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Tracking a Silent Killer

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Tracking a silent killer

A genetics race to protect America's food supply and economy

Kansas has been fortunate to avoid a major wheat disease outbreak. Barbara Valent is working to reinforce that good fortune with science.

Valent, a university distinguished professor of plant pathology, leads a team of Kansas State University and governmental scientists in a comprehensive project on *Magnaporthe oryzae*, or wheat blast fungus. Although the disease is concentrated in South America, it is highly infectious — accounting for 30 percent of Brazil's wheat crop loss in 2009. More favorable climate conditions could cause 100 percent crop loss, Valent said.

As the leading wheat-producing state in the U.S., Kansas contributes roughly 20 percent of the nation's total wheat production and \$20.6 billion to the American economy. A wheat blast outbreak in Kansas could decimate crops and inflate food prices.

Wheat blast was first observed in South America around 1985 and efforts have been made to keep it isolated from America's heartland. In 2011, however, a single wheat head that was infected with the fungus was discovered in Kentucky.

"The interesting thing is it was not an imported fungal strain from South America; it's native to the U.S.," Valent said. "What happened was a host shift in a rye grass pathogen, a disease closely related to wheat blast that can mutate into it. It's something we predicted could happen, and we're hoping that it was just a rare event and won't ever show up again because the consequences could be enormous."

Finding a needle in a wheat bushel

Valent is collaborating with Jim Stack and Bill Bockus, university professors of plant pathology; Christian Cruz, a plant pathology doctoral candidate from Ecuador; and Gary Peterson and Kerry Pedley, scientists with the U.S. Department of Agriculture's Agricultural Research Service.

Researchers are testing South American wheat blast strains on varieties of Kansas wheat in Kansas State University's Biosecurity Research Institute to identify which have the best and worst resistance.

Tests have revealed that Everest, currently a favorite variety of Kansas wheat producers, has one of the lowest resistances to wheat blast.

"We're going to need resistance for wheat protection," Valent said. "That means wheat breeders will need to incorporate resistance traits into these less resistant varieties. Unfortunately there is no magic bullet variety for resistance against wheat blast."

Additionally, Cruz leads resistance field tests in Bolivia, an area of South America highly prone to wheat blast. The more resistant wheat varieties identified in the Biosecurity Research Institute are being planted and studied in a natural, disease-prone environment. Field results correlate with lab results.

Cracking the code

Valent and colleagues are also comparing different strains of the fungus and their genomes, or their genetic blueprints.

Comparisons among 25 years of South American wheat blast strains have revealed a much more aggressive pathogen in the field today, Valent said. The result is fungal strains that do more damage and transmit easier.

Data will be used to develop diagnostics that can quickly identify the wheat blast pathogen and differentiate whether it is foreign or mutated from the rye grass pathogen.

"It may not matter where the strain originated, but we need to follow the populations because the foreign and mutated strains of wheat blast could have different properties and consequently different sensitivities," Valent said. "The discovery in Kentucky is not a game-changer, but it makes it more important that we are ready."

By Greg Tammen, Communications and Marketing

