Researchers find conflicting effects of climate, vector behavior on spread of plant disease

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The *Phytobiomes* journal cover. Credit: Courtesy of The American

A top challenge of mitigating the impact of climate change on agricultural production is knowing the exact ways in which higher temperatures and altered precipitation regimes affect the many aspects of agroecosystems. This is especially the case with insect pests and crop diseases.

Through a paper published in *Phytobiomes*, a new and fully open-access journal of The American Phytopathological Society, researchers explored these connections using experimentation and a mathematical model to understand the role temperature plays in the development and spread of Pierce's disease, an economically important disease of grapevines spread by vectors such as the leafhopper.

The transdisciplinary study, conducted by University of California, Riverside entomologist Matthew Daugherty, as well as insect ecologist Adam Zeilinger and plant pathologist Rodrigo Almeida at the University of California, Berkeley, is among the first to look at a disease, insect vector, and temperature change in concert to understand their ultimate epidemiological significance.

Their findings, presented in their paper titled "Conflicting Effects of Climate and Vector Behavior on the Spread of a Plant Pathogen," offer more than just a glimpse into the consequences of climate change for Pierce's disease. It highlights that rising temperatures can bring a mixed bag of positive and negative effects, at least when vectors are involved.

Results of the study suggest that, although a warming climate may exacerbate disease symptoms in infected grapevines, innate vector behavior may set an upper limit on the extent of Pierce's disease spread.

"Our results confirm that higher temperatures do encourage more rapid development of infections and an earlier appearance of disease symptoms," said Daugherty. "However, that doesn't mean pathogen spread was enhanced. Rather, because the leafhopper vectors of the Pierce's disease pathogen avoid feeding on diseased vines, pathogen spread declined over time at higher temperatures."

"Conversely, for other plant diseases in which higher temperatures favor disease development and in which vectors prefer diseased plants, a warming climate would be likely to more consistently promote severe disease outbreaks," Daugherty said.

The research, which draws from concepts and methods in plant pathology, vector biology, and disease ecology, exemplifies the complex interactions taking place in the plant's biome and underscores the value of crossing sub-disciplinary boundaries to support integrative research.

More information: Matthew P. Daugherty et al, Conflicting Effects of Climate and Vector Behavior on the Spread of a Plant Pathogen, *Phytobiomes* (2017). DOI: 10.1094/PBIOMES-01-17-0004-R

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