

Prove It!

By Paul Koch, Turfgrass Diagnostic Lab Manager

How do you actually prove something? I work to prove the cause of certain ailments to your turfgrass on every sample that comes into the diagnostic lab. Some are fairly straightforward; if the turfgrass is reddish in color, the weather has been cool and wet, and there are numerous spores consistent with a leaf spot fungus then I've proven to my own satisfaction that leaf spot is the cause of the damage to the turf. Others are more complicated. What if no fungal organisms are observed? Users of the TDL never get 'I have no idea' for a diagnosis, so how can I prove that what I suspect to be causing the damage is actually causing the damage. The truth is that in most cases I can't, but in diagnostics 'proof' can be thought of in similar terms to a legal case. Proof is not present or absent in black and white terms, but instead accumulated and often presents itself on a gradient. Some 'proof' accumulated over time will support your case, oftentimes other 'proof' will contradict the previous 'proof' you found. In the end the final verdict is made by the end user, who will then deliberate your case before making a decision that either validates your claims or does not.

Growth regulation and red turf; a case study

Springtime is both an exciting and frustrating time of year for superintendents. The turf is greening up and activities outside abound, but highly variable weather can wreak havoc on the best laid plans and the turf can assume almost any color under the sun. Every spring though for the past 3-4 years the TDL has received several samples of creeping bentgrass with a red or purple cast (Figure 1). This reddish cast was present because the older (lower) leaves had senesced but the newer leaves were green and healthy (Figure 2). Because the symptoms usually accompanied cool, wet weather it was thought that leaf spot may be to blame. No leaf spot spores were ever observed on the affected leaf blades though. Because annual bluegrass was always healthy while the bentgrass was affected, take all patch was oftentimes another diagnosis associated with these patches. But the roots were usually white and showed no signs of fungal infection, not to mention being 4-6 weeks earlier than normal take-all symptoms appear, eliminating that possibility from contention. So what was causing the off-colored turf? Most of the symptoms would disappear once consistently warm temperatures arrived, and the reddish turf became an afterthought until the following spring.

Then came the spring of 2011. Whereas 5-6 samples or reports of symptoms would be recorded by the lab in previous springs, 2011 easily brought four to five times that number. A few courses even had symptoms that progressed beyond color to actual thinning of turf. This now was more than a mere afterthought, and caused considerable concern amongst area superintendents. Despite the widespread nature of the symptoms, there were still no signs of any fungal infection. So the question remained, what was causing the off-colored turf?

One of the first things that gets inspected when a sample arrives is the list of recent pesticide applications. While nearly every sample had adequate disease protection, it was observed that every sample submitted also had some sort of growth regulation on their list of recent applications. The most common was a combination of Proxy® and Primo MAXX® to limit annual bluegrass seedhead production, but other superintendents had only applied Primo MAXX®. This was a red flag, as there are numerous reports of turf discoloration in conjunction with a number of growth regulators. Further, symptoms appeared to be the worst in areas of spray overlap, clearly following straight lines at some golf courses. Looking deeper into the applications and talking with the superintendents provided another potential clue, as most if not all of them had been applied shortly prior to a bout of cold temperatures or even a frost. With a couple hard frosts occurring over much of the state well into May, this provided an explanation as to why the discoloration was so much more prevalent this spring than in years past.

Aside from a comment on the Primo MAXX® label cautioning against applying in high or low temperatures, there is nothing on either the Primo or the Proxy label about frosts and discoloration. A quick search on applying either of these growth regulators prior to frost found little information aside from general recommendations and comments. This suggests that this problem isn't widespread or severe, which is consistent with what has been observed in Wisconsin.

The previous couple of paragraphs lay out the case for involvement of Proxy® and Primo MAXX® with the symptoms observed this spring, an affliction I have affectionately called 'PGR patch.' But have we proved a correlation? Well not until we look at the facts the defense would provide in the case.

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First, and the most damning, is why didn't every course that sprayed Proxy/Primo and experience a frost see this PGR patch? And why was the damage in roughly circular patches, not constant over the entire area sprayed with the growth regulators? What is the mechanism for this discoloration?

These are all excellent questions, and ones that I don't have a good answer to at this point. The likely reason that every course didn't see damage is because every course is different. Local environmental conditions can vary widely from hole to hole, not to mention course to course. The health of the plants also seems to have an effect, as symptoms were more pronounced in areas of heavy traffic, poor drainage, etc. The patchy nature of the symptoms seem to correlate with differ-



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ent strains or 'clones' of bentgrass that are found in a putting green, which can have a number of varying characteristics compared to surrounding bentgrass. The mechanism is the most complicated to theorize about at this point. One potential mechanism could be an overregulation of the plant's growing capabilities, leading to reduced uptake of certain crucial nutrients during the cold temperatures that lead to a temporary discoloration.

So have we proven the correlation yet? The answer remains no, but a lot of interesting information provided with the frosts of 2011 have helped to provide a set of clear questions that could be answered in future

field research. This next step is yet to be attempted, and no plans are currently in the works at UW for a field trial to explore the effects of cold temperatures on plant growth regulators. For those looking to explore this more at their own facility I would recommend leaving a couple 'check' areas next spring when you spray your spring growth regulators. The easiest 'check' is to place a board down over a problem area prior to spraying to prevent the growth regulators from reaching the turf, and compare the health of the sprayed vs unsprayed turf. In the meantime, you will have to act as judge, jury and executioner. Provided the evidence for and against in Table 1, what is your verdict?

Best wishes Dr. Stier

Like most of us in the turfgrass industry, I did not start out at Wisconsin in turfgrass maintenance. My beginnings were in bacteriology, with aspirations to enter a medical research field. Quickly becoming disillusioned with that track, I looked fondly upon my summer work on the maintenance staff at The Bog golf course in Cedarburg and decided to look up turf maintenance. I met with Dr. Stier to discuss the program my freshman year, and John has been a pivotal mentor and advisor to me in both an official and unofficial manner since that very first meeting. Many of my most challenging questions in both research and academics were answered with assistance from John. In addition, it was with strong endorsements and a backing from John that let the major fungicide producers know Wisconsin was still a great place to test fungicides after the departure of Dr. Geunhwa Jung to the University of Massachusetts-Amherst. My work would have been much harder without John's support. So the news of John's departure to the University of Tennessee was met at first with personal sadness, but was followed quickly by an appreciation and thanks for the guidance he has provided me for nearly ten years. Best wishes in your new endeavor John, an Old Fashioned awaits you anytime you return.



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Figure 1: The purple- or reddish-colored turf with healthy annual bluegrass was a common symptom on many area golf courses this spring.

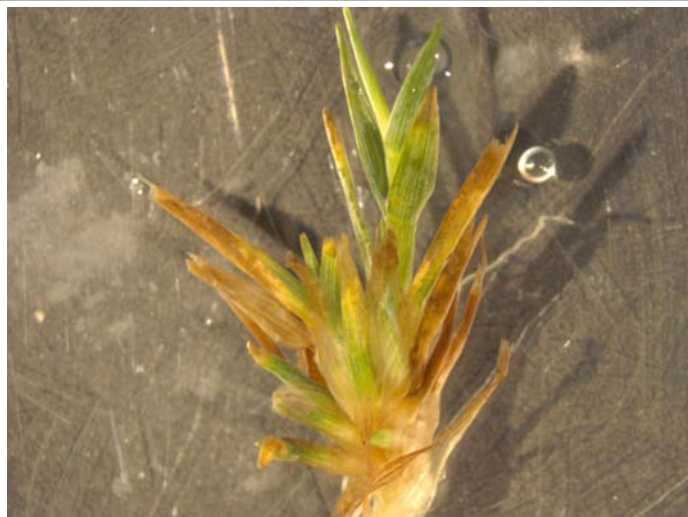


Figure 2: Another key characteristic of 'PGR patch' was the affliction of older (lower) leaves, while the newer leaves were green and healthy. The afflicted older leaves gave the stand the 'cast' of red or purple color.

Evidence in Support of PGR Damage

- No diseases or insect damage observed.
- PGRs recently applied in every case of purple/reddish-colored turf the past 5 springs where disease was not present.
- Frosts or cold temperatures frequently followed the PGR application, much more severe symptoms in 2011 with late season frosts.
- Symptoms more apparent in areas of PGR overlap.

Evidence Against PGR Damage

- Symptoms appear in roughly circular patches, but PGRs applied over entire putting surfaces.
- Not every course that has applied PGRs in spring has observed the discoloration.
- Few other reports of similar damage in other areas of the country.
- What type of growth regulator is causing the symptoms, and what is the mechanism?



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