Influence of Winter on Plant Pathogens

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With the mild winter we experienced, I have had many questions about the influence of winter on plant pathogens. In other words, will summer diseases be more severe because the winter did not "kill" the inoculum from the previous fall. This question is valid because disease can be predicted based on inoculum density (how much inoculum) and inoculum potential (energy needed to initiate infection). These two terms are frequently used in plant pathology, but are rarely studied in any detail. Inoculum density can be determined relatively easily, yet one must understand what the form of inoculum is. Once the source of inoculum is known (ie spores, hyphae, sclerotia, etc.) then all a researcher has to do is simply count the number of propagules per unit area. However, the number of propagules does not always equate to disease severity because the inoculum potential differs for each plant pathogen. As I mentioned earlier, inoculum potential is the measure of the energy or capability that a pathogen needs to infect a plant. This particular term is very hard to quantify and is why predicting diseases based on inoculum density is problematic.

Understanding these two terms are vital when considering if our mild winter affected inoculum densities of our summer pathogens. It is true that a mild winter would definitely limit the loss of viable inoculum deposited in late summer or early fall. However, we do not understand how efficient our inoculum is at causing disease. We may only need one or two units of inoculum for dollar spot or anthracnose to induce an epidemic. These are the unknowns when trying to answer the question about the effects of a mild winter on our summer fungal problems. The other issue is we really do not have a good understanding of how our summer pathogens survive. For many years, turfgrass pathologists claimed that the dollar spot fungus overwintered in thatch and soil as hyphae and stroma (a specialized survival structure). Yet, when Renee Rioux (Ph.D student in my program) attempts to isolate the fungus she can only find it closely associated with plant tissue. Thus from our preliminary evidence it seems like the dollar spot fungus overwinters inside living plant tissue. If this turns out to be true, then the winter temperatures have little impact on dollar spot development.

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As for our other summer diseases like anthracnose, summer patch, brown patch, Pythium blight, anthracnose and take-all patch, we still do not have a good grasp on how much inoculum is needed to initiate an infection. All of the fungi that cause the aforementioned diseases are common soil inhabitants and in many cases produce survival structures that have evolved the ability to tolerate extremes in weather. It is true that the mild winter probably did not kill off as much inoculum when compared to previous winters, but we still do not know what environmental conditions we may experience this summer. In my humble opinion, the winters affect our summer diseases minimally because I continue to stress that the most important aspect of the disease triangle is environment. We know year in and year out we have enough inoculum present for disease to occur, so the only driving factor are the environmental conditions during the summer months. I do believe that less inoculum died during this past winter, but I do not think that will translate into more disease this summer. Once again we are at the mercy of Mother Nature when it comes to what this summer holds. The only thing we can guarantee is that the TDL and myself will be ready to help WGCSA members with whatever happens during this season!

On a personal note, I would like to thank the members of the WGCSA for their continued support of the TDL. Without the constant support from the industry the TDL would have evaporated long ago. At GIS, in Las Vegas Brett Grams asked if Paul would be willing to help with a 50/50 raffle at the Wisconsin Room and this was a huge success. You all purchased $1100 worth of tickets during the event. This is absolutely remarkable because the money came from your own wallets!! Furthermore, the eventual winner of the raffle, Randy Dupont, donated everything back to TDL! From Paul, myself and the entire turf team at UW, thank you very much for your support of our program!!