

Mystery Fungus

Specialist Keeps Eye On Possible Disease Of Future

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A single diseased wheat head collected in a field in western Kentucky has the heads of researchers spinning in an effort to identify what appeared to be wheat blast – a destructive disease known only to occur in South America. Among those concerned is Dr. Don Hershman, University of Kentucky Extension plant pathologist located at the Research and Education Center in Princeton, Ky.

“About a year ago we found a diseased wheat head that looked quite a bit like *Fusarium* head blight,” he said. “*Fusarium* head blight beaches out areas of the head; it’s very noticeable and is a very common problem in Kentucky and most everywhere wheat is grown in the United States. This sample was collected because the symptom appeared slightly in advance of when we expected to see *Fusarium* head blight symptoms develop.

“The sample actually was collected by station director Dr. Lloyd Murdock who was conducting a nitrogen study. When our diagnostician looked at the diseased head he noticed that there was something unique about it. It didn’t have the standard coloration normally associated with *Fusarium* head blight. He checked and saw there was a fungus called *Pyricularia* that was associated with this diseased head. *Pyricularia* has never been found infecting wheat in Kentucky or anywhere else in this country for that matter,” Hershman continued.

Wheat blast was first detected in Brazil in 1985, and since 1985 it has caused massive devastation of the wheat crop in certain parts of Brazil, Paraguay and Bolivia and other places all in South America. It’s one of the diseases that the United States government and many others have feared might spread to other continents and cause significant devastation in wheat.

Wheat blast is caused by the fungus *Pyricularia arisea* which has never been detected outside of South America. So this discovery in a Kentucky wheat field was very noteworthy. There was considerable concern that this particular fungus could damage U.S. wheat like it has done in South America.

“It’s almost comical to say, but we actually found the disease on this one head only,” he continued. “When we did some extensive surveying in the immediate vicinity of where the initial disease head was found, we still couldn’t find a single other head. So everything I’m talking about is based on one diseased head which really threw the system for a loop, so to speak, because who knows what to do with that. It does indicate that if there’s one diseased head there’s probably more. So the concern at the time was that this fungus may have been imported into the United States possibly with the seed, because even though seed transmission is relatively low with this fungus, it does occur. The concern was that it might have been imported from another country, particularly from South America as there is a lot of commerce between South America and the United States.”

The past year there has been a lot of work researching this fungus. Much is continuing to be done. Dr. Mark Farman, research plant pathologist in the Department of Plant Pathology located in Lexington, is an expert on this fungus and has been working with a similar fungus that causes rice blast throughout his career.

“He’s a world renowned expert on rice blast and also the fungus that can affect wheat so we are very fortunate to have this resource in our department,” Hershman said. “Dr. Farman took the isolate that he had collected from our diseased wheat head and initiated molecular studies; mind you, molecular work, not standard protocol for conducting diagnostic work, so this is a very important point. If we just relied on PCR technology, we would not have some of the answers to critical questions we were asking. Dr. Farman determined that genetically the fungus is quite distinct from the fungus that causes wheat blast in South America. It is actually more genetically similar to the *Pyricularia* that he had previously collected off of perennial ryegrass that causes a disease on that grassy crop. I might add that *Pyricularia* is also known to cause grey leaf spot of annual ryegrass which is a common forage crop in the south.”

Based on Farman’s work, Hershman feels there’s a good chance this fungus has been around for quite some time. An isolate collected

Among those concerned by a single diseased wheat head collected in a field in western Kentucky is Dr. Don Hershman, University of Kentucky Extension plant pathologist located at the Research and Education Center in Princeton, Ky.

Photo by John LaRose Jr.



from the diseased wheat head was sent to the USDA’s Foreign Disease-Weed Science Research Unit located at Fort Detrick, Md., where they work with potentially devastating pathogens in a contained environment. They have subsequently determined that the fungus we collected actually was as pathogenic, or able to cause disease, as isolates they had previously collected from South America. So it is able to cause disease on wheat, but genetically Mark Farman determined that it’s pretty distinct.

“So the conclusion is that this is not an exotic import, that, in fact, this fungus has been here for probably a long time,” Hershman said. “Over time it appears to have gained the ability to infect wheat, but has yet to cause any level of damage.

“The main thing I want to indicate is that it is here, the question is what is here,” he continued. “It’s a fungus that probably is now able to develop on wheat to some extent. What we know about wheat blast is that it is primarily a disease of a humid, wet, and warm environment. So, unless the fungus were to change radically, the chances are very slim that it will cause any damage in Kentucky wheat or wherever wheat is grown in the country, except maybe in the deep south. And that is very good news.”

There is a concern that climate change or global warming could pave the way for this fungus to become a problem in the future.

“The point is that if the temperatures do change over time, like over the next 10, 20, 50 years, and the Kentucky environment becomes more like Mississippi or Louisiana, there is the potential for this to be a disease of the future,” Hershman said. “However, right now I would say, it’s not a significant concern. The fact that it’s probably a domestic and not an exotic pathogen is really important and that’s why USDA APHIS does not plan on regulating future finds of the disease in the United States.

“Right now, we’re just getting the word out so growers, consultants and others can look for symptoms that appear to be *Fusarium* head blight and take a closer look,” he urged. “I think it’s important to get a better idea of how widespread this fungus might be in the United States without putting any fear that we’ve got this new disease that’s going to take over the wheat crop, because I don’t believe that is the case. However, in the future who knows what will happen?”

No one knows where it originated in South America but most believe it was once in grassy weeds and eventually developed the ability to infect wheat.

“The results have been catastrophic down there and we obviously don’t want the same thing to happen here, so I just want to encourage you, I think we’re in good shape,” Hershman said. “We don’t have much to worry about, maybe in the future, but there are a lot of people right now working on this problem. In fact, there is a group called the Wheat Blast Recovery Team which is being run out of Kansas State University and they’re actively looking for resistance to the wheat blast fungus. My guess is that by the time it’s an important disease here, they will have made considerable progress in finding the resistance and that’s probably the main way it will be controlled in the future.”

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