

Spraying soybeans with fungicides after Hurricane Irene

The question has come up after the tremendous rainfall and damage caused by hurricane Irene whether or not one should spray their soybeans with fungicides. There was also a question just before the hurricane as to whether or not it was advisable to throw in a fungicide since many fields were to be sprayed for insects like podworm and stinkbugs. The answer to both those questions is highly dependent on each individual situation and a blanket recommendation cannot be made, especially because soybean rust is not going to be an issue this season.

Before we discuss the factors that play a part in determining fungicide need let me briefly explain why we rely on statistics and statistically valid research to answer these questions. Most of you are familiar with yield monitors and their output either because you have equipped your combine with one, or the custom combining operation that does the harvesting has one, or you have seen sample maps in a trade publication. If you haven't then I'm sure you are still aware of the issue of variability in a field because of all the hoopla associated with any precision Ag equipment article or ad. These have been invaluable tools as they have really shown that an apparently uniform 40 acres is really quite variable. The obvious reasons for the variability are variations in soil type, depth, moisture and fertility just to name a few. But there are also many other less obvious reasons associated with pests since they are not uniformly distributed across any field as well. Some fields are more variable than others but every field is to some degree not uniform. The fact is if you took any production field and arbitrarily split it in half the average yield in each half would not be identical. In fact I would suspect that the vast majority in our area would easily have about 3-5 bu/A yield difference between each half. Again some might have greater uniformity and a smaller difference and some might have more. It is this variability that illustrates the need for statistics. Think of it this way. If the same field that we split arbitrarily in half produces yields that are different by 3-5 bu/A without a treatment then how do we know if we put a fungicide (or anything else) on half that it did anything? We use statistical tools and design experiments following certain statistical rules to answer that question. Two of the most important rules are replication and randomization. We will replicate so that we test a treatment more than once and get a measure of the variability in the response. We will randomize where each replicate of each treatment goes in the field to make sure they all have an equal chance of being in a high yield spot or low yield spot in a field. By using these and other tools we can then use the variability that is there to say whether or not a treatment has a certain probability of having an effect. The point is a bigger number doesn't always mean that the treatment has a real or significant effect for those conditions. Sometimes a 3-5 bu yield difference could just be chalked up to being part of the background variation.

Ok, getting back to should we spray fungicides on soybeans after this heavy rainfall and wind damage. Let's start with the damage. There have been no independent scientifically sound experiments that show a consistent and reliable yield advantage to spraying fungicides in the absence of diseases. Physical damage by itself is not

going to be corrected by a fungicide. Some fungicides reportedly have a positive effect on plants by counteracting components of plant stress responses. However, there is no proof from independently conducted field trials that this affect is large enough to affect yields in the field in non-diseased plants.

Stands that are lodged, leaning or matted down because of high winds tend to favor the development of certain diseases because the canopy remains closed and therefore remains wet for longer periods. Also, the distance a fungus needs to move either from leaf to leaf or soil to leaf in lodged or leaning stands is generally less. Heavy rains play a more important role than the stand damage in driving disease development. The rain from Irene provided two main avenues for greater disease development: spread of disease-causing agents if they were present; and a wet or humid environment that favors pathogen growth and infection of plants. A key that cannot be ignored is there has to be a pathogen around and in a form capable of being moved.

There are soybean diseases that will not respond to foliar fungicides. Bacterial blight and Bacterial pustule are diseases that are favored by hard driving rains. They look very similar to several fungal diseases, but because bacteria cause these fungicides cannot control them. Don't get talked into spraying just because there are some leaf spots. There are also some fungal diseases that will not respond to foliar applied fungicides. The stem and root diseases in particular, Charcoal rot, Fusarium wilt, SDS and Phytophthora all are fungal diseases that cannot be controlled either preventatively or curatively at this time of year. One on-line source of brief disease descriptions with pictures is <http://cipm.ncsu.edu/ent/ssdw/soyatlas.htm> .

The soybean diseases that can occur in Maryland that can have an impact on yield, and can be managed with foliar applied fungicides are primarily: soybean rust, frogeye leaf spot and brown spot. Soybean rust due to the earlier drought in the South is not likely to be a problem this year. Its reestablishment and increase on kudzu has been severely delayed and is at the lowest level of infestation in August since monitoring for this disease began in 2005. Hurricane Irene therefore was highly unlikely to pick up enough spores from Florida and deposit them in Maryland to be an issue. Of the remaining two diseases Frogeye appears to have more potential for damage but is fortunately less common than Brown spot. Brown spot is the most common foliar disease but tends to be a lower canopy problem. Both are much more likely to develop if the previous crop was soybeans. I cannot find any data that would indicate there is much of a chance of getting a yield response from a fungicide by controlling frogeye or brown spot when the fungicide is applied after the R3 growth stage. The reproductive growth stages are: R1 initial flowering, R2 full flower, R3 small pods are formed at upper nodes, R4 full pod, R5 beginning seed, and R6 full seed. One on-line source for soybean growth stages can be found at: http://extension.agron.iastate.edu/soybean/production_growthstages.html . There are other common diseases that tend to form late in the season and tend to be considered seed quality issues. Another way to understand these late season diseases is that fungicides reduce them but without a significant change in yield.

Only seed quality is improved. Although seed size is often improved, only rarely does that translate to significant yield increases. The most common of these diseases are purple seed stain, pod and stem blight, and anthracnose. There is a third category of generally late appearing diseases that are reduced by fungicides but we have little evidence that they respond to the fungicide with a yield increase, for example *Phyllosticta* leaf spot. In short as a general rule it takes a fair amount of foliar disease that starts early in the reproductive period, if not before, to cause enough damage to reduce yields that can be countered with a fungicide.

With regard then to our current post-Irene situation, here are my thoughts on fungicides in soybeans.

- Scout first. If you know there is a specific problem that is starting then you can much more easily decide on the need for a fungicide.
- If you are a seed producer and the soybeans are between R1-R3 then consider spraying. You will protect some seed quality and have the potential for managing brown spot or frogeye if present and in that case may see a yield benefit. If the beans are between R4 and R5 then consider spraying if you haven't sprayed earlier. However, expect only a seed quality improvement.
- If you are growing soybeans for general production and are between R1-R3. Scout first! If you have symptoms of frogeye leaf spot or of brown spot in the middle of the canopy then a fungicide application may be warranted. This is much more likely to occur if the soybeans were planted no-till into soybean stubble. If the field is at R4 and symptoms of frogeye or brown spot are evident then spraying is much less likely to improve yields. If the soybeans are at R5 then there is little evidence that you will get your money back from a fungicide application especially if it is just brown spot. If there is frogeye, it's R5, and it continues to be wet the disease will get worse but there is no evidence that you will get a return on the fungicide. If you are not comfortable with not spraying then consider spraying in strips. In essence run your own test. It will cost you less and you will have a better basis for making the decision next time.
- Knowing the field history and rotation history are helpful. If you have soybean planted no-till into soybean stubble (it could be wheat-bean or barley-bean stubble) then you have the best chance of having diseases that can be reduced with fungicides and therefore get a yield response with a fungicide. The next level of risk based on crop rotation is when soybeans are just a year apart in the rotation, e.g., full-season beans followed by corn followed by wheat or barley and then double-crop beans. The lowest level of risk is there is a two-year or more rotation to soybeans. The most likely thing to happen with a fungicide application at R3 to R4 is improvement of seed quality (for example reduced purple seed stain or improved test weight) but not necessarily improve yields. The higher the risk based on rotation then the higher the chance a yield improvement will be attained. In my opinion, you have a 30-50% chance of getting a yield boost (3-5 bu/A) in

- soybeans with the higher chance coming from the higher risk situation and spraying at R3.
- Last point. Spraying for yield protection without knowledge of what is out there has already led to the development of a strain of frogeye that is resistant to strobilurins (Headline, Quadris, etc.). This has been confirmed in IL, KY and TN. It's not a very good insurance program to spray against diseases when you just spray for yield boost because you are destroying one of the best tools you might need later on.

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