CHLOROPICRIN ONLY			
Manufacturer/labeler	**Product Name**	**EPA Reg. No.**	**Status**
Great Lakes Chemical	Chlor-o-pic Fumigant Soil Fumigant	5785-17	Active
Reddick Fumigants	Pic-c100 - Soil Fumigant	85607-1	Active
Hendrix & Dail	Pic-plus Fumigant	8853-6	Active
METHYL BROMIDE + CHLOROPICRIN			
Hendrix & Dail	Tri-con 50/50 Preplant Soil Fumigant	11220-10-8853	Discontinued
Hendrix & Dail	Tri-con 57/43 Preplant Soil Fumigant	11220-4-8853	Discontinued
Great Lakes Chemical	Terr-o-gas 98 Preplant Soil Fumigant	5785-22	Active
Reddick Fumigants	Bro-mean C-33 Preplant Soil Fumigant	5785-24-37733	Discontinued
Hendrix & Dail	Mbc-33 Soil Fumigant	8853-3	Active
Hendrix & Dail	Mbc Concentrate Soil Fumigant	8853-2	Active
CHLOROPICRIN + 1,3-DICHLOROPROPENE			
Dow Agrosciences	Telone C-17 Soil Fungicide And Nematicide	62719-12	Active
Dow Agrosciences	Telone C-35 Soil Fungicide And Nematicide	62719-302	Active
Reddick Fumigants	Pic-c60 - Soil Fumigant	8536-8-85607	Active
Hendrix & Dail	Pic-clor 60 - A Multi-purpose Liquid Fumigant	8536-8-8853	Discontinued
CHLOROPICRIN + IODOMETHANE			
Arysta LifeScience	Midas 25:75 - Soil Fumigant	66330-42	Active
Arysta LifeScience	Midas 50:50 - Soil Fumigant	66330-57	Active
Arysta LifeScience	Midas Ec Bronze - Soil Fumigant	66330-58	Active
Arysta LifeScience	Midas 33:67 - Soil Fumigant	66330-59	Active
Arysta LifeScience	Midas Ec Gold - Soil Fumigant	66330-60	Active
METAM-SODIUM			
Manufacturer/labeler	**Product Name**	**EPA Reg. No.**	**Status**
Taminco	Metam Clr 42% - Soil Fumigant	45728-16	Active
Amvac Chemical	Vapam Hl - Soil Fumigant	5481-468	Active
Tessenderlo Kerley	Sectagon 42 - Soil Fumigant	61842-6	Active
METAM-POTASSIUM			
Manufacturer/labeler	**Product Name**	**EPA Reg. No.**	**Status**
Taminco	Metam Klr 54% Soil Fumigant	45728-27	Active
Amvac Chemical	K- Pam Hl A Soil Fumigant	5481-483	Active
Tessenderlo Kerley	Sectagon-k54 - Fumigant Solution For All Crops	61842-7	Active
DAZOMET			
Manufacturer/labeler	**Product Name**	**EPA Reg. No.**	**Status**
Certis USA	Basamid G Microbial Fungicide - Soil Fumigant	70051-101	Active

If you have questions on the new safety measures or product labels, contact Matt Sunseri, 608-224-4547 or email matthew.sunseri@wisconsin.gov. You can also find more information on the EPA website at www.epa.gov/oppsrrd1/reregistration/soil_fumigants.

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Penn State Study Confirms that Traditional Late Fall Fertilization is Not Beneficial

By Dr. Doug Soldat, *Department of Soil Science, University of Wisconsin-Madison*

During the first week of November I had the chance to attend an international meeting of crop and soil scientists in Long Beach, CA. This is always a great opportunity to see the latest and greatest research results from researchers all around the world. In particular, several sessions are dedicated exclusively to turfgrass research where scientists present their latest results in either fifteen minute talks or by printing their results on enormous posters which are displayed on the convention center floor for all to see.

This year, a presentation on fall applied nitrogen really caught my attention. The presentation was made by graduate student Chase Rogan, advised by Dr. Max Schlossberg at Penn State University. The study was conducted on a mixed stand of bentgrass and *poa*, and treatments included nitrogen applied at four different dates in the late fall.

Contrary to the long-held belief that nitrogen applied while the grass is not growing will increase root growth, the PSU researchers found the best fall N timing was actually 15 days before the first hard frost. Nitrogen applications made after this date had poorer spring density, vigor, and growth rate.

While I've felt like somewhat of a heretic for my against-the-grain pronouncements about fall applied N, I'm now a bit relieved because the PSU findings are nearly identical to our results from field research in Madison and St. Paul.

For maximum benefit, nitrogen applications should be made earlier than traditionally thought. Based on our research (and now the PSU research), I suggest three options to replace the traditional large (1 lb/M) fertilizer application in the late fall:

1) Fertilize no later than the first hard frost at a reduced rate (0.5 lb/M).
2) Use a granular 50% slow-release fertilizer in late September (1 lb/M).
3) Continue spoon feeding (0.1 - 0.2 lb/M) every two weeks until the first hard frost.

Each of these three options will result in increased nitrogen uptake compared to large applications of soluble fertilizer in late October. If you want to stick with a single, large application of a soluble fertilizer, a map of the first killing frost dates can help you determine when to apply (Figure 1). For Madison, the best timing appears to be late September or early October. Up north, the best timing may be as early as September 1, a fairly radical departure from the old recommendations.

I expect the PSU study is only the first among many to re-evaluate the conventional wisdom of late-fall applied N in cold climates. As I've written in these pages before, the original fall N research was conducted in coastal Virginia and Rhode Island in climates much unlike our own. A critical component of field research is to test results for applicability in various

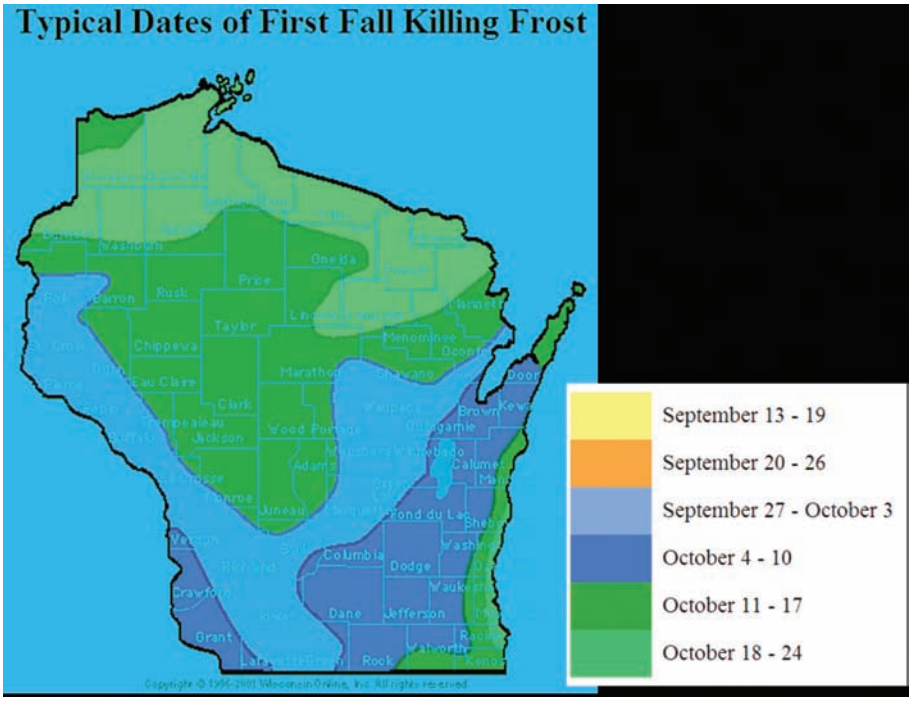

Figure 1. A map from www.wisconline.com showing a map of average dates of the first killing frosts across Wisconsin.

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climates. It appears that in cold climates, late-fall nitrogen applications aren't the best idea.

Congratulations to the Wisconsin Golf Course Superintendents Association and the Wisconsin Turfgrass Association for having the wisdom and courage to provide much of the funding to support our research which originally proposed to evaluate the one thing we thought we knew best - turns out we learned something new after all.

A second notion that appears to be on its last legs is the notion that potassium is a good "winterizer". My position on potassium has been conservative and largely influenced by Dr. Kussow: if the soil contains adequate potassium, applying additional potassium is akin to burning money.

Maintaining soil potassium levels remains important, and applying potassium in small doses on sandy soils with low CEC is probably a good idea. However, research that began at Cornell nearly a decade ago has continued to show that applying large amounts of potassium to sandy soils can create more problems than it solves.

Graduate student Dave Moody under the direction of Dr. Frank Rossi has found a strong relationship between potassium concentration in the leaves of turf and the amount of gray snow mold damage: the more potassium in the leaf, the faster gray snow mold progresses. The relationship was fairly weak for pink snow mold. Dave is currently investigating several reasons for why this may be the case, but the data seem fairly clear that juicing the turf with potassium will increase the amount of gray snow mold damage.

These were just two of hundreds of talks on turfgrass, and I enjoy watching the incremental progress that is being made in all areas of turfgrass science. I hope you see the value in supporting research like this which can sometimes overturn long-held beliefs and increase your ability to become a more efficient turfgrass manager.

As always the turfgrass research from University of Wisconsin-Madison was well represented at the conference. Our turf group made eleven presentations, two of which won awards in the graduate student competition: Ben Pease won 2nd place for his oral presentation on growing velvet bentgrass in the shade and Shane Griffith won 2nd place for his poster on using biosolids to grow sod. Congratulations to Ben and Shane and the rest of the UW graduate students, it's a pleasure to work with such a talented group of people.

Fall Applications of Potassium: Are They Much Ado About Nothing?

By Dr Jim Kerns, *Department of Pathology and* **Paul Koch,** *Turfgrass Diagnostic Lab Manager, University of Wisconsin - Madison.*

Just recently most of the turfgrass team at UW attended the Tri-Society Meetings (Agronomy, Crop Science and Soil Science Societies of America) in Long Beach, California. I know this is a harsh life we lead. Trust me this was by far the best location of these meetings since I have been a member. The meetings are fantastic because of the breadth and the quality of the information presented. A significant amount of turfgrass pathology presentations are given but I also enjoy hearing about new technologies, biology and management in other areas of turf research. Outside of the turf presentations I usually attend two or three talks in other disciplines such as soil microbiology or even soil physics. Basically these meetings are a wonderful continuing education opportunity for researchers in turfgrass science.

One topic that caught my attention centered on the effect of potassium applications on snow mold severity of annual bluegrass plants. Applications of potassium are thought to increase tolerance to environmental stress, but potassium applications by themselves do not improve tolerance to snow mold pathogens (2). Research conducted by Dr. Jim Beard indicated that the ratio of nitrogen to potassium was more important than potassium alone for improving resistance to snow mold pathogens (1). Thus the idea of applying fertilizers in late summer to early fall with nitrogen to potassium ratios of 2:1 was established. Dr. Beard found that ratios of 1:4 or 1:8 did not improve resistance to snow mold pathogens. The work presented in one of the sessions was from David Moody, a graduate student in Dr. Frank Rossi's program. During a routine snow mold trial they noticed differences in snow mold severity with applications of potassium. They actually noted that when potassium was applied, snow mold severity was worse! This was an interesting observation considering previous precedence for applications of potassium was shown to limit snow mold and winter damage.

I guess Frank and David found this observation to be very curious, so they designed a very elaborate growth chamber experiment to examine this observation even further. The experiment was conducted in multiple phases where they cycled the temperature and light levels down gradually. They also buried the plants in a thin layer of snow to simulate winter conditions. After the cycling through all the different environmental conditions they inoculated the turf with Microdochium nivale (Microdochium patch pathogen). They determined that with increasing levels of tissue potassium, disease severity levels also increased. These findings go against the previous notion that potassium fertilization may actually improve resistance to snow mold pathogens. The main point from the study was they observed an increase in snow mold severity at each level of potassium application. Looking through the methods they presented they had nitrogen to potassium ratios of 2:1, 1:1, 1:4 and ~1:8 and at each level they observed an increase in snow mold severity, although the increase may have been small.

David and Dr. Rossi then investigated what activity in the cells would prompt the observed increase in snow mold severity. From the same growth chamber experiment they analyzed the tissue for structural carbohydrates, malate, citrate and other plant metabolites. In summary they concluded that potassium applications limit the development of carbon skeletons. Having a limited pool of carbon skeletons could potentially limit the plants natural ability to defend itself. I thought this research was extremely fascinating and I look forward to seeing how it progresses in the future. By no means should potassium fertilization in the fall cease, since there is more work that needs attention with this subject.

On a completely unrelated note, I want to make a few comments about the PCNB situation. To my knowledge the PCNB stop sale order has not been resolved, therefore it would be wise when making the budget for next year to plan for a PCNB-less snow mold program. Of course if you need any assistance please do not hesitate in contacting Paul or myself.

Another issue that needs to be addressed is the long residual control of PCNB. When PCNB was first released one of the desirable characteristics was the long residual control of fungal pathogens. The reason for the length of control was

the chemical is fairly persistent in the environment. Extended persistence in the environment is not a desirable trait of "modern" fungicides. For those that needed an alternative to PCNB, keep in mind that a fungicide application during the spring maybe needed to control new infection centers of Microdochium patch (pink snow mold).

Paul's PhD research indicates that the fungicide chlorothalonil and iprodione only provides about 30 to 40 days of protection in winter conditions (Figure 1 and 2). Interestingly we observed that snow cover did not have a profound effect on fungicide efficacy over time. Although we did see fungicide efficacy breakdown around 30 to 40 days, we did not observe snow mold development in treated plots in the field. This information does not open the door to fungicide applications during winter melts. All this is saying is that fungicides applied before snowfall protect against snow mold damage. The reason we do not observe tremendous amounts of snow mold damage with programs lacking PCNB, is likely due to the fact that environmental conditions in January and February are not conducive to snow mold development. Furthermore, if snow mold infection is prevented it is very difficult for snow mold fungi to mount a counter attack later in the winter.

References:

1. Burpee, Lee. 1988. Preventative control of cold-weather diseases. Golf Course Management. August, pgs. 62-68.
2. Nus, Jeff. 1996. Cold-season pathogens. Golf Course Management. August, pgs. 49-52.

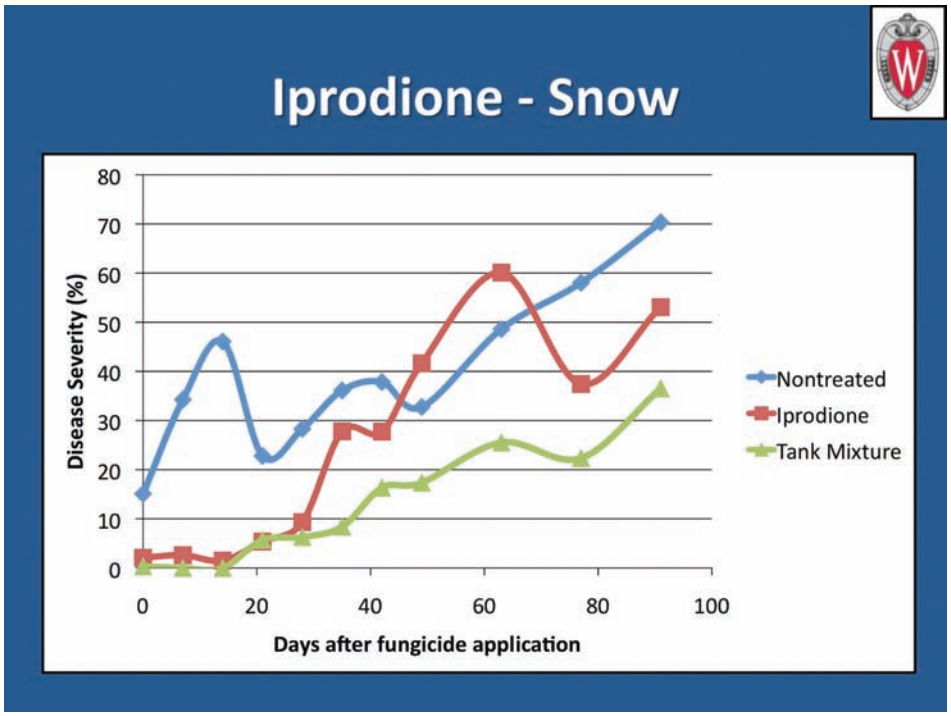

Figure 1. Microdochium patch disease progress as affected by iprodione applications. Fungicides were applied in the field at the OJ Noer Turfgrass Education Center and cores were removed from the research site weekly or biweekly from December 9th to March 4th. Each core was infested with *Microdochium nivale* and disease severity was rated visually. The blue line represents a non-treated control, the red line represents a single application of iprodione and the green line represents a single application of a tank mixture of iprodione and cholorthalonil.

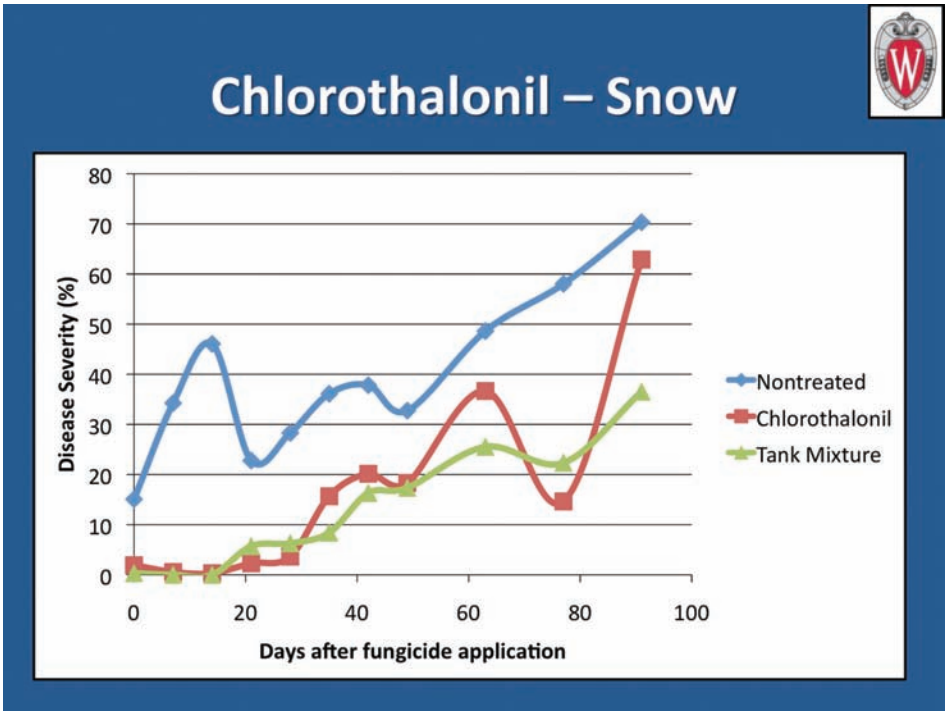

Figure 2. Microdochium patch disease progress as affected by cholorthalonil applications. The methodology was similar to those presented in figure 1's caption. The blue line represents a non-treated control, the red line represents a single application of chlorothalonil and the green line represents a single application of a tank mixture of iprodione and cholorthalonil.

The Symposium Did We Predict the Future in 1994

By David Brandenburg, *Golf Course Manager, Rolling Meadows Golf Course*

The 45th Annual Wisconsin Golf Turf Symposium titled Golf In The Year 2010; Did We Predict the Future gave attendees a unique look into our industry over the past 15 years and more. It was a recap of the 1994 Symposium titled, Golf in The Year 2010, The Game, The Job, The Challenge. We were fortunate to have Steve Mona and Nick Christians back as speakers.

The technological advances have been incredible in equipment, fertilizers, plant protectant materials, irrigation, grass development and high quality turf maintenance. Who would have thought putting greens would ever be mowed at 1/10th of an inch?

On the negative side who would have considered the economy would have affected the golf industry as much as it has with budget cuts a reality for most in attendance and a few attendees already laid off for the winter. These members are left wondering how they will accomplish their offseason work when they return in the spring.

Steve Mona, Chief Executive Officer of the World Golf Foundation and former 14 year Executive Director of the Golf Course Superintendents Association of America gave the keynote address, "The Golf Industry: Past, Present and Future".

The talk started with disturbing news on how since 2000 the number of golfers has dropped from 30 to 27 million while even more concerning the number of core golfers has gone from 17 to 15 million. Those core golfers are the games primary spenders and the most likely to buy clubs, balls and apparel from golf shops.

The National Golf Foundation and Golf DataTech show overall rounds played have dropped 9.5% over the past 10 years.

The construction of courses has all but stopped after opening over 200 courses a year from 1988 to 2003 with a peak of 400 new openings in 2000. For the past 5 years course closings have outpaced openings by 208 18 hole equivalents.

The negatives continued with research from The National Golf Foundation showing golf consumer confidence and retirement confidence are both down and consumer's frugality is on the rise. In the long run frugality is a good virtue but in an economic downturn it does slow recovery.

As an optimist and a leader in the global golf industry Mono then turned to what the industry is doing to recover the lost rounds why he feels recovery is coming. With the following programs in place the keys are in set to allow new and casual golfers to expand their interest in the game.

Golf 20/20 is the collaboration of all golf organizations to lead the industry into the future.

Get Golf Ready encourages adults to enter the game at their local clubs.

We Are Golf brings the golf industry to congress to show the benefits of the games and the effect golf has on the economy. For instance golf is a $1.2 billion industry in Wisconsin.

Image of the Game brings the positives of the golf industry to the media including the $3.5 billion in annual charitable giving from the golf industry each year.

The First Tee and National Schools Program promotes golf to inner city kids and middle and high school around the country.

Golf's Drive Toward Sustainability is the environmental branch of the World Golf Foundation bringing the message of golf's positive environmental benefits to the world.

Mona discussed how surveys of current non-golfers show 27% of them have some or increased interest in taking up the game of golf. Wisconsin is a leader in the golf industry with a participation rate of 15.2% of adults in comparison of 9.6% for the national average.

Mona finished his talk with what superintendents can do to help their clubs and the industry improve overall.

Focus on Facility Success – Understand how your department affects the entire facility.

View Yourself as Part of Your Facility's Senior Management Team – Don't be afraid to offer advice and opinions at your club drawing on your experiences in the golf industry.

Proactively Participate in Industry Growth Initiatives – Encourage club leaders to participate in beginner programs and events to bring more players to the course.

Lead Your Facility's Environmental Efforts – Be sure to help spread the word about your clubs positive impact on the environment.

Next up was Dr. John Stier, Chairman of the Department of Horticulture, University of Wisconsin – Madison with a talk titled "The Future Was Not What We Thought". John reviewed some of the visions of the USGA and GCSAA in 1985.

The group had forecasted improved turf varieties that would use 50% less nutrients and water and that most landscaper turf would be watered with non-potable water by now. Some courses especially in the southwest are using non-potable water and research on drought tolerant grasses continues but we are not quite as far as expected by 2010.

Dr. Stier updated us on current research with Texas Bluegrass, Fescues, Velvet Bentgrasses and True Putt the first commercially available Poa Annua. It seems the True Putt and the DW-184 from University of Minnesota have not been successful in the field and most research on improved varieties from seed has stopped.

The federal government put a moratorium on Bio-technology and work with roundup ready bentgrasses and short growing bluegrasses due to concerns from advocacy groups.

Other ideas from the past that never took off were the Hovercraft to replace golf carts to reduce compaction as featured in the Oct 1986 issue of Golf Course Management and the laser cutting unit.

Electric mowers are half here but not quite 100% reliable yet and biological controls for insects are available but have not proven effective on a reliable basis.

Dr. Stier ended with a quote from Robert Adams and John Rooney in their article "*Evolution of American Golf Facilities*" where they stated "If means are not developed to counter the rising costs, American golf may become once again what it once was, a game for the privileged few." The amazing thing was this article came out in 1985!

Terry Yamada, Executive Director, IPM Council of Canada joined us to shed some light on the extreme and quick changes to pesticide regulations in Canada. The issue started locally but once emotion and politics got involved it grew to a national issue with the turf industry on the losing end of it.

It only took 6 months for Ontario's Bill 64 to go from a simple proposal to law banning the use of most turf protectant used for cosmetic purposes. Golf courses can get an exemption from the ban but only under stringent requirements including IPM accreditation programs, written reports from daily scouting pass an 80 question exam and show proof of sprayer calibration three times per year.

Seed Research of Oregon's Dr. Leah Brilman

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