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Glyphosate controversy requires research to resolve

by Jim Ruen, contributing editor

Apr. 15, 2011

When Don Huber's, Ph.D., "CONFIDENTIAL and URGENT" letter to U.S. Secretary of Agriculture Tom Vilsack requesting a delay in approval of Roundup Ready alfalfa became public, it went viral. The concerns raised in the letter became fuel for a firestorm of concern in the anti-GMO blogosphere that saw many of its worst fears materializing in Huber's letter. Chief among them was "the discovery of an electron microscopic pathogen that appears to significantly impact the health of plants, animals and probably humans."



Huber would seem to know what he is talking about. He has been a plant pathologist for 50 years and a retired colonel in the U.S. Army with 30 years of advising the U.S. government on biological threats to the nation's food supply. Yet he received no response from Secretary Vilsack. Convinced the issue required attention, Huber shared it with others at the USDA and elsewhere. Since then, he says, USDA researchers have begun working with him. Outward reaction from the public research community has to date been largely critical and defensive of glyphosate.

The bulk of Huber's letter referred to the pathogen, a summary of recommendations also referred to glyphosate chelating nutrients and implications in increases of "more than 40 plant diseases ..." It is to this section that various weed scientists, agronomists and pathologists at Ohio State University, Iowa State University and Purdue University have largely responded.

They have pointed out that there is limited data to support Huber's claims related to increased disease as a result of glyphosate applications or glyphosate-resistant cultivars. They also emphasize that glyphosate is an effective weed control product with no data showing farmers have reason to change their weed control program as a result of Huber's concerns.

Review of Huber's letter shows that of more than 800 words in the letter, some 80 plus words refer to glyphosate's role in promoting soil pathogens and disease. Ironically, the role of glyphosate as a facilitator of disease is increasingly recognized as its mode of action. More than 700 words deal with the, as yet unidentified, pathogen Huber refers to it as "a ultra small, micro-fungal-like organism." His claim is that the pathogen has been found in soil, plants and animals, and in particular, plants infected with various plant diseases largely unaddressed, and for good reason from an academic standpoint.

A New Pathogen?

There is no data that has been published on the possible pathogen or possible associations with plant or animal health. Had there been data, the reaction from Huber's former peers might have been different, admitted Peter Goldsbrough, department head, Botany and Plant Pathology Department, Purdue University, and co-signer of the Purdue response to Huber's letter.

Referring to Huber's alleged pathogen, Goldsbrough said, "It has never been presented in any forum, nor published in any literature. If I saw data, I would be more than happy to assess it. It would be a huge issue if it were a threat."

Huber is the first to agree that more data is needed, not the least of which is establishing the organism's identity. Before this story is published, he expects to have the pathogen

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Soybean Meal	358.8s	+9.6
Soybean Oil	58.27s	+0.13
Wheat	799-4s	+14-4
Wheat(HRW)	932-4s	+12-4
Wheat(HRS)	951-4s	+12-6
Rough Rice	13.995s	+0.090

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Lean Hogs	102.050s	-0.850
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RBOB	3.3086s	+0.0313
Ethanol	2.586s	+0.017
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Gold	1,503.2s	+4.9
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sequenced, a major step in the identification process. He also expects to have rapid response, in-field tests available this cropping year.

"We now have enough information to suggest that it is not a new organism, but one that has been in place until conditions changed that brought it to our attention," said Huber. "There is still a lot of information we need to get."

What Do We Know?

What Huber does know about the pathogen is largely associative. Practicing veterinarians as well as some university veterinary pathologists have identified and traced a causal relationship between feed with high levels of the pathogen and reproductive failure and even spontaneous abortions in livestock also hosting high levels of the pathogen. Here, too, the scientific rules of engagement apply.

"Veterinarians and researchers involved are still working out the epidemiology," said Huber. Without the proper protocols in place and data in hand, any premature release opens the researchers up to the type of criticism Huber has already received.

When contacted by the veterinarians trying to trace the pathogen, Huber was already working with crop consultants and others concerned with expanded plant diseases in Midwestern corn and soybeans. In particular, Goss's wilt in corn and sudden death syndrome (SDS) in soybeans were taking a growing economic toll in the 2009 and 2010 growing seasons.

"What is interesting about expanded Goss's wilt is that it is traditionally not a very aggressive bacterium, occurring in very localized and susceptible cultivars in a few spots in western Nebraska," said Huber. "In the last two years, we found that even resistant hybrids were suddenly very susceptible, and it was spreading over Iowa, Illinois and into Wisconsin. We wondered if this was a new strain of the bacteria. We were seeing additional symptoms of gray/green desiccated tissue and the same scorched appearance in SDS soybeans."

Huber had previously worked with bacterial diseases in citrus as well as soybeans in South America and noted an association with the use of glyphosate. For more than 20 years, he had been actively researching glyphosate's role in the soil ecosystem. His and other published research demonstrated that glyphosate ties up essential micronutrients, thereby interfering with the plant's immune system and encouraging disease.

When the veterinary researchers reported high levels of pathogen being found in corn silage and corn infected with Goss's wilt, Huber began anticipating it in other affected plants. "We started working together to sort out the symptoms and systems and see what conditions accompanied it," said Huber. "We found the pathogen was prevalent when glyphosate was involved, even (in wheat) as a burndown the year before. We started looking and found it was also highly prevalent in soybeans with SDS."

Examining How It's All Connected

Exactly what the relationship is between the pathogen, glyphosate and bacterial diseases is yet to be proven. Huber suspects a synergistic relationship that occurs when key nutrients are withheld from the plant due to application of glyphosate and its release into the root zone. Huber points to work done by Robert Kremer, Ph.D., USDA, ARS, University of Missouri. Since 1997, Kremer has been evaluating the impact of glyphosate-tolerant soybean varieties and corn hybrids, and has found that glyphosate use with these crops can consistently affect soil biology and soil ecology. He has shown microbial shifts including changes in manganese (Mn) reducing and oxidizing bacteria, which may affect availability of Mn to the plant and reduced nodulation on glyphosate-tolerant soybean roots.

"We consistently saw lots of fusarium colonizing the roots of transgenic plants relative to conventional varieties with lower levels of fusarium," said Kremer. "We have identified a few species of fusarium with most in the *Fusarium oxysporum* complex, some of which can be pathogens under certain conditions. About 20 percent are in the SDS group, but we've not shown a direct relationship between SDS and glyphosate. We think a lot of factors would have to come together for a disease relationship to occur."

Is A Perfect Storm Brewing?

Having those factors come together is what concerns Bob Streit, Central Iowa Agronomics. He fears a perfect storm of weather stress, nutrient-deficient plants and disease-inducing inoculum. For the past two years he has been working with clients to fight SDS and Goss's wilt including tissue testing that showed low levels of micronutrients in affected plants. Streit had heard about Huber's work on glyphosate, plant nutrition and disease and finally met with him in 2009.

"I knew what Kremer was doing in Missouri, and when Don shared his data with me, everything fell into place," recalled Streit. "Between glyphosate tying up minerals in the plant, even if they were available to the plant roots, and glyphosate having an effect on the rhizosphere community, we had a triple whammy going on."

Since then, Streit has worked closely with Huber and a growing group of others gathering data and investigating the suspected correlations between glyphosate, bacterial diseases and the pathogen. Streit is confident Huber's concerns will be proven real. In the meantime, the group is developing remediation programs to improve a plant's response to disease pressure and soil biology's response to glyphosate and collecting data.

"The scientists working on the pathogen are doing the work needed," he said. "They want all the data assembled correctly so it meets scientific scrutiny when it is published. Until then, they have to be protected so their work doesn't get shut down."

Impact for GM Alfalfa?

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NASDAQ	2,375.50s	+20.50
Dollar Index	74.180s	-0.387

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Which brings us back to the question of why Huber wrote his initial letter to Secretary Vilsack before the research could be completed. "My credibility may take a blow, but I felt the situation was serious enough that I didn't have a choice, but to ask for help," he said. "My letter was a plea to alert him to my concerns. Alfalfa has a bacterial wilt also, and if the relationship with glyphosate, the new pathogen and Goss's wilt holds up, it could be devastating for alfalfa producers and livestock producers alike. All I asked was for the secretary to delay his decision until the epidemiology work was done."

In the meantime, Huber is continuing his work and preparing for the year ahead. "Goss's wilt survives in the crop residue," he noted. "If we have any kind of moisture early, we'll have a repeat of last year or even greater if drought stress occurs."

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