

Revolution had significantly lower soil moisture than the others for most of the season. These results imply that in a sand-based, low-organic matter root zone, the wetting agents tested decreased soil moisture, presumably leading to firmer playing conditions compared to the untreated control. Furthermore, it shows that all wetting agents are not identical, and some very substantial differences in soil moisture can be seen among products.

In 2010, the only product tested from the 2009 group was Revolution. Again, we tested Revolution on the same low organic matter putting green as in 2009, and also on an eight year old sand root zone with substantial organic matter accumulation (~4%). As you can see in Figure 3, the difference between the wetting agent treatment and the control on the low organic matter root zone is less dramatic in 2010 compared to 2009. They difference also appears to vanish in the high organic matter content root zone.

In conclusion, over the last two wet years we have learned quite a bit about how wetting agents behave in wet conditions. It appears that on low organic matter sand root zones, wetting agents can decrease the soil moisture content in the upper three inches. However, your results may vary as we saw differences in the degree to which moisture content decreased from 2009 to 2010. In addition, there was no difference in soil moisture content in 2010 on a high organic matter content sand based root zone.

Hopefully, this information will help clarify the role that wetting agents play under wet conditions. It would be beneficial for researchers to continue to evaluate and publish the performance of various wetting agents in wet conditions in a variety of soil types and drainage rates (i.e. high sur-

face organic matter and/or poor internal drainage rates). In a perfect world, there would be a set of standard conditions under which all surfactants could be quickly and easily tested in laboratory conditions. This information would give consumers the information they needed to make the best decision for their particular situation. Until that day comes, superintendents will need to continue to make decisions based on experience, peer recommendations, and pieced together the results from studies conducted under conditions that most closely approximate their own.

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Don't Forget Those Other Growth Regulators

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

When things are going well, sometimes old lessons learned long ago are forgotten. Some old lessons were learned in the classroom, and then forgotten about in the field because they didn't apply right away. Others were learned from tribulation in the field and would never be forgotten... until that practice just became too convenient to swear off any longer. Several lessons learned during summers like '88 and '96 were forgotten during the mild summers of recent years, and were painfully brought back in 2010 for many superintendents. A few superintendents were reminded of one old lesson in particular in 2010, and it can serve as a learning experience for everyone. Some fungicides do more than just kill fungi.

One of the prominent aspects of using a PGR program (Christians, 1998). Add in the effects of growth regulating fungicides and stressful summer conditions, though, and the results can be discouraging. Some fungicides, most notably the demethylation inhibitor (DMI) class, act to control fungi by interrupting the formation of sterols in select fungi. This interruption disrupts the fungal cell membranes and leads to death. In addition, DMI fungicides react with the plant itself to inhibit gibberellic acid (GA) synthesis early in the GA pathway. GA acts to promote plant growth and as far as DMI fungicides are concerned, this inhibition is a non-target effect. Some compounds, most notably paclobutrazol, which are very similar in structure and reactivity to DMI fungicides act primarily as PGR's. When applied together or in close concert, PGR's such as paclobutrazol and DMI fungicides like propiconazole can increase the level of

plant growth regulation beyond a healthy level. Other PGR's like trinexapac-ethyl inhibit GA at a different point on the GA pathway, but can still provide an additive growth regulator effect when combined with DMI fungicides. In most instances the fungicide growth regulator effect is negligible, and in mild temperatures can even produce the desirable characteristics we normally associate with PGR's. But when high rates of DMI fungicides are used throughout a stressful summer in concert with PGR's, problems can start to develop. Undesirable effects of overregulation with DMI fungicides include coarser leaf blades, yellowing or browning of turf, and reduced recovery ability (Vincelli 2007). This often results in extensive algae or moss invasion, which can be very difficult to remove. A primary problem with DMI fungicide overregulation is the difficulty in diagnosing it. The symptoms usually manifest themselves as thinning turf, with possible yellowing.



Figure 1: Some of the desirable growth regulation characteristics of DMI fungicides, most notably the darker green color, can be observed in this photo from Kansas State University. Photo courtesy of Dr. Megan Kennelly.

increased resilience to summer stress are all potential benefits of using a PGR program (Christians, 1998). Add in the effects of growth regulating fungicides and stressful summer conditions, though, and the results can be discouraging. Some fungicides, most notably the demethylation inhibitor (DMI) class, act to control fungi by interrupting the formation of sterols in select fungi. This interruption disrupts the fungal cell membranes and leads to death. In addition, DMI fungicides react with the plant itself to inhibit gibberellic acid (GA) synthesis early in the GA pathway. GA acts to promote plant growth and as far as DMI fungicides are concerned, this inhibition is a non-target effect. Some compounds, most notably paclobutrazol, which are very similar in structure and reactivity to DMI fungicides act primarily as PGR's. When applied together or in close concert, PGR's such as paclobutrazol and DMI fungicides like propiconazole can increase the level of

plant growth regulation beyond a healthy level. Other PGR's like trinexapac-ethyl inhibit GA at a different point on the GA pathway, but can still provide an additive growth regulator effect when combined with DMI fungicides. In most instances the fungicide growth regulator effect is negligible, and in mild temperatures can even produce the desirable characteristics we normally associate with PGR's. But when high rates of DMI fungicides are used throughout a stressful summer in concert with PGR's, problems can start to develop. Undesirable effects of overregulation with DMI fungicides include coarser leaf blades, yellowing or browning of turf, and reduced recovery ability (Vincelli 2007). This often results in extensive algae or moss invasion, which can be very difficult to remove. A primary problem with DMI fungicide overregulation is the difficulty in diagnosing it. The symptoms usually manifest themselves as thinning turf, with possible yellowing.

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lowing or browning included. The effect is usually most pronounced on annual bluegrass and certain clones of bentgrass that have segregated from the general population. This can be caused by any number of factors, including traffic and shade. No signs of physical injury are visible either with or without a microscope, which is why a list of recent pesticide applications is so important to accurately diagnosing DMI-induced injury.

There is no question that both DMI fungicides and plant growth regulators are integral pieces in providing high quality turfgrass in the Midwest. That doesn't mean we shouldn't watch out for possible problems they may cause. To be safe, only apply half rates or lower of DMI fungicides when daily high temperatures are over 85°F for 7 or more days. If applying along with a

plant growth regulator in the heat of summer, it is best to change the fungicide application to a different class of fungicide that does not mimic the growth regulator effects. No other fungicide class in turfgrass aside from the DMIs is known to have significant growth regulator activity. If over regulation is suspected based on significant turf thinning, yellowing, or algal infestation then immediately remove all growth regulation from the program and raise the mowing height to promote rapid recovery. Once recovery has progressed to a satisfactory level, renewal of a PGR program can be implemented but should be done so with caution.


All in all, injury attributable to over-regulation caused by DMI fungicide applications is pretty rare in the Midwest. Every now and then a summer will arrive with plenty of

heat, moisture, and humidity that increases disease and insect activity to the point where growing golf course turfgrass a truly unpleasant profession. When one of these summers comes around next, remember some of the old lessons learned back in 2010 for how to proceed.

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Crowds Return for Great Education

By **Tom Schwab**, O.J. Noer Turfgrass Research and Education Facility, University of Wisconsin-Madison

The 2010 WTA Summer Field Day saw the return of crowds from field days past. Attendance increased by 40 compared to last year. There were 256 attendees and 70 sales representatives from 31 different companies at this year's show. It's hard to know why the numbers increased from previous years' shows. The great education from researchers and turf students and the popular lawn care training session may have contributed, along with perfect weather conditions. It was a perfect summer day, with temps in the mid 80's and a slight breeze. The large trade show also could have helped to increase attendance. Whatever the reason, it was great to see the excitement and interest.

The education was more in depth than past years and the research talks were expanded into the afternoon which was requested by attendees. Everyone left the show with new and innovative ideas that they could put to work when they got back home. For example, graduate student Bill Kreuser presented findings from four years of plant growth regulator (PGR) research. This research is not only valuable for golf course managers, who have been using PGRs for 2 decades, but new formulations have been released to make it easier for lawn care companies and even homeowners to use the products. Bill's research developed a growing degree day model and he explained how to use it to help schedule when to reapply PGRs for maximum benefit.

Dr. Jim Kerns talked about several of his research projects. One project assesses the use of low input alternative species of grasses as a pest management strategy. These species



Guest speaker Dr. Lee Miller from the University of Missouri, presented cooperative research on turf diseases.

include tufted hairgrass, prairie junegrass, hard fescue, and several others. These grasses were planted last fall and Jim will be analyzing them over several years to see if they are attractive and functional species that are truly low input and potentially more environmentally friendly.

Dr. Doug Soldat from the UW and Bob Vavrek from the United States Golf Association talked about new soil moisture sensing tools. These tools read soil moisture to determine when the turf needs to be irrigated. These tools may someday be required to be used if Wisconsin's regulations on water use become stricter, which, as Doug and Bob explained, could happen. So many other presentations and presenters gave the crowds great information. Some of the other talks included:

- Controlling ants on greens and fairways
- Controlling white grubs in homelawns
- Efficacy of Acelepryn and Merit for control of Japanese beetles
- Fairy ring management strategies

- Hydroseeding with a herbicide
- Mycorrhizal fungi and phosphorus effects on bentgrass establishment
- New developments in nozzle and sprayer technologies
- Pre-emergent crabgrass control
- Residual activity of insecticide treatments for control of black cutworms
- Use of modern creeping bentgrass cultivars to reduce fungicide inputs

In addition to the research presentations, there was a limited-space afternoon lawn care workshop for attendees that were lucky enough to register early. Attendees could learn from UW faculty and staff how to identify grasses, weeds, diseases, and insects, and calibrate sprayers and spreaders. The workshop was geared for employees who may not have had formal turf training and wanted to brush up on some of their turf care skills. The session has sold out since it was started 3 years ago and attendees gave praise to the session once again this year.

The trade show was totally

revamped for 2010 to the delight of attendees and exhibitors. The location of the show was moved to the Noer Facility's front lawn rather than being stuck out in the back 40 of the facility. Vendors were pleased because there was much more interest and traffic with the new layout and location, and attendees liked it because there was more to see and learn in the closer, friendlier set-

ting. Please help support the Summer Field Day vendors that help bring this great event to you every year. The 2010 vendors are listed below.

One other huge highlight of this year's field day was the attendance of Professor emeritus Dr. Jim Love. Many years ago, in talking with OJ Noer himself, Dr. Love determined the need for a turf program at the UW-Madison and thus started the

scholastic program in Wisconsin. So many of his former students and others were thrilled and honored that he was with us this year.

All in all, Field Day was a super success. From the crowds to the education to the invaluable interaction between colleagues, this year's show was one to be enjoyed. I hope you were able to attend. 🌱

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