystrobin)	4 lbs	13.8 b	3.6 e
Check	0	88.8 a	1.0 f

Rated: 3/30/11
125 days snow cover

Concert 8.5 fl oz

Concert 5 fl oz + Banner MAXX 1 fl oz

Interface 6 fl oz

Headway G 4 lbs/M

Fairway Trial 2010-11 (Chewelah)

Chewelah Golf and Country Club
Chewelah, WA

Fairway Trial 2010-11 (Chewelah)

Rated: 3/30/11
125 days snow cover

Headway G 4 lbs/M

Renown 4.5 fl oz

Concert 8.5 fl oz + Banner MAXX 1 fl oz

Concert 8.5 fl oz

Chewelah Golf and Country Club
Chewelah, WA

Fairway Trial 2010-11 (Chewelah)

Rated: 3/30/11
125 days snow cover

Instrata 5 fl oz

Instrata 9 fl oz

CHECK

Concert 5 fl oz + Medallion 0.25 oz

Chewelah Golf and Country Club
Chewelah, WA

Fairway Trial 2010-11 (Chewelah)

125 days snow cover
70% gray/30% pink

Fungicide treatment	Rate (prod/M)
Interface (iprodione + trifloxystrobin) + SG	6 fl oz
Concert (propiconazole + chlorothalonil) + Medallion (fludioxonil)	5 fl oz 0.25 oz
Instrata (propiconazole + fludioxonil + chlorothalonil)	5 fl oz
Renown (azoxystrobin + chlorothalonil)	4.5 fl oz
Concert (propiconazole + chlorothalonil) + Banner MAXX (propiconazole)	5 fl oz 1 fl oz
Concert (propiconazole + chlorothalonil)	8.5 fl oz

Greens Trial 2010-11 (Pullman)

'T-1' creeping bentgrass

Applied: 11/17/10
Rated: 3/24/11
65 days snow cover
Pink snow mold

Rep 2

Rep 1

Greens Trial 2010-11 (Pullman)

65 days snow cover
 100% pink snow mold
 Rated: March 24, 2011

Fungicide treatment	Rate (prod/M)	Disease (% area infected)	Turf quality	Color
INTERFACE (iprodione + trifloxystrobin) + SG + DACONIL ULTREX (chlorothalonil)	6 fl oz 5 oz	0.0 c	5.5 a	5.5 a
INTERFACE (iprodione + trifloxystrobin) + SG + DACONIL ULTREX (chlorothalonil)	5 fl oz 5 oz	0.0 c	5.3 ab	5.3 ab
INTERFACE (iprodione + trifloxystrobin) + SG + DACONIL ULTREX (chlorothalonil)	4 fl oz 5 oz	0.0 c	5.0 ab	4.8 bc
INSTRATA (propiconazole + fludioxonil + chlorothalonil) + PAR (proprietary pigment concentrate)	7 fl oz 0.37 fl oz	0.0 c	4.8 b	4.5 c
INSTRATA (propiconazole + fludioxonil + chlorothalonil)	5 fl oz	0.0 c	4.0 c	3.5 d
INSTRATA (propiconazole + fludioxonil + chlorothalonil)	7 fl oz	0.0 c	4.0 c	3.3 d
TARTAN (triadimefon + trifloxystrobin) + SG	2 fl oz	0.3 c	5.0 ab	5.0 abc
RESERVE (triticonazole + chlorothalonil) + SG	4.5 fl oz	0.3 c	4.8 b	5.0 abc
PAR (proprietary pigment concentrate)	0.37 fl oz	5.3 b	3.3 cd	5.0 abc
CHECK		14.8 a	2.3 d	3.8 d

Greens Trial 2010-11 (Pullman)

<65 days snow cover
100% pink

Fungicide treatment	Rate (prod/M)
INTERFACE (iprodione + trifloxystrobin) + SG + DACONIL ULTREX (chlorothalonil)	4 or 5 fl oz 5 oz
INSTRATA (propiconazole + fludioxonil + chlorothalonil) + PAR (proprietary pigment concentrate)	5 or 7 fl oz 0.37 fl oz
TARTAN (triadimefon + trifloxystrobin) + SG	2 fl oz
RESERVE (triticonazole + chlorothalonil) + SG	4.5 fl oz

Greens Trial 2010-11 (Chewelah)

creeping bentgrass
annual bluegrass

App date: 10/29/10
Rated: 3/30/11
125 days snow cover
60% gray/40%pink

Rep 1

Rep 2

Greens Trial 2010-11 (Chewelah)

125 days snow cover
60% gray / 40% pink
Rated: March 30, 2011

Fungicide treatment	Rate (prod/M)	Disease (% area) infected)	Turf quality	Color
TARTAN (triadimefon + trifloxystrobin) + SG + DACONIL ULTREX (chlorothalonil)	2 fl oz 5 oz	1.0 d	6.5 a	6.5 b
RESERVE (triticonazole + chlorothalonil) + SG + COMPASS (trifloxystrobin)	4.5 fl oz 0.25 oz	1.3 d	6.0 ab	6.0 c
INTERFACE (iprodione + trifloxystrobin) + SG + TRITON FLO (triticonazole) + SG	5 fl oz 0.85 fl oz	1.8 cd	6.3 ab	7.0 a
INSTRATA (propiconazole + fludioxonil + chlorothalonil) + PAR (proprietary pigment concentrate)	9.3 fl oz 0.37 fl oz	2.3 cd	6.5 a	7.0 a
INSTRATA (propiconazole + fludioxonil + chlorothalonil)	11 fl oz	3.8 cd	5.3 abc	5.3 d
INTERFACE (iprodione + trifloxystrobin) + SG TRITON FLO (triticonazole) + SG	6 fl oz 0.85 fl oz	6.5 cd	6.0 ab	7.0 a
INTERFACE (iprodione + trifloxystrobin) + SG TRITON FLO (triticonazole) + SG	3 fl oz 0.5 fl oz	7.3 cd	5.0 bc	6.0 c
INSTRATA (propiconazole + fludioxonil + chlorothalonil)	9.3 fl oz	7.3 cd	4.3 c	4.8 e
INTERFACE (iprodione + trifloxystrobin) + SG TRITON FLO (triticonazole) + SG	4 fl oz 0.85 fl oz	8.8 c	4.0 c	6.3 bc
PAR (proprietary pigment concentrate)	0.37 fl oz	78.8 b	1.0 d	1.0 f
CHECK	0	86.3 a	1.0 d	1.0 f

Greens Trial 2010-11 (Chewelah)

Interface 5 fl oz + TritonFLO 0.85 fl oz

Interface 6 fl oz + TritonFLO 0.85 fl oz

Instrata 9.3 fl oz + PAR 0.37 fl oz

Check

Rated: 3/30/11
125 days snow cover

Chewelah Golf and Country Club

Reserve 4.5 fl oz + Compass 0.25 oz

Tartan 2 fl oz + Daconil Ultrex 5 oz

Instrata 11 fl oz

Reserve 4.5 fl oz + Compass 0.25 oz

Rated: 3/30/11
125 days snow cover

Greens Trial 2010-11 (Chewelah)

Chewelah Golf and Country Club

Instrata 9.3 fl oz + PAR 0.37 fl oz

PAR 0.37 fl oz

Tartan 2 fl oz + Daconil Ultrex 5 oz

Interface 3 fl oz + Triton FLO 0.5 fl oz

Greens Trial 2010-11 (Chewelah)

Chewelah Golf and Country Club
3/30/11

Greens Trial 2010-11 (Chewelah)

125 days snow cover
60% gray/40% pink

Fungicide treatment	Rate (prod/M)
TARTAN (triadimefon + trifloxystrobin) + SG + DACONIL ULTREX (chlorothalonil)	2 fl oz 5 oz
RESERVE (triticonazole + chlorothalonil) + SG + COMPASS (trifloxystrobin)	4.5 fl oz 0.25 oz
INTERFACE (iprodione + trifloxystrobin) + SG + TRITON FLO (triticonazole) + SG	5 or 6 fl oz 0.85 fl oz
INSTRATA (propiconazole + fludioxonil + chlorothalonil) + PAR (proprietary pigment concentrate)	9.3 or 11 fl oz 0.37 fl oz

Greens Trial 2010-11 (McCall)

creeping bentgrass
annual bluegrass

App date: 10/27/10
Rated: 5/2/11
160 days snow cover

Rep 2

**3 weeks prior to putting out trial, green was treated
with Banner MAXX 3 fl oz + Daconil 5 oz**

Rep 1

City of McCall Golf Course
McCall, ID

Greens Trial 2010-11 (McCall)

160 days snow cover
Rated: May 2, 2011

Fungicide treatment*	Rate (prod/M)	Disease (% area infected)	Turf quality
INSTRATA (propiconazole + fludioxonil + chlorothalonil) + PAR (proprietary pigment concentrate)	9.3 fl oz 0.37 fl oz	0.0 b	7.8 a
RESERVE (triticonazole + chlorothalonil) + SG + INTERFACE (iprodione + trifloxystrobin) + SG	5.4 fl oz 6 fl oz	0.3 b	7.7 ab
INSTRATA (propiconazole + fludioxonil + chlorothalonil)	11 fl oz	0.3 b	4.3 c
RESERVE (triticonazole + chlorothalonil) + SG COMPASS (trifloxystrobin) + SG	5.4 fl oz 0.25 oz	1.0 b	6.3 b
INSTRATA (propiconazole + fludioxonil + chlorothalonil)	9.3 fl oz	1.0 b	4.7 c
INTERFACE (iprodione + trifloxystrobin) + SG + TRITON FLO (triticonazole) + SG	3 fl oz 0.5 fl oz	18.7 a	4.0 c
INTERFACE (iprodione + trifloxystrobin) + SG TRITON FLO (triticonazole) + SG	6 fl oz 0.85 fl oz	21.7 a	3.8 c
CHECK	0	22.3 a	2.3 d

* Prior (early October 2010) to the study the entire practice green was treated with Banner MAXX 3 fl oz + Daconil 5 oz.

Greens Trial 2010-11 (McCall)

Rated 5/2/11
160 days snow cover

Interface 6 fl oz + Triton FLO 0.85 fl oz

City of McCall Golf Course
McCall, ID

Greens Trial 2010-11 (McCall)

Rated 5/2/11



**Interface 6 fl oz + Triton FLO 0.85 fl oz
Close up of suspicious brown areas**

City of McCall Golf Course
McCall, ID

Greens Trial 2010-11 (McCall)

CHECK

Interface 3 fl oz + Triton FLO 0.5 fl oz

Reserve 5.4 fl oz + Interface 6 fl oz

Reserve 5.4 fl oz + Compass 0.25 oz

**Rated 5/2/11
160 days snow cover**

**City of McCall Golf Course
McCall, ID**

(Reserve 5.4 fl oz + Interface 6 fl oz) + SG

Instrata 9.3 fl oz

160 days snow cover

Rated 5/2/11

Instrata 9.3 fl oz + PAR 0.37 fl oz

Instrata 11 fl oz

Greens Trial 2010-11 (McCall)

City of McCall Golf Course
McCall, ID

Greens Trial 2010-11 (McCall)

160 days snow cover
Gray/pink snow mold

Fungicide treatment*	Rate (prod/M)
INSTRATA (propiconazole + fludioxonil + chlorothalonil) + PAR (proprietary pigment concentrate)	9.3 or 11 fl oz 0.37 fl oz
RESERVE (triticonazole + chlorothalonil) + <i>SG</i> + INTERFACE (iprodione + trifloxystrobin) + <i>SG</i>	5.4 fl oz 6 fl oz
RESERVE (triticonazole + chlorothalonil) + <i>SG</i> + COMPASS (trifloxystrobin) + <i>SG</i>	5.4 fl oz 0.25 oz

* Prior (early October 2010) to the study the entire practice green was treated with Banner MAXX 3 fl oz + Daconil 5 oz.

Snow Mold Research 2011-12

- Petro-Canada:
 - Greens: Reduced fungicide rates with Civitas + Harmonizer
- Syngenta:
 - Greens: A9898A and A7087F (Secure)
- Bayer:
 - Fairways: Fungicides vs PCNB
 - Greens

WSU Disclaimer

“Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. **It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.**”

A photograph of a golf course in a mountainous region. The foreground and middle ground show green grass with several large, irregular patches of snow. In the background, there is a dense forest of tall evergreen trees and some bare deciduous trees. The sky is overcast.

Questions?

<http://turf.wsu.edu/>

PCNB is it back?

- August 19, 2011 EPA overturned the stop sale order on PCNB
- Will it ever be available?

Single formulations with 2 fungicides

- Bayer

- **Interface** (iprodione + trifloxystrobin) w/ StressGard

- **Tartan** (triadimefon + trifloxystrobin) w/ StressGard

- **Reserve** (triticonazole + chlorothalonil) w/ StressGard

- Cleary's

- **Spectro 90** (thiophanate-methyl + chlorothalonil)

Rated: 3/30/11
125 days snow cover

CHECK

Concert 5 fl oz

Instrata 9 fl oz

Renown 4.5 fl oz

Fairway Trial 2010-11 (Chewelah)

Chewelah Golf and Country Club
Chewelah, WA

Fairway Trial 2010-11 (Chewelah)

Rated: 3/30/11
125 days snow cover

Concert 8.5 fl oz + Banner MAXX 1 fl oz

Concert 5 fl oz + Medallion 0.25 oz

Concert 5 fl oz

Concert 5 fl oz + Banner MAXX 1 fl oz

McCall, ID

167 days snow cover

95 % *T. ishikariensis*

5 % *T. incarnata*

CHECK

Typhula Blight = OMG