What's Creeping You Out No

Ideas In Pest Management

Factors Affecting Fungicide Performance

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As summer approaches so to does the battle between diseases and golf course superintendents. Although in a perfect world it would be nice to manage fungal diseases without using a pesticide, yet we do not currently have that option. Fungicides are necessary in order to maintain the quality playing surfaces golfers demand, but it never hurts to understand the factors that affect fungicide performance. With an understanding of these factors, I believe that golf course superintendents could maximize their fungicide programs and possibly even extend residuals of some of their applications.

The primary factors that affect fungicide performance are what Rick Latin refers to as deposition factors, depletion factors, disease pressure and fungicide resistance. Dr. Latin discusses these factors extensively in his book A Practical Guide to Turfgrass Fungicides, which in my humble opinion is by far the best Turfgrass text I have ever read! Deposition factors refer to deployment of the fungicide, which includes application rate, application volume, application timing and application interval. Depletion factors refer to the removal of a fungicide either through degradation processes, mowing or rainfall. Disease pressure refers simply to the disease triangle- there are some circumstances when the pressure is so intense that more frequent and higher rates of products are required to maintain suppression. Finally fungicide resistance is essentially the natural selection of tolerant individuals through the repeated use of a fungicide, especially ones with single site modes of action. The remainder of the article will examine these factors in a bit more detail.

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Deposition Factors:

Fungicides are typically applied using water as the carrier and one of the most controversial topics is how much water should I use. Most researchers apply fungicides in 2-gallons/1000 ft^2, yet most golf course superintendents try to limit that water volume for efficiency during the application. Do you run the risk of losing performance when the water volume is cut from 2 gallons to 1.5, 1 or even lower? Coverage is not ideal when spraying fungicides from a sprayer traveling at 6 mph so why reduce water volume too much (Figure 1A). Most of the current research has focused on evaluating different water volumes for the control of dollar spot. Research conducted at Kansas State University demonstrated that water volumes could be reduced without sacrificing dollar spot suppression when using chlorothalonil (Figure 1B). These applications were conduced biweekly, which probably demonstrates that frequency of applications are important when lowering water volume.

The question I pose is what happens if we use a DMI or another product and expect more than 14 days of control? Does the residual control change with increasing water volume? I ask these questions because we routinely get exceptional control in our dollar spot trials with limited breakthrough, yet I rarely hear of the same control from golf course superintendents. Yes I know we do not have traffic and golfers at the OJ Noer and most certainly an argument could be made about how this influences disease pressure. However, keep in mind that we as plant pathologists are morbid and we do everything possible to induce disease development, so it's unlikely that the pressure observed at any particular golf course is higher than the pressure at the OJ Noer. We plan to deploy our own water volume experiment this summer looking at residual control of dollar spot, in other words can we extend intervals just by increasing water volume? If you are interested come to the Wisconsin Turfgrass Association Summer Field Day on July 31st for the results.

Depletion Factors:

Once a fungicide is deployed into the environment there are many factors that remove it from the plants we applied them to. One of the biggest factors is mowing. Constant mowing is an excellent way to remove or dilute fungicides from the targeted area. Notice the word dilute because in some cases we are removing protected tissue and as the new growth emerges it may or may not be protected. Another factor that we have worked on extensively is the degradation of fungicides in response to temperature. Paul Koch has focused his PhD research on how fungicides persist in the environment and has found that fungicides degrade rapidly when temperatures increase from 50 to 68 to 86^{o}F (Figure 2). It is interesting that by 14 days we cannot detect iprodione on turf when temperatures are at 86^{o}F. Based on this particular research, we think that microbes are the main entities degrading iprodione in the environment. Therefore as temperatures increase so to will the degradation of iprodione. This is why Paul and I say increase rates and intervals during the summer months and when disease pressure is highest.

Another question I commonly receive is how long does it take for a fungicide to be absorbed. To answer this question, Pete Dernoeden's group did a very nice study that applied water 30 minutes after fungicide application. They used four different fungicides, Emerald, Chipco 26GT, Daconil Ultrex and Banner MAXX in this experiment and used dollar spot to evaluate the efficacy after rainfall. Emerald and Chipco 26GT were not affected after rainfall, but Daconil Ultrex and Banner MAXX were. This tells us that Daconil and Banner's performance can be affected if a rainstorm occurs within 30 minutes after application. However, typically fungicides dry quickly and once they do, it is difficult to dislodge them. Therefore it is imperative to water-in fungicides immediately after application when targeting take-all patch and fairy ring.

Disease Pressure and Fungicide Resistance:

Like the past two summers, sometimes the summers are perfect for diseases.

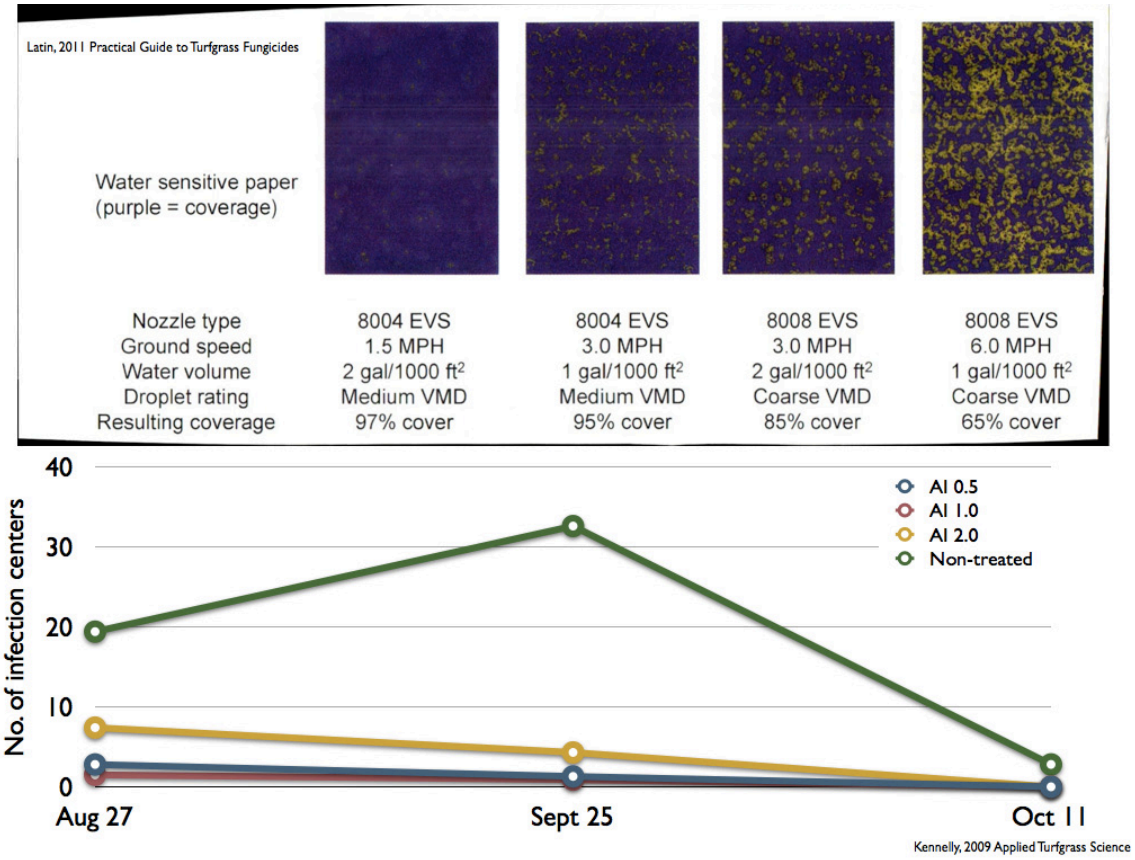

Figure 1. A. Various coverage on water sensitive paper when applied with different nozzles, at different speeds and in different water volumes. Notice the coverage when applying at 6 mph at 1 gal/1000ft^2. B. The graph depicts the effect of water volume on the control of dollar spot with chlorothalonil.

When conditions are quite conducive, it can be difficult to manage diseases even with the best fungicides. As disease pressure increases so to must the fungicide rate and interval in order to successfully manage turf diseases. For example, the past two summers have been perfect for Pythium blight especially in creeping bentgrass fairways. When conditions are ripe for Pythium, this is not the time to use low rates. Also it seems like the tendency is to assume fungicide resistance when fungicides fail to perform during the summer. While this can be a real and difficult problem to manage, it is imperative to have this tested before assuming that you have an insensitive population. I think many

failures can be attributed to lack of protection because the fungicide has been degraded. I find it suspicious that fungicide resistance is typically alleged when extreme disease pressure occurs and when it is hot. I think we forget that our fungicides do not last very long in the environment or at least that's what our research shows. Before applying a fungicide this summer, I hope you consider these factors in order to maximize performance!

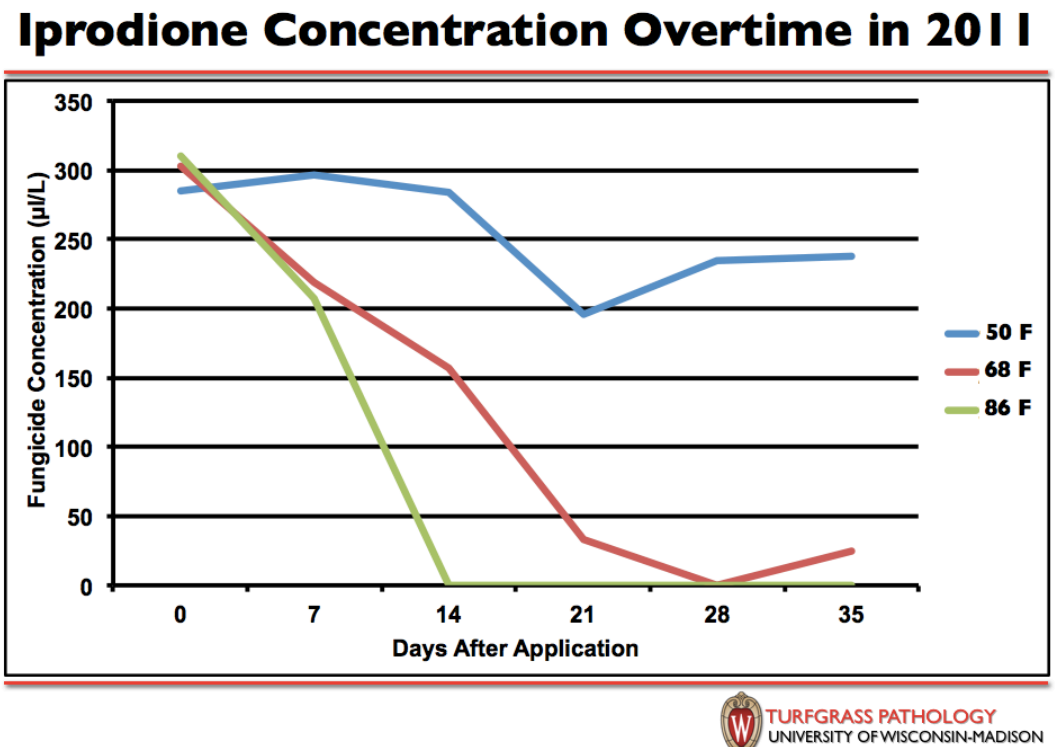

Figure 2. The effect of temperature on the degradation of iprodione in 2011. Iprodione was applied once and plugs were brought to the lab 0, 7, 14, 21, 28, and 35 days after application to incubate at 50, 68 or 86°F. Fungicide concentration was measure using a commercially available ELISA kit.