Can a Firm Foundation of Turfgrass Resistance Reduce the Pressure of Dollar Spot?

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If you look at textbooks containing control strategies of plant diseases, you will find a list of basic principles for lessening the severity of pathogen attack on particular crops. Our particular crop is cool season turfgrass adapted in Wisconsin and other regions with similar climatic conditions. Listed first, because of its importance, is the selection of disease resistant cultivars or species that are well adapted to various areas. Then the list goes on to explain cultural practices such as balance of N-P-K fertilizer, mowing height, proper irrigation, chemical and biological control. It makes sense that planting resistant cultivars or species is the most important and fundamental prevention technique as this is the foundation of disease control.

However, because of the complex situation, it is difficult to renovate existing grasses with newly developed resistant cultivars. Revenue losses make the renovation of existing grasses a rare practice in turfgrass business, expecially by golf courses. Resistant cultivars are mostly used in new courses. Occasionally their usage extends to renovating parts of existing courses. For the above cases and future possibilities, our lab initiated an experiment at the O.J. Noer Turfgrass Research and Education Facility last year to answer the question, "Can we reduce the frequency of fungicide application to control dollar spot by growing resistant bentgrass cultivars or species in fairway condition?"

Fortunately, our initial research results indicate that the answer to our question is a resounding "Yes". How do you feel when you see research results which reasonably explain your experimental hypothesis and which indicate significant difference among treatments? To me, it is a great and wonderful feeling, just like a person who won a race. If you understand how the experiment was performed, then you will see why I am so excited about our results.

As researchers, we first review facts, theories and proposals. Then we formulate a logical hypothesis that

is testable by experimental methods. Next, we carefully design an experiment, considering the number of replications, the type of experimental design, and most importantly the control of homogenous conditions such as temperature, fertility, humidity and day length. After the experimental design is determined, we carry out the experiment as precisely as possible. Finally, we objectively evaluate the hypothesis on the basis of the experimental results. If the results are reasonably interpretable, then our mission is completed. Otherwise, we need to go back to reformulate the initial hypothesis.

I would like to report what we have learned from our experiment this year at O.J. Noer. The results presented here are only based on the first year of field data and a second year's data will be required before strong recommendations can be made.

Briefly, seventeen cultivars (one dryland, three colonial, and 13 creeping bentgrass) were planted at O.J. Noer in a 3' x 5' split plot during the summer of 2000. A subplot received four treatments (14, 21, and 28-day schedules of fungicide application with 3.2 oz/1000 ft^2 of Daconil Ultrex and a control without fungicide). Detailed experimental procedures and results are described in the 2001 Wisconsin Field Day book.

Here I want to address several observations made from the statistical analysis. Consider the three components of a disease triangle: host (turfgrass), pathogen (dollar spot), and environment (temperature, moisture, and light). We must not forget to consider the grass component of this triangle. Therefore, knowing whether the grasses growing in your golf course are resistant or susceptible to dollar spot will significantly effect turfgrass management strategy. Here are some conclusions from our experiment:

1. Cultivars tested in our study were significantly different from each other in terms of dollar spot susceptibility. In other words, significant differences exist between cultivars.
2. All cultivars of colonial and dryland bentgrass species have shown resistance to dollar spot but a large range of variation was detected in creeping bentgrass cultivars. Testing additional cultivars of the two species is required to confirm these results.
3. Significant difference among four treatments was not detected within the resistant cultivars. Of course, the control treatment (no fungicide) has more symptoms than treatments with fungicide. However, no statistical significance was detected among the four treatments. An interesting finding was that each treatment (14, 21, and 28-day schedules of fungicide application) reduced the damage of dollar spot to almost zero in resistant cultivars.
4. On the other hand, when highly susceptible cultivars were used, significant symptoms were found even with fungicide application. In this case, a higher rate or more frequent application is probably required in order to maintain an acceptable quality of turfgrass.

There are two more important questions for which we are continuing to seek answers. Can similar results obtained in our current study be seen when the weather conditions are relatively favorable for the growth of the dollar spot pathogen, but not for the growth of turfgrass? Also, how long can resistant cultivars sustain their resistance in spite of the rapid change in pathogenicity of isolates? The latter is a very important and complex question to be resolved. In general, the chance of developing resistant isolates is much greater when repeated fungicide applications are made on susceptible cultivars than when few applications are made on resistant cultivars.

It was not many years ago that I, as a father, used to read a book titled "Three little pigs and the big bad wolf" to my children. My lessen of this story is to build a house with a firm foundation regardless of any circumstances so that the wolf (dollar spot) can not blow it away.