

## **The Effects of Various Fungicides on the Control of Overwintering Diseases 2004-05**

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### **Summary**

This trial was developed in order to evaluate various fungicides for their control of overwintering diseases. The site at Greywolf Golf Resort was chosen due to consistently high disease on creeping bentgrass fairways. This site is considered a worst case scenario for snow moulds due to the susceptibility of the grasses to snow mould and the long winters with deep snow cover. As a result, plots were not inoculated as significant natural infections typically occur at this site. Plots were laid out and treatments were applied on October 14 and 25, 2004. An evaluation to determine the effectiveness of the various treatments was conducted on April 12 and 26, 2005. The winter of 2004-05 was considered to be one where snow pack was below normal to normal and disease pressure was high. The snow cover duration was 153 days.

All products were applied on both application dates unless otherwise stated. Rate of application was per 100m<sup>2</sup>. Effective control of Fusarium patch (pink snow mould) was obtained with the following treatments.

- Compass 50 WG 22.8 g
- Compass 50 WG 15.2 g
- Rovral Green GT 250ml and Compass 50 WG 7.6 g
- Triticonazole SC 1.67 32ml and Compass 50WG 7.6g
- Triticonazole SC1.67 32ml and Rovral Green GT 250ml
- Triticonazole SC 1.67 32 ml and Compass 50WG 7.6 g and Rovral Green GT 125 ml
- A14036B 296 mls single application only
- A14036B 222 mls single application only
- Medallion 4.3 g and Banner MAXX 54 ml and Daconil 2787 107 ml single application only

### **Introduction**

Fine turfgrasses, which are not protected by fungicides, are predisposed to damage caused by snow moulds. On golf greens, where creeping bentgrass (*Agrostis palustris*) or annual bluegrass (*Poa annua*) are the predominant species disease damage is a frequent occurrence. Turfgrasses weakened or damaged by snow moulds are extremely slow to recover and are often invaded by opportunistic weedy grass species. As the possibility of chemical resistance to snow moulds increases, new fungicides may be of benefit.

A typical snow mold prevention program consists of three fall applications and a single application in the spring and fungicides with different modes of action are alternated. However, in this trial, the same products were applied either on a single date or on both dates so that the individual fungicides or tank mixes could be evaluated for snow mould control.

## **Materials and Methods**

Plots were located on a fairway at the Greywolf Golf Resort, Panorama, British Columbia, Canada. This site, which has creeping bentgrass fairways, was chosen due to consistently high disease pressure that was the result of winters with lasting snow cover. Plots that measured 1 m x 2 m were arranged in a randomized complete block design with four replications. A 0.5 meter buffer was maintained around each plot. Treatments were applied with a compressed air sprayer on October 14 and October 25, 2004 which was 17 and 6 days prior to permanent snow cover. The sprayer was equipped with TeeJet 8004 nozzles and was calibrated to apply 10.3 litres/100m<sup>2</sup>. Plots were not inoculated.

Disease ratings were conducted on April 12 and 26, 2005 and were based on percent area symptomatic. The rating scale for disease severity is based on area covered with the disease and is classed as very low (0-19%), low (20-39%), moderate (40%-59%), high (60%-79%) and very high (>80%).

Pathogen identification was by means of visual, microscopic and cultural assessment. On the first rating date, three samples were taken from each of the four untreated control plots and used for an individual disease severity assessment. Sample size was approximately 5 by 5 cm and was removed with a knife. Individual shoots from each sample were visually examined for the presence of sclerotia of *Typhula ishkariensis* (long duration snow cover grey snow mould or Typhula blight). In addition, five leaves from each individual sample were examined under a microscope for the presence of spores of *Microdochium nivale* (pink snow mould or Fusarium patch). Percentage of plants and leaves infected was determined in order to assess disease severity for each disease.

On the second rating date, a 10 X 10cm grid that had 100 individual squares was randomly placed in two separate locations in each of the control plots. Ten random samples within the grid were selected and the turf was observed under a magnifying glass for the presence of sclerotia in order to determine the presence of Typhula blight. One sample from each of the control plots and one other obviously damaged area from a treated plot were sent to BioVision Seed Labs, Edmonton, Alberta for culturing to determine the presence or absence of Fusarium patch.

## **Status of Registration in Canada**

Banner MAXX, Daconil 2787, and Rovral Green are all registered for use on Typhula blight and Fusarium patch (grey and pink snow mould). Compass is registered for Fusarium patch. Both Triticonazole, A14036B and Medallion are not registered for use in Canada at this time, although all are being considered. At present, the only registered tank mix for Typhula blight and Fusarium patch is Daconil and Rovral Green. For more information go to the following website. <http://www.hc-sc.gc.ca/pmra-arla/english/main/search-e.html>

Table 1. List of Treatments

Products	Active Ingredient	Mode of Action	Product Test Rate(s)	Application Date(s)
Single Product Treatments				
A14036B	Not available	Not available	296 ml/100m <sup>2</sup> 222 ml/100m <sup>2</sup> 148 ml/100m <sup>2</sup> 111 ml/100m <sup>2</sup> 74 ml/100m <sup>2</sup>	October 25, 2004
Banner MAXX	Propiconazole 14.3%	Systemic	216 ml/100m <sup>2</sup> 108 ml/100m <sup>2</sup>	October 25, 2004
Compass 50WG	Trifloxystrobin 50%	Systemic	22.8g/100m <sup>2</sup> 15.2 g/100m <sup>2</sup> 7.6 g/100m <sup>2</sup>	October 14 & 25, 2004
Daconil 2787	Chlorothalonil 500g/l	Contact	240 ml/100m <sup>2</sup> 214 ml/100m <sup>2</sup>	October 25, 2004
Medallion	Fludioxonil 50%	Not available	8.6 g/100m <sup>2</sup> 4.3 g/100m <sup>2</sup> 2.15 g/100m <sup>2</sup>	October 25, 2004
Rovral Green GT	Iprodione 240g/l	Contact	375 ml/100m <sup>2</sup>	October 14 & 25, 2004
Triticonazole SC1.67	Triticonazole 16.7%	Systemic	96ml/100m <sup>2</sup> 64ml/100m <sup>2</sup> 32ml/100m <sup>2</sup>	October 14 & 25, 2004
Two Product Tank Mixes				
Compass 50WG Rovral Green GT	Trifloxystrobin 50% Iprodione 240g/l	Systemic Contact	7.6 g /100m <sup>2</sup> 250 ml/100m <sup>2</sup>	October 14 & 25, 2004
Compass 50WG Triticonazole SC1.67	Trifloxystrobin 50% Triticonazole 16.7%	Systemic Systemic	7.6g/100m <sup>2</sup> 32 ml/100m <sup>2</sup>	October 14 & 25, 2004
Rovral Green GT Triticonazole SC1.67	Iprodione 240g/l Triticonazole 16.7%	Contact Systemic	250 ml/100m <sup>2</sup> 32 ml/100m <sup>2</sup>	October 14 & 25, 2004
Three Product Tank Mixes				
Banner MAXX Daconil 2787 Medallion	Propiconazole 14.3% Chlorothalonil 500g/l Fludioxonil 50%	Systemic Contact Not available	108 ml/100m <sup>2</sup> 214 ml/100m <sup>2</sup> 8.6 g/100m <sup>2</sup>	October 25, 2004
Banner MAXX Daconil 2787 Medallion	Propiconazole 14.3% Chlorothalonil 500g/l Fludioxonil 50%	Systemic Contact Not available	54 ml/100m <sup>2</sup> 107 ml/100m <sup>2</sup> 4.3 g/100m <sup>2</sup>	October 25, 2004
Compass 50 WG Rovral Green GT Triticonazole SC1.67	Trifloxystrobin 50% Iprodione 240g/l Triticonazole 16.7%	Systemic Contact Systemic	7.6g/100m <sup>2</sup> 125 ml/100m <sup>2</sup> 32 ml/100m <sup>2</sup>	October 14 & 25, 2004
Untreated Control				

## **Results**

### **Weather Conditions 2004-05**

The Greywolf Golf Resort is located in Panorama, British Columbia. It is a golf/ski resort and is located above the town site of Invermere in mountainous terrain. Snow pack was below normal to normal and maximum cover on the test site was approximately 90 cm. Permanent snow cover occurred on November 1, 2003 and had completely melted by April 2, 2004. Snow cover duration of approximately 153 days produced high disease severity (72% damage on untreated control plots).

The first snowfall occurred on October 20. Rainfall events occurred on November 12, December 10-11 and January 18-19. Ice formed on the turf during the first rainfall and injury from ice cover was apparent.

### **Presence of Overwintering Pathogens**

On the first rating date sclerotia of *Typhula* blight was not observed on any shoots within the sampled areas. In addition, no spores of *Fusarium* patch were present on any samples when observed under a microscope. For that reason, following the second date five samples were sent to the lab and each sample showed that *Fusarium* patch (pink snow mould) was present when cultured. From these tests and observations, it was concluded that all disease present was *Fusarium* patch and that *Typhula* blight did not occur.

### **Comparison of Various Treatments**

Damage from ice injury and winter diseases was evident on the plots. In order to assess individual plots for injury from disease, damage from ice injury was first determined and that area was not rated. During the first rating, the plots were very wet and it was difficult to distinguish between disease and ice cover injury. As a result, data from the first rating date are not shown.

Very effective control was obtained with the following treatments (Table 2):

- Compass 50 WG 22.8 g
- Compass 50 WG 15.2 g
- Rovral Green GT 250ml and Compass 50 WG 7.6 g
- Triticonazole SC 1.67 32ml and Compass 50WG 7.6g
- Triticonazole SC 1.67 32ml and Rovral Green GT 250ml
- Triticonazole SC 1.67 32 ml and Compass 50WG 7.6 g and Rovral Green GT 125 ml
- A14036B 296 mls
- A14036B 222 mls
- Medallion 4.3 g and Banner MAXX 54 ml and Daconil 2787 107 ml

Table 2 Percent Fusarium patch (pink snow mould) for various fungicides (April 26, 2005).

Products	Active Ingredient	Product Applied	Product Rate per Application	Percent Diseased Area
Compass 50WG	Trifloxystrobin 50%	Double application	7.6 g /100m <sup>2</sup>	8.3% a
Rovral Green GT	Iprodione 240g/l		250 ml/100m <sup>2</sup>	
Compass 50WG	Trifloxystrobin 50%	Double application	22.8g/100m <sup>2</sup>	13.4% ab
Rovral Green GT	Iprodione 240g/l	Double application	250 ml/100m <sup>2</sup>	15.0% abc
Triticonazole SC1.67	Triticonazole 16.7%		32 ml/100m <sup>2</sup>	
Compass 50 WG	Trifloxystrobin 50%	Double application	7.6g/100m <sup>2</sup>	16.0% abcd
Rovral Green GT	Iprodione 240g/l		125 ml/100m <sup>2</sup>	
Triticonazole SC1.67	Triticonazole 16.7%		32 ml/100m <sup>2</sup>	
Compass 50WG	Trifloxystrobin 50%	Double application	15.2 g/100m <sup>2</sup>	27.5% abcde
A14036B	Not available	Single application	296 ml/100m <sup>2</sup>	27.5% abcde
Banner MAXX	Propiconazole 14.3%	Single application	54 ml/100m <sup>2</sup>	27.5% abcde
Daconil 2787	Chlorothalonil 500g/l		107 ml/100m <sup>2</sup>	
Medallion	Not available		4.3 g/100m <sup>2</sup>	
A14036B	Not available	Single application	222 ml/100m <sup>2</sup>	28.8% abcde
Compass 50WG	Trifloxystrobin 50%	Double application	7.6g/100m <sup>2</sup>	28.8% abcd
Triticonazole SC1.67	Triticonazole 16.7%		32 ml/100m <sup>2</sup>	
Compass 50WG	Trifloxystrobin 50%	Double application	7.6 g/100m <sup>2</sup>	31.3% bcde
Medallion	Not available	Single application	4.3 g/100m <sup>2</sup>	31.8% bcde
Rovral Green GT	Iprodione 240g/l	Double application	375 ml/100m <sup>2</sup>	30.0% bcde
Banner MAXX	Propiconazole 14.3%	Single application	216 ml/100m <sup>2</sup>	33.8% bcdef
Medallion	Not available	Single application	8.6 g/100m <sup>2</sup>	35.0% cdef
Banner MAXX	Propiconazole 14.3%	Single application	108 ml/100m <sup>2</sup>	35.0% cdef
Daconil 2787	Chlorothalonil 500g/l		214 ml/100m <sup>2</sup>	
Medallion	Not available		8.6 g/100m <sup>2</sup>	
A14036B	Not available	Single application	111 ml/100m <sup>2</sup>	41.3% efgh
Banner MAXX	Propiconazole 14.3%	Single application	108 ml/100m <sup>2</sup>	41.3% efgh
A14036B	Not available	Single application	148 ml/100m <sup>2</sup>	45.0% efghi
Medallion	Not available	Single application	2.15 g/100m <sup>2</sup>	47.5% efghi
Triticonazole SC1.67	Triticonazole 16.7%	Double application	64ml/100m <sup>2</sup>	53.8% fghij
Daconil 2787	Chlorothalonil 500g/l	Single application	240 ml/100m <sup>2</sup>	56.3% ghij
Triticonazole SC1.67	Triticonazole 16.7%	Double application	96ml/100m <sup>2</sup>	57.5% hij
A14036B	Not available	Single application	74 ml/100m <sup>2</sup>	62.5% ij
Daconil 2787	Chlorothalonil 500g/l	Single application	214 ml/100m <sup>2</sup>	63.8% ij
Untreated control				71.8% j
Triticonazole SC1.67	Triticonazole 16.7%	Double application	32ml/100m <sup>2</sup>	73.6% j

LSD<sub>0.05</sub> =

21.1

\* Values that have the same letter as a suffix are not significant from each other.

## Discussion

Injury to the turf was as a result of ice cover injury and winter disease. During the second evaluation, it was much easier to differentiate between the pathogen and the ice cover injury and for that reason, results of the second evaluation are the only ones discussed.

This year disease severity was considered to be high. In six years of snow mould trials at Greywolf, there have been only two years where percent disease was less than 80%. This was one of those years, and it was thought that the reduced snow depth may have been a factor in the reduced disease severity.

Last year was the first time an attempt was made to quantify disease through the observation of individual shoots and leaves. Previously, we had attempted to determine the disease percentage by examining the actual turfgrass stand symptoms. However, the accuracy of this method was questioned due to the fact that the diseases coalesced which made it difficult to distinguish between them. Furthermore, this method did not take into account that an individual plant could be infected by more than one disease.

The method for evaluating each snow mould provided us with severity ratings for each disease. From this revised method it was possible to determine that the disease severity of Fusarium patch (pink snow mould) was high (60-80%) and that the severity of Typhula blight (grey snow mould) was very low.

Rovral Green GT and Compass were very effective as a tank mixture and has performed well in each of the two trial years. However, it should be pointed out that disease pressure was predominantly from Fusarium patch in both years. Compass, by itself, at the two high rates was also effective.

Triticonazole when mixed with either Rovral Green or Compass was also a very effective treatment. The three way mix of Triticonazole, Rovral Green and Compass was also effective even though the Rovral Green was applied at a reduced rate of 125 ml.

The experimental product A14036B was effective at the higher rates even with just a single application. The three way mix of Medallion, Banner MAXX and Daconil 2787 was also effective when applied as a single application.

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