play golf, as the field played 18 holes at Brown Deer Park Golf Course and 18 holes at Milwaukee Country Club. From there, the field is narrowed to the low 64 who will start the match play portion of the competition at Milwaukee Country Club. Five 18-hole matches over three days, leaves two players for the 36-hole match final.

Brown Deere Park Golf Course is a backyard neighbor with Milwaukee Country Club and annual host of the PGA Tour's US Bank Championship (Formerly the Greater Milwaukee Open). The municipally owned daily fee course designed by George Hansen opened in 1929. Tim Wegner is the Golf Course Superintendent at Brown Deer a challenging layout playing 6,787 yards from the back tees. The course will be set up with a rating of 72.6 with a slope of 133 for the Mid-Amateur.

Brown Deer Park Golf Course hosted the U.S. Amateur Public Links Championships, in 1951, 1966 and 1977. With the PGA stopping every year, Wegner and his staff are as experienced as anyone in Wisconsin at preparing for tournament golf.

Milwaukee Country Club designed by H.S. Colt and Charles Alison opened in 1911. Patrick Sisk has been the Certified Golf Course Superintendent for 8 years at the club that plays 7,098 yards from the back tees and will be set up with a rating of 74.2 with a slope of 136 for the event.

Milwaukee Country Club hosted the USGA two other times with the 1969 Walker Cup Match and the 1988 USGA Senior Amateur. This was my second visit to this incredible property after watching the WSGA State Amateur there a few years ago. Colt and Alison took a great piece of property and designed a tremendous golf course on it. I went Thursday for the semi-final matches as much to see the course again than to watch the golf.

Milwaukee Country Club's par 5, 529 yard third hole requires your "A" game.

Sisk and the staff at the Milwaukee Country Club were challenged by the early summer rains and flooding that affected much of the badger state. Set on the Milwaukee River, the course saw 13.5 inches of rain swell the river and cover some parts of the course with 8 feet of water. Silt deposits killed or weakened turf while the water damaged 22 bunkers including six that needed to be completely rebuilt.

The back 9 was closed for 2 1/2 weeks while the water receded and areas were reseeded and repaired. The extra efforts and skill used by the staff paid off as the course looked in great condition and received many positive comments from the contestants.

Wisconsin was well represented with residents Matt Behm, Janesville; Mark Bemowski, Mukwonago; Nathan Colson, Milwaukee; David Foley, Pewaukee; Jeffery Lister, Greendale; Tim Murphy, Eau Claire and John Staehler, Caledonia qualifying for the event.

Matt Behm a starter at Janesville Riverside Golf Club during the golf season qualified for match play and considers himself a true public links player. Behm who claims to have never had a golf lesson was the WSGA player of the year in 2006 when he won the Ray Fisher tournament and took 5th place and low amateur at the State Open. He was disappointed in his first round loss to Tom Dooley of Albany, MN, 2 down.

Nate Colson a former standout golfer at Marquette University also made it to match play. Now an accountant in the Milwaukee area, Nate lost his first round match to Jimmy Chestnut of Grand Blanc, MI, 1-down.

The last Wisconsin connection after round one was Mark Scheibach a native of Fond du Lac. The former professional turned amateur and 3-time Big-10 player of the year while at the University of Wisconsin Madison lives in Bermuda Dunes, Florida. Scheibach who manages eight golf courses in Florida and Hawaii lost in the second round 3-2 to Tom Dooley of Albany MN, (the same player who knocked out Matt Behm in round 1) but was pleased with his success at the event and loved being back in Wisconsin.

The 36-hole final was between Steve Wilson of Ocean Springs, MS and Todd Mitchell of Bloomington, IL. Wilson, owner of two gas stations played professionally for 10 years on mini tour events before being reinstated as an amateur in 2005. He is well known on the Gulf Coast for his amateur play, however until Monday of the tournament, he had never won a match in a match play format. Steve had had to adjust to the speed of Milwaukee's bentgrass greens from the often-slower Bermuda grass greens in the south.

Steve Mitchell, an insurance salesman, was a star baseball player at Illinois State and was drafted in the 14th round by the New York Yankees. He played shortstop for the Yankees' Class A affiliate but quit after two years when he realized pro ball was not for him. Mitchell barely made it into the match play by making a 12-foot par to get into a playoff with 19 others to make the 64-player field. Steve commented that Milwaukee Country Club was among the best courses he'd ever played, and he compared it to Oakmont where he played in the 2003 USGA Amateur.

Steve Wilson adjusted well to the fast bentgrass greens as he had 14 one-putt holes enroot to a 5 and 4 victory over Mitchell. Wilson was excited to be able to play at next years Masters Tournament even though he is up against tough odds as no Mid-Amateur winner has advance to the final 36 at Augusta.

Wisconsin is lucky to have a number of great golf courses to host both local and national championships. There is a story in every event and every player, we just need to go out and find them.

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Maintaining Constant Growth Regulation with Primo Maxx

By Bill Kreuser and Dr. Doug Soldat, *Dept. of Soil Science, University of Wisconsin-Madison*

Editors Note: Bill Kreuser is a senior in the Turf Management program at UW-Madison.

Trinexapac-ethyl, the active ingredient in Primo Maxx, has been extensively researched by turfgrass scientists nationwide. Among other benefits, researchers have shown Primo application increases turf color and density (e.g. Fagerness and Yelverton, 2000; Lickfeldt et al., 2001), heat and drought tolerance (McCann and Huang, 2007), and shade tolerance (Stier and Rogers, 2001 Stienke and Stier, 2003). However, these secondary benefits can often overshadow the most obvious benefit of Primo: reduced clipping production. The Primo Maxx label states the product will provide a 50% reduction in clipping production for 4 weeks when used according to directions. However, our experiences indicate that many superintendents perceive a reduction of Primo's efficacy during summer months.

Research published in Golf Course Management by Drs. Branham and Beasley in July 2007 showed that Primo is metabolized by the plant faster at higher air temperatures. More specifically, they reported that the half-life of Primo in the plant is 6 days at 64°F, but only 3 days at 86°F. In this case, a half-life is defined as the amount of time required for 50% of the material to be metabolized. That means Primo was disappearing (being metabolized) in the plant twice as fast at 86°F compared to 64°F. Branham and Beasley correctly conclude that understanding these physiological aspects of Primo will help superintendents more effectively utilize the product. We thought that it might be interesting to take this concept one step further and investigate whether or not more specific re-application recommendations could be developed based on air temperatures.

Growing degree day (GDD) systems are used to predict various naturally occurring events such as the bloom of various plants or the emergence or insects. In turf, GDD systems are widely used to predict the optimum timing for herbicides and Primo/Proxy mixtures to suppress seedheads (for other examples, please visit www.gddtracker.net).

A daily GDD is simply the average air temperature minus a predetermined base temperature. Commonly used base temperatures are either 32 or 50°F. For example, if the maximum air temperature yesterday was 90 and the minimum was 66, the average air temperature was 78. This would be 28 base 50°F GDD, or 48 base 32°F GDD (78 - 50, or 78 - 32, respectively). We would then add the daily GDD to the accumulated GDD from all the other days during the year. If a GDD is negative, that number is treated as zero. As you'll see below, in our study we opted to use a Celsius growing degree day system with a base of zero. This was the simplest system for us to use, and it can be easily converted to base 32°F GDD.

Our hypothesis was that a GDD system can be used to estimate Primo metabolism and provide a tool for turfgrass managers to schedule Primo re-application. Establishing such a system would provide superintendents a method to more effectively maintain consistent growth regulation throughout the growing season. To test our hypothesis we designed an experiment that had five Primo re-application intervals along with a control that received no Primo.

Materials and Methods

This experiment is being conducted on a sand-based L-93 creeping bentgrass putting green. The plots are watered daily to prevent water stress from interfering with the growth regulation. The study is a randomized complete block design with 4 replicates of five re-application intervals along with a zero Primo control. Four of the re-application intervals are based on a growing degree day system (GDD) and the fifth interval is re-applied every 4 weeks as per the label.

Growing degree days are calculated by adding the mean daily air temperature, in degrees Celsius

from our weather station, daily until the desired re-application threshold has been surpassed. The four re-application thresholds in this study are 100, 200, 400, and 800 GDD. Once the appropriate GDD has been achieved, Primo is applied and the growing degree days are reset. Primo is applied at the labeled rate of 0.125 fl oz of product/M in 2 gallons of water with a CO2 power backpack sprayer.

Grass clippings are collected daily, washed, dried, and weighed. Then we calculate the clipping production in comparison to the control. This is done by dividing the treatment clipping mass by the clipping mass of the control. Values less than one, represent a reduction in clipping production while values greater than one represent increased clipping production compared to the control. Overall visual quality and chlorophyll readings are recorded weekly.

Results and Discussion

Both the 100 and 200 GDD re-application treatments maintained constant growth regulation during the summer (200 GDD results shown in Fig. 1). Compare the 200 GDD re-application interval (Fig. 1) to the 4-week interval shown in Fig. 2. You'll notice that on most dates, the 4-week interval is actually producing more clippings than the untreated control. This can be attributed to the "rebound effect" often reported in other studies where turf coming out of growth reduction will show enhanced growth. However, by re-applying Primo every 200 GDD, this rebound effect was minimized and growth suppression was fairly constant throughout the summer of 2008. However, for all re-application treatments, the 0.125 application rate reduced clipping production by only 20 to 30% at peak suppression, significantly lower than

Figure 1. 200 GDD Re-application Clipping Production

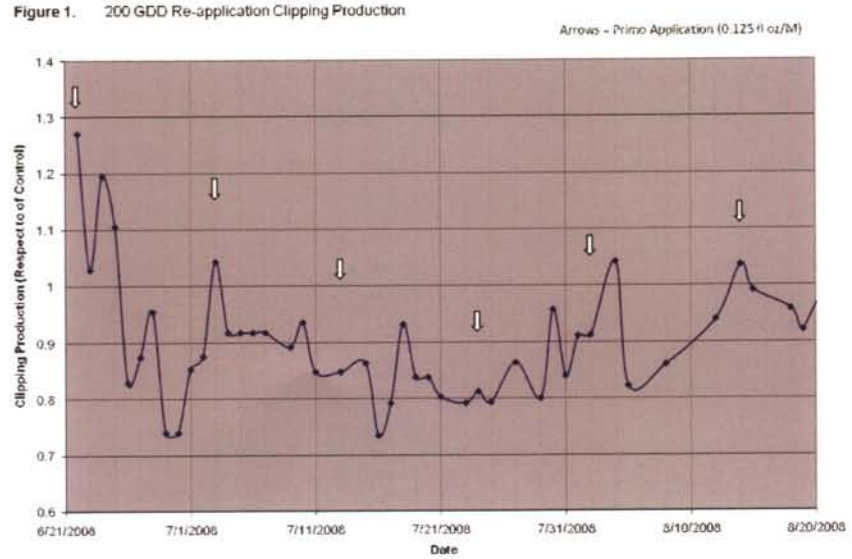


Figure 2. 4 Week Re-application Clipping Production

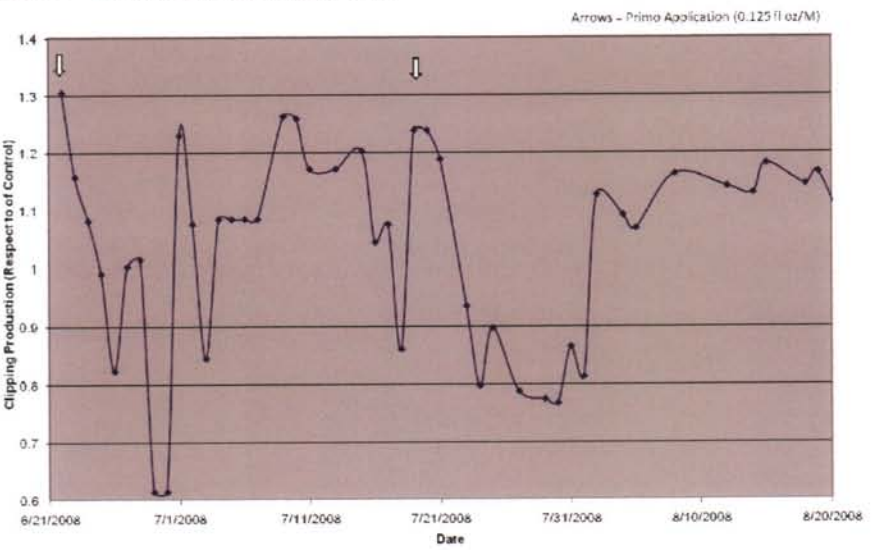
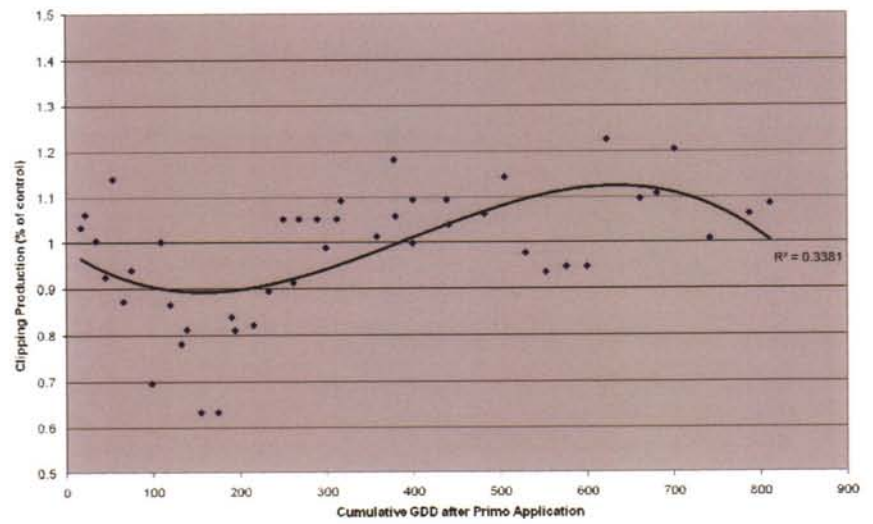


Figure 3. Dry Clipping Production After Primo Application



the 50% reduction claimed on the label (Table 1). This is likely related to the rate of application, as we have seen growth reductions up to 80% in Kentucky bluegrass plots at much higher application rates (data not shown).

As you can see in Figure 3, following a Primo application at GDD=0, the maximum reduction in clipping production occurs around 150 GDD, and then growth rates increase until the are approximately equal to that of the untreated control around 300 growing degree day units. During July, 300 GDD can occur in as little as twelve days. However, in the May or September 300 GDD may occur after 21-28 days. Between 300 and 500 GDD units following Primo application, the turfgrass will enter a rebound phase (Fig. 3). During this phase clipping reduction is greater than the control. Typically the duration and magnitude of this rebound phase is similar to the suppression phase. At the labeled application rate the rebound is 300-500 GDD units long and with a 15 to 35% increase in clipping production in comparison to the control treatments.

As reported in previous Primo studies turfgrass color/chlorophyll index (CI) and overall visual quality increased with Primo application (Tables 2 & 3). Similarly to the clipping production data the color and quality were consistently greatest for the 100 and 200 GDD treatments. The 400 GDD, 800 GDD, and 4 week re-application treatments varied slightly as the turfgrass experienced the suppression/rebound cycling. Statistical

Table 1. Clipping Production with Respect to Control as Influenced by Primo Re-application

Primo Application		Clipping Production (Percent Growth of Control)									
Re-application Frequency	Rate fl oz/M	6/28/2008	7/9/2008	7/15/2008	7/20/2008	7/25/2008	7/30/2008	8/2/2008	8/8/2008	8/14/2008	8/18/2008
100 GDD	0.125	88 A	79 A	79 A	83 AB	82 A	72 A	68 A	84 A	100 A	93 A
200 GDD	0.125	95 A	89 AB	87 AB	84 AB	79 A	95 BC	91 AB	86 A	104 A	96 A
400 GDD	0.125	100 A	123 B	105 CD	67 AB	101 AB	106 C	86 AB	93 AB	105 A	115 C
800 GDD	0.125	81 A	101 AB	106 CD	95 AB	120 B	109 C	87 AB	84 A	98 A	105 ABC
4 Week	0.125	101 A	127 B	120 D	124 B	90 AB	76 AB	113 B	117 B	113 A	115 BC
Control	0	100 A	100 AB	100 BC	100 AB	100 AB	100 C	100 AB	100 AB	100 A	100 AB

Table 2. Chlorophyll Index as Influenced by Primo Re-application

Primo Application		Chlorophyll Index							
Re-application Frequency	Rate fl oz/M	6/22/2008	7/9/2008	7/23/2008	7/31/2008	8/14/2008	8/21/2008	8/28/2008	9/7/2008
100 GDD	0.125	248 A	310 A	275 A	293 A	325 A	338 A	303 A	384 A
200 GDD	0.125	244 A	299 A	269 A	285 AB	306 AB	315 AB	279 AB	355 AB
400 GDD	0.125	248 A	305 A	267 A	284 AB	303 B	319 AB	277 B	346 B
800 GDD	0.125	243 A	304 A	261 A	269 B	288 BC	310 AB	268 B	339 B
4 Week	0.125	250 A	310 A	271 A	280 AB	306 AB	313 AB	279 AB	350 AB
Control	0	240 A	301 A	262 A	274 AB	283 C	305 B	263 B	324 B

Table 3. Overall Putting Green Quality as Influenced by Primo Re-application

Primo Application		Overall Quality Rating							
Re-application Frequency	Rate fl oz/M	6/22/2008	7/9/2008	7/23/2008	7/31/2008	8/14/2008	8/21/2008	8/28/2008	9/7/2008
		Scale of 1 to 9 (perfect quality)							
100 GDD	0.125	7.5 A	7.9 A	7.6 A	8.3 A	8.6 A	8.3 A	8.5 A	8.5 A
200 GDD	0.125	7.4 A	7.6 A	7.8 A	7.8 A	8.1 AB	7.5 AB	8.1 AB	8.0 ABC
400 GDD	0.125	7.5 A	7.4 A	7.6 A	7.9 A	8.0 A	7.4 AB	7.9 AB	8.4 ABC
800 GDD	0.125	7.5 A	7.4 A	7.6 A	7.5 A	7.8 BC	7.4 AB	7.4 B	7.8 BC
4 Week	0.125	7.5 A	7.9 A	7.6 A	7.8 A	8.1 AB	7.5 AB	7.8 AB	7.9 ABC
Control	0	7.4 A	7.1 A	7.6 A	7.6 A	7.3 C	6.9 B	7.2 B	7.6 C

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differences for both color (CI) and quality didn't occur until approximately six weeks after the study. It's unclear if that is due to initial plot variability or if it takes the plant that time to develop those qualities.

Summary and Conclusions

From our preliminary research during this summer, we found that re-applying Primo every 200 GDD or less will provide consistent growth regulation on a creeping bentgrass putting green. Additionally this re-application interval will maintain darker green color and higher turfgrass quality. Re-applying more frequently didn't increase growth suppression measurably, nor did it significantly affect quality or color; even when Primo was being re-applied every 4-5 days in July. It is important to stress that these results occurred on a bentgrass putting in full sun. The green is watered to 100% of estimated potential evapotranspiration and fertilized with 0.6 lb N/M monthly. These factors may be important in rate of Primo metabolism.

To help superintendents keep track of GDD we created an Excel spreadsheet that allows turfgrass managers to enter the daily temperature (°F) along with the date they applied Primo. This program will convert the temperature to Celsius and then tell turfgrass managers when Primo application is need. This program will be available this winter.

We are encouraged by our results and plan to continue this study in coming years. We plan on investigating other plant growth regulators at various application rates on other grass species. Other potential variables include nitrogen fertility levels and different traffic levels. Our ultimate goal is to develop a program that would allow turfgrass managers to obtain accurate re-application interval recommendations for a wide variety of agronomic situations.

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Early Season Control of Dollar Spot on Wisconsin Fairways

By Paul Koch, *Turfgrass Diagnostic Lab, University of Wisconsin Madison*

Last month at the American Phytopathological Society meetings in Minneapolis, MN, I had the pleasure to play a round of golf with several turfgrass pathologists from around the country. Since my foursome, with the notable exception of Dr. Kerns, hacked the ball all over the course we got to see nearly every shot from every angle as if we were preparing for a major championship (though I doubt Tiger practices shots 50 yards off the tee box). Large fairways were a common theme on this course but one hole in particular had a massive fairway that stretched several hundred yards from side to side and served as a double fairway for the next hole coming back the opposite direction. While visually dramatic, I couldn't stop thinking about how long it takes to mow that fairway or how expensive it must be to control disease on that fairway.

Which brings us to a problem seen at most golf courses these days; the increasing demands for high quality fairway turf in an era of flat or declining budgets. Its one thing to maintain two acres of putting green turf to near perfection, but it's another thing entirely to maintain 15 to 25 acres of fairway turf to near perfection. The number one blemish on most high quality Wisconsin fairways in a given summer will be dollar spot (*Sclerotinia homoeocarpa*), which to completely control requires six to ten fungicide applications spaced 14 to 21 days apart beginning in June. Depending on the products used the annual cost of these applications will run in the tens of thousands of dollars, money most courses don't really have these days.

So how can we reduce our fairway dollar spot applications and still maintain high quality turf? As more of the basic biology of the dollar spot pathogen is discovered we should continue to reduce our reliance on fungicides, but in the interim the timing of our fungicide applications can have significant impact on the development of the pathogen. Unpublished research out of Michigan State University in the 1990's suggested that applying fungicides targeting dollar spot in the spring would delay the onset of dollar spot symptoms in the summer. This has been supported in published fungicide trials in Illinois, Connecticut, and Maryland within the past five years (McDonald and Dernoeden, 2006; Kaminski and Putman, 2007; Settle *et al*, 2007).

Rather than simply look at the effective length of different fungicides, Dr. John Stier, Dr. Jim Kerns, and myself wanted to look more broadly at the efficacy of different chemical classes for early-season dollar spot control. Specifically, the objectives of our study were to i) determine the type of fungicide most effective at delaying the onset of dollar spot symptoms ii) evaluate and compare efficacy of single fungicide applications to tank-mixes in an early-season dollar spot control program and iii) determine the approximate length of control and possible fungicide savings obtained with an early season application.

MATERIALS AND METHODS

The study was conducted at Milwaukee Country Club in River Hills, WI on a mature 'Penncross' creeping bentgrass (*Agrostis stolonifera* L.) fairway maintained at 0.5 inches. Experimental units measured three by five feet and were arranged in a randomized complete block design with four replications. Treatments were applied using a CO_2 - pressurized boom sprayer at 40 psi equipped with two XR Teejet 8004 VS nozzles. All fungicides were agitated by shaking and

Table 1. Fungicides and fungicide mixtures applied at Milwaukee CC in Milwaukee, WI on 3 May 2006 and 2 May 2007 for early season and conventional control of *Sclerotinia homoeocarpa* F. T. Bennett.

Fungicide	Brand Name	Rate[a]	Program
Propiconazole	Banner MAXX	1	Early-season[b]
Iprodione	Chipco 26GT	3.1	Early-season[b]
Chlorothalonil	Daconil Ultrex	12.6	Early-season[b]
Boscalid	Emerald	0.4	Early-season[b]
Propiconazole Iprodione	Banner MAXX Chipco 26GT	1 3.1	Early-season[b]
Propiconazole Chlorothalonil	Banner MAXX Daconil Ultrex	1 12.6	Early-season[b]
Propiconazole Chlorothalonil	Banner MAXX Daconil Ultrex	0.5 6.3	Conventional[c]

[a]calculated as kg active ingredient per ha
[b]applied once
[c]applied every 21 d beginning 31 May 2007