Influence of Winter Covers on Snow Mold Severity: A Summary of Year 1

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Last year the WGCSA funded our study to examine the influence of winter covers on snow mold severity. The study was conducted at Bass Lake Golf Course near Antigo, WI with Dave Van Auken as our host. (Thank you Dave for hosting us and being such a gracious host, we really do appreciate it.) The site was on a 'Penncross' creeping bentgrass putting green maintained at a height of 0.125 inches. The plots were 3 ft by 10 ft and the treatments were arranged in a strip, split plot design.

Basically the putting green was divided into three sections, covered with an evergreen cover, a green jacket cover with insulation and no cover. Then the three winter cover treatment sections were split into three different fungicide application timings: an early application (10/06/2011), a split application (10/06/11 and 11/1/11) and a late application (11/01/11). Interface at 4.0 fl oz and Triton FLO at 0.85 was applied once for the early and late application timings. The split application received two applications of the mixture listed above, but the rates were cut in half to achieve the same amount of product in each application timing.

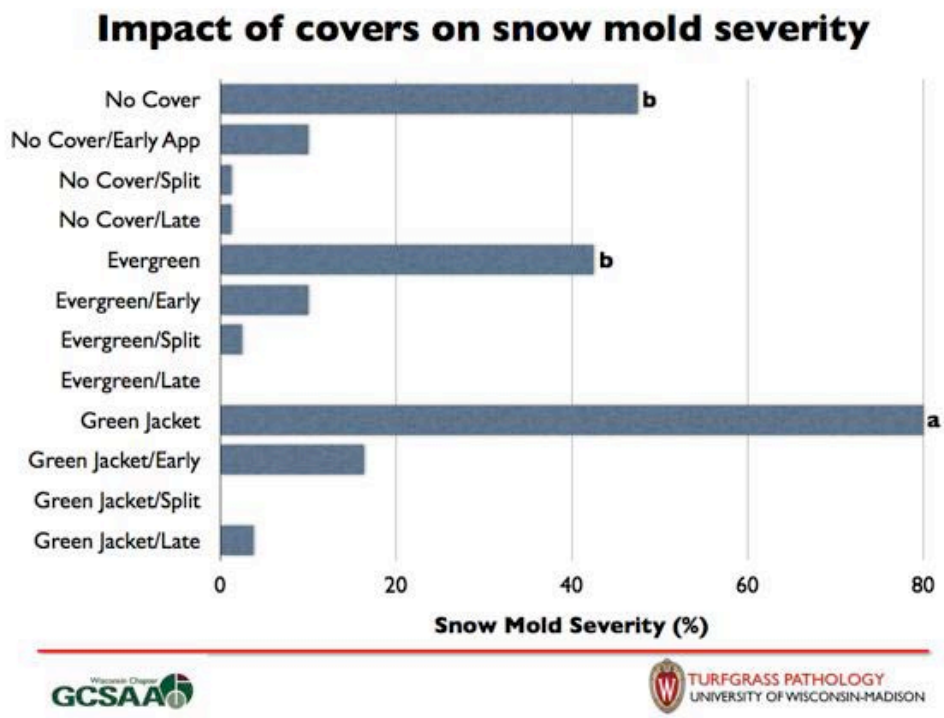

Figure 1. Impact of winter covers on snow mold severity at Bass Lake Country Club in Antigo, WI.

Immediately following the final fungicide application on Nov. 1, Dave Van Auken and crew installed the winter covers. Disease severity and turfgrass quality were visually estimated on March 19, 2012. The experimental area was under snow cover for approximately 100 days. This experiment will be repeated this year. Although most of our snow mold trials in 2011-2012 were a wash, this particular trial yielded excellent and interesting results. The purpose of this experiment was to investigate claims of severe snow mold development despite using excellent fungicide mixtures for snow mold management.

After the first year, we immediately discovered that snow mold was most severe in the absence of fungicides under the Green Jacket covers with insulation (Figure 1 and 2). We did not observe significant differences between fungicide timings under any winter cover treatment. However, it was apparent that snow mold development was more severe when applications were only performed in early October. This is important because I heard many claims that systemic products need to get into the plant early in order to be effective. This is not true and I may have caused some of the confusion. We observe excellent suppression of snow mold when fungicides are applied well before snow cover, but after the last mowing of the year. We also did not observe a difference between split applications and a single late application, but keep in mind that we only treated a 120 ft2 with our tanks! It remains to be seen if coverage is better when applications are split when treating large acreage.

It is interesting to note, that we did not see differences among application timings within the Green Jacket treatment despite increased development in the non-treated control. We used an exceptional fungicide mixture that has performed well at our site in the Upper Peninsula of Michigan, which may have confounded our results. However, if you notice the early applications averaged about 18% disease and the late application had some disease development as well. It will be interesting to see how this changes when we repeat the study this year because the plot locations will remain the same. Thus, inoculum density in plots with some breakthrough maybe higher and may allow for more differences this year.

Throughout the study we monitored environmental conditions. Although nothing immediately stood out, we did notice the insulating green jacket covers tempered the extremities of winter better than snow and snow plus the permeable Evergreen cover. Essentially, we may see more striking differences in regions with less persistent snow cover. Snow cover itself is an excellent insulator for environmental extremes and covers are only needed to protect against desiccation and ice damage. We hope this study and potentially another study with the NGLGCA will help us determine if covers are truly needed in environments with persistent snow cover during the winter months.

This study was very exciting and our cooperator, Dave Van Auken, was an absolute pleasure to work with. We look forward to collecting another year's worth of data and reporting the findings. If you have any questions or comments please feel free to contact Paul or I about the study. Looking forward to this year!!

Figure 2. Images of the impact of winter covers on snow mold severity in the absence of fungicides. The far left image was not under any winter cover, the middle was under a permeable Evergreen cover and the right was under a Green Jacket cover with insulation.

Paul Koch Completes PhD in July 2012

By Dr. Jim Kerns, Department of Pathology, University of Wisconsin - Madison

I am pleased to announce that Paul Koch completed requirements for a PhD in Plant Pathology at UW-Madison. I remember when I was hired five years ago, Paul asked if he could work on his PhD while still maintaining his responsibilities with the TDL and fungicide program. Some in my department thought this was not a great idea, but John Stier, who worked closely with Paul, said he had the work ethic to handle both duties. Based on my initial meetings with Paul and John's comments, I was confident that Paul could do this. So off we went! Before I arrived, Paul submitted a GCSAA Environmental Institute for Golf grant to study fungicide persistence in a winter environment. The grant was funded and we quickly embarked on a marvelous adventure. Paul found commercially available enzyme linked immonusorbant (ELISA) assay kits for cholorthalonil and iprodione. Basically these kits are like home pregnancy kits for fungicides. He thought this would be the best way to monitor chlorothalonil and iprodione concentrations without relying on a cooperator that possess a sophisticated gas chromatograph mass spec unit.

Dr. Paul Koch examining a turfgrass plant.

(Photo from Univeristy of Wisconsin - Madison, Turfgrass Diagnostic Lab Website)

Now these kits, of course, sounded too good to be true. And they were. When we received the kits, we quickly realized that we were the first researchers in the US to purchase these kits because the instructions were in Japanese! So Paul quickly learned Japanese and away he went, kidding of course. We asked the company to provide instructions in English. All kidding aside, the first problem we faced was adopting these kits for a turfgrass system. These kits were originally intended to detect minute quantities of pesticides on produce, so we had to determine a way to detect concentrations typical of field application rates. Paul spent a significant amount of time developing the methods to use these kits in his project. Consequently he will get a paper just from validating these kits in a turf system.

Once the kits effectively measured fungicide concentration, he embarked on answering the question: How long to fungicides persist in a winter environment?" With little guidance from Stier or myself, Paul developed a field experiment to answer this question. His plots consisted of strips of snow and non-snow covered plots. Within these strips were fungicide treatments consisting of iprodione, chlorothalonil and a tank-mixture of iprodione and chlorothalonil. From each individual plot, Paul and his team of undergraduates, collected two cup cutter sized cores using an extremely powerful hand drill equipped with a hole-saw attachment. In order to get the cores out of the ground, the team typically needed the assistance of a crow bar to pop the cores out. Keep in mind that this was all done with snow on the ground. There were many funny instances of getting vehicles stuck, choice words deployed judiciously and even the use of a sled! I think one lesson Paul learned was to NEVER conduct winter research again! He then would bring the two cores to the lab to analyze for fungicide concentration using the ELISA kits and the other was used in a bioassay where he inoculated cores during each sampling date with Microdochium nivale, the causal agent of pink snow mold.

From this research we quickly learned that fungicide persistence was tied to temperature. In other words, if soil temperatures remain below freezing the fungicides would persist regardless of our snow cover treatments. Thus if we experience an open and cold winter, fungicides applied for snow mold control in the fall will persist for as long as freezing temperatures persist. However once temperatures consistently eclipse 32oF, fungicide concentrations decline readily. We also learned that the pink snow mold fungus has a hard time infecting grass that has experienced extremely cold temperatures. Therefore, we now know that re-applications during January and February are not necessary during "normal" winters. Last winter was the exception; Paul observed a steady decline in fungicide concentrations most likely due to the abnormally warm winter we experienced. Thankfully this spring was not conducive for pink snow mold!

Paul then decided to examine the effect of temperature on fungicide persistence a bit further. He laid out another field trial, applied the same fungicide treatments, collected cores and incubated them at 50oF, 68oF and 86oF. Samples were removed immediately after the initial fungicide applications and subsequent samples were collected every 7 days until 35 days after application.

From this Paul discovered that iprodione degrades more readily at 86 than at 68 or 50oF. This provides evidence that fungicides may need to be re-applied at shorter intervals during the summer months to achieve acceptable suppression of turfgrass diseases. It has been extremely rewarding to work with Paul on these two fungicide studies. It is an area that no one in the country is investigating and it is of paramount importance to turfgrass managers. Thus we used an extremely novel research technique and approach to answer a fundamental question from our industry.

Paul had two other chapters of his dissertation that I did not discuss, but each one of Paul's chapters will be published in peer-reviewed journals. While Paul was conducting his PhD research, he also continued to successfully run my fungicide program and the TDL. During his tenure as TDL manager, Paul was responsible for a program that has generated over a million dollars in outside revenue!! Paul handled the day to day operations of my lab, my fungicide program, supervised three undergraduates AND received and examined about 100 to 200 turf samples a year!! Plus he did all of this without ever complaining, I don't think I ever heard him complain about his job. Thanks to Paul's extreme dedication and talent, I was afforded the time to recruit students, secure grants, and perform extension activities to ensure an excellent tenure case. For that, I will always be indebted to him!

Paul is also extremely dedicated to the turfgrass industry of Wisconsin. His reasoning for pursuing a PhD was to continue to conduct research to aid turfgrass managers. He thoroughly enjoys helping anyone in the turfgrass industry and will work tirelessly to do so. One of Paul's best attributes is the ability to accept constructive criticism with grace. I think a motivating factor to accept criticism so well is so he can better serve the turfgrass industry. He understands that he is not all-knowing and criticism will only make him better.

Paul has been an invaluable member of my program and UW turf team. I am extremely proud of his accomplishments as my employee and student, but I also understand that Paul must also move on to run his own program. He has applied to three excellent turfgrass positions at Ohio State, NC State and Oregon State. Any of these departments would be lucky to have Paul, as he would develop a nationally recognized program very quickly. I look forward to watching Paul develop his own program when he leaves UW and understand that I will have to live in his shadow in the future! Congratulations Paul, we are all very proud of you!!