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UNH Research Tackles the Disease that Causes Heartbreak for Cereal Grains

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NEWSROOM (//WWW.UNH.EDU/UNHTODAY/NEWS)



UNH Research Tackles the Disease that Causes Heartbreak for Cereal Grains

Monday, February 19, 2018

(HTTPS://WWW.UNH.EDU/UNHTODAY/NEWS/2018/02/19/UNH-RESEARCH-TACKLES-DISEASE-CAUSES-HEARTBREAK-FOR-CEREAL-GRAINS)

DURHAM, N.H. – Stem rust, one of the world’s most feared agricultural diseases infecting wheat and other cereal crops, is capable of severe epidemics presenting a threat to the global food supply. As a result, scientists with the New Hampshire Agricultural Experiment Station at the University of New Hampshire are trying to understand the potential risk of the disease spreading and, perhaps even more importantly, evolving greater virulence in the region.



According to the Durable Rust Resistance in Wheat project, stem rust spores arriving as late as one month before harvest can turn a previously healthy crop into a tangled mass of stems, which produces little to no grain. A 1953 pandemic in North America resulted in the loss of 40 percent of North

SCIENTISTS WITH THE NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION AT THE UNIVERSITY OF NEW HAMPSHIRE ARE TRYING TO UNDERSTAND THE POTENTIAL RISK OF STEM RUST SPREADING AND, PERHAPS EVEN MORE IMPORTANTLY, EVOLVING GREATER VIRULENCE IN THE REGION.

America's spring wheat crop. Pandemics have been noted throughout history, with significant events occurring in South Asia, China, Central Asia, East and Central Europe, North America and elsewhere in the past 130 years.

The research is being conducted by Radhika Bartaula, doctoral student in genetics, in collaboration with Iago Hale, assistant professor of specialty crop improvement. Bartaula explained that stem rust also infects some species of barberry, a completely unrelated perennial shrub.

Colonial immigrants introduced European barberry to New England for its reputed medicinal qualities and other properties. Today in New England, European barberry and Japanese barberry grow so abundantly that both are classified as invasive species. A hybrid of these two species, though relatively rare, is known to occur throughout the region (https://urldefense.proofpoint.com/v2/url?u=http-3A__www.bioone.org_doi_abs_10.3119_14-2D16-3FjournalCode-3Drhod&d=DwMFaQ&c=c6MrceVCY5m5A_KAUkrdoA&r=43nhFYk7Lgb9QdQ_EwZ2RfOaAn9EEDYKO5BGcXFwdG0&m=NGmXO__IQTXu5SQFM1SAsZzkAbfzCgfsU5RZHMkLft04tWGYtzkArgSuiopuo8KmKcTkWSCl6kxGHY&e=).

European barberry is infected by the stem rust pathogen, allowing it to complete its life cycle and for the pathogen to evolve ever more destructive races. It is this association between European barberry and the stem rust pathogen that led to the largest plant eradication effort in U.S. history. Between 1918 and 1973, more than 500 million common barberry plants were destroyed throughout the North Central plains in a largely successful effort to stop the occurrence of wheat stem rust epidemics in the United States.

“While European barberry functions as a host of the stem rust pathogen, Japanese barberry does not,” said Bartaula. “As for the hybrid between them, nothing was known. In our research, we are using the hybrid to gain an understanding of the mechanism of Japanese barberry’s resistance. At the same time, we are investigating the relevance of all three species (European, Japanese and hybrid barberry) to the spread and evolution of stem rust our region. Given the growing interest in revitalizing the small grain industry in the New England, understanding the role of the sexual host in rust epidemiology is very important.”

The experiment station researchers conducted field surveys of natural populations of European barberry, Japanese barberry, and their hybrid and tested all three species for their responses to stem rust disease. As expected, all European barberry samples were susceptible and all Japanese barberry samples were resistant. However, the hybrids exhibited both susceptible and resistant reactions. Building on this result, the researchers are using genetics to identify the genes responsible for Japanese barberry’s resistance to stem rust.

“In the big picture, we would like to understand Japanese barberry’s defense strategy against this complex pathogen. Our hope is that insight into the mechanism of disease resistance in the sexual host may contribute to the global effort to develop varieties of wheat that are immune to this historic disease,” Bartaula said.

This material is based upon work supported by the NH Agricultural Experiment Station, through joint funding of the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 233561, and the state of New Hampshire. This work also is supported by the Bill & Melinda Gates Foundation through the Durable Rust Resistance in Wheat and Delivering Genetic Gain in Wheat projects. This research was presented recently at the 2018 NH Farm and Forest Expo.

Founded in 1887, the NH Agricultural Experiment Station (<http://colsa.unh.edu/nhaes>) at the UNH College of Life Sciences and Agriculture (<https://colsa.unh.edu/>) is UNH’s original research center and an elemental component of New Hampshire’s land-grant university heritage and mission.

The University of New Hampshire is a flagship research university that inspires innovation and transforms lives in our state, nation and world. More than 16,000 students from all 50 states and 71 countries engage with an award-winning faculty in top ranked programs in business, engineering, law, health and human services, liberal arts and the sciences across more than 200 programs of study. UNH’s research portfolio includes partnerships with NASA, NOAA, NSF and NIH, receiving more than \$100 million in competitive external funding every year to further explore and define the frontiers of land, sea and space.

Editor's Notes:

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VIDEO

https://www.youtube.com/watch?v=seHjZINeQzc&list=PLIV5m_SmQxYRKoZab-ykYSp1v5uSthgCg&index=1&t=43s (https://www.youtube.com/watch?v=seHjZINeQzc&list=PLIV5m_SmQxYRKoZab-ykYSp1v5uSthgCg&index=1&t=43s)

Radhika Bartaula presents UNH’s research on stem rust at the 2018 NH Farm and Forest Expo.

PHOTOS

<https://colsa.unh.edu/nhaes/sites/colsa.unh.edu.nhaes/files/media/images/stemrust.jpg>

(<https://colsa.unh.edu/nhaes/sites/colsa.unh.edu.nhaes/files/media/images/stemrust.jpg>)

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