



Status of DMI Resistance with Respect to Dollar Spot

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Just recently I was at a meeting in Hartford, CN to discuss DMI resistance in populations of the dollar spot fungus, *Sclerotinia homoeocarpa*. The meeting consisted of a day and a half of presentations from the likes of Dr. Frank Wong (UC Riverside), Dr. Geunhwa Jung (UMass), Dr. Lane Tredway (NCSU), and members of Drs. Jung's and Tredway's program. I must admit that I am not a resistance guru, so it was very informative meeting for me. Basically the idea of the meeting was to give researchers an idea of the current research being done and have an opportunity to discuss how to handle DMI resistance in the future. There was some very interesting data presented at this meeting, which will be discussed in the following few paragraphs.

Before talking about the presentations and some of the newest findings with DMI resistance, it is important to review what a DMI fungicide is. DMI stands for Demethylation inhibitor, which means they target a specific process in the sterol biosynthesis pathway. Specifically these fungicides prevent ergosterol biosynthesis, a critical component of a fungal cell wall (Figure 1). Without ergosterol the fungal membranes become leaky and other toxic sterols build-up, thereby inhibiting fungal growth. I know you're dying to know what mechanisms control sterol biosynthesis! This is where DMI resistance becomes fuzzy. The genetics behind sterol biosynthesis is messy to say the least. This is the reason why the DMI fungicides are considered to have a low to medium risk for resistance.

Although the fungicides do act on a single site, many genes regulate the single site and there are probably many different types of ergosterols. The bottom line is DMI resistance within dollar spot fungal populations is real, but has rarely amounted to control failures.

Back to the presentations, Dr. Wong spoke about using the examples in other crops as a means to learn about management in turf-grass. Basically in other crops researchers have found that the level of DMI resistance can be delayed or maintained by increasing rates and shortening intervals between sprays. Although Dr. Wong was correct, the problem with turf is the rates are already

much higher than in other crops and currently intervals are already relatively short. I guess if there were issues with dollar spot control we could shorten intervals to 7 days, but many courses in the Midwest do not have a budget that would sustain such costs. Dr. Wong also highlighted that DMI resistance seems to be fairly stable once we detect reduced levels of sensitivity to the fungicides. In other words, we may not revert back to a population that is extremely sensitive by avoiding the DMI chemistries all together. That being said, it does not mean that we cannot use DMI fungicides. By using management strategies like tank mixing and alternating

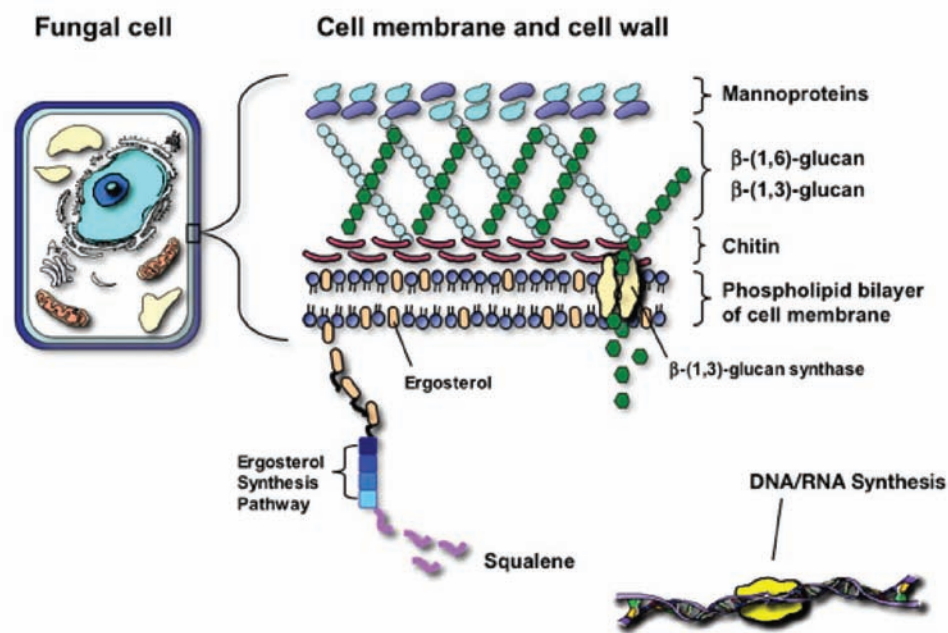


Figure 1. Depiction of ergosterol within a fungal cell and the mechanism proposed for synthesis of the molecule. Notice how many ergosterols are contained within the fungal cell membrane, which depicts how important ergosterol is to a fungus. The image was adapted from http://www.doctorfungus.org/thedrugs/antif_pharm.htm.

chemistries, we can sustain the level of sensitivity within the pathogen population.

Following Dr. Wong, Dr. Tredway discussed the differences in controlling DMI resistant *S. homoeocarpa* individuals curatively and preventatively. He found that curatively the DMI fungicides were not able to suppress the very resistant individuals. Preventatively however, he did not see any differences in control regardless of the sensitivity level of the pathogen. Basically dollar spot is controlled well with preventative applications versus curative applications. I think this is something the Midwest has known for a long time! I do think that DMI fungicide resistance is something to keep in mind because we do not want to lose that class of chemistry. Yet I do not think it is the main reason for the reduction in intervals I heard about at this meeting, nor do I think it is the only explanation for the lack of curative control. We do not know enough about the biology of the dollar spot fungus to make these conclusions. For all we know the fungus may not be active when curative applications are conducted. Hopefully the turfgrass pathology program at UW can answer some basic biology in the next few years.

Remember I mentioned the genetics of DMI resistance was messy, well Dr. Jung and Dr. Banya Ma (a post-doc in Dr. Tredway's program) elaborated on this. They are working on identifying the genes responsible for DMI resistance in the dollar spot fungus. They have made significant progress, but they are finding that the picture is not so clear. Dr. Tredway's group has found a gene that appears to be correlated with DMI resistance, but they still have quite a bit of work to do. Dr. Jung's group is working on characterizing the importance of an efflux pump in *S. homoeocarpa* populations. This pump is thought to be a mechanism that allows the fungus to pump out the DMI fungicides, thus avoiding growth inhibition. These two are doing excellent work and have formed a nice collaboration. I cannot wait until the next time we get together to hear what they are doing.

Essentially, resistance to the DMI fungicides is real and something to keep in mind. I am unsure of how much field resistance actually exists because of the rates and intervals we use in turf. However, it is imperative to practice tank mixing DMI's with a multi-site inhibitor such as chlorothalonil or mancozeb or rotate to a different mode of action. This will help delay or prevent the onset of field resistance. Keep in mind there are many flavors of DMI's presently: propiconazole, metconazole, triticonazole, triadimefon, fenarimol and myclobutanil. Look at the Frac code listed on the fungicide label, rotating chemicals means not using another chemical with the Frac code # 3. Fungicide resistance is a complicated subject and if you have any concerns or questions, please do not hesitate in contacting us! 🌱

ELIMINATE GUESSWORK WHEN SPRING FEEDING

Spring fertilization varies greatly on a number of factors. Cultural practices performed, soil amendments made, irrigation and drainage upgrades, fertilizers applied, and what happened last fall plays a significant role with this season's success. However, having a sound fertility program will provide you with your best chance of success for the upcoming season.

Typically, spring applications are applied after the early flush of shoot growth has occurred, but predicting spring weather can be a challenge when it comes to soil and air temperature, and precipitation. That's why choosing a fertilizer that performs in cool climates is so vital.



John Meyer
Regional Manager
AGROTAIN International, LLC

The nitrogen applied with UMAXX, a top performer in cool weather, is plant available as soon as watering in occurs. In addition, what the plant does not immediately use will be held onto the soil colloid as a reserve for future use.

This is a drastic change from other fertilizers.

Coated products are a great example of fertilizers that don't offer immediate plant nutrition and are subject to leaching once the protective coating breaks down.

Still other products rely on a process called mineralization, depending on soil microbes to break down nitrogen. Whereas soil microbes aren't fully active until the soil temperature reaches 55 degrees – which might not happen until late spring depending on the region – UMAXX begins working immediately and is not dependent on soil temperature for nitrogen release.

Although fine-tuning a spring fertilization program varies on many factors, its importance will be felt all summer long and even into the fall. The benefit of using an all-weather, long-lasting performer such as UMAXX provides immediate benefits, as well as a positive long-term impact. UMAXX gives the freedom to apply as a nitrogen component in a blend or part of a soluble fertilizer program. UMAXX offers consistent performance regardless of temperature or application type.

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