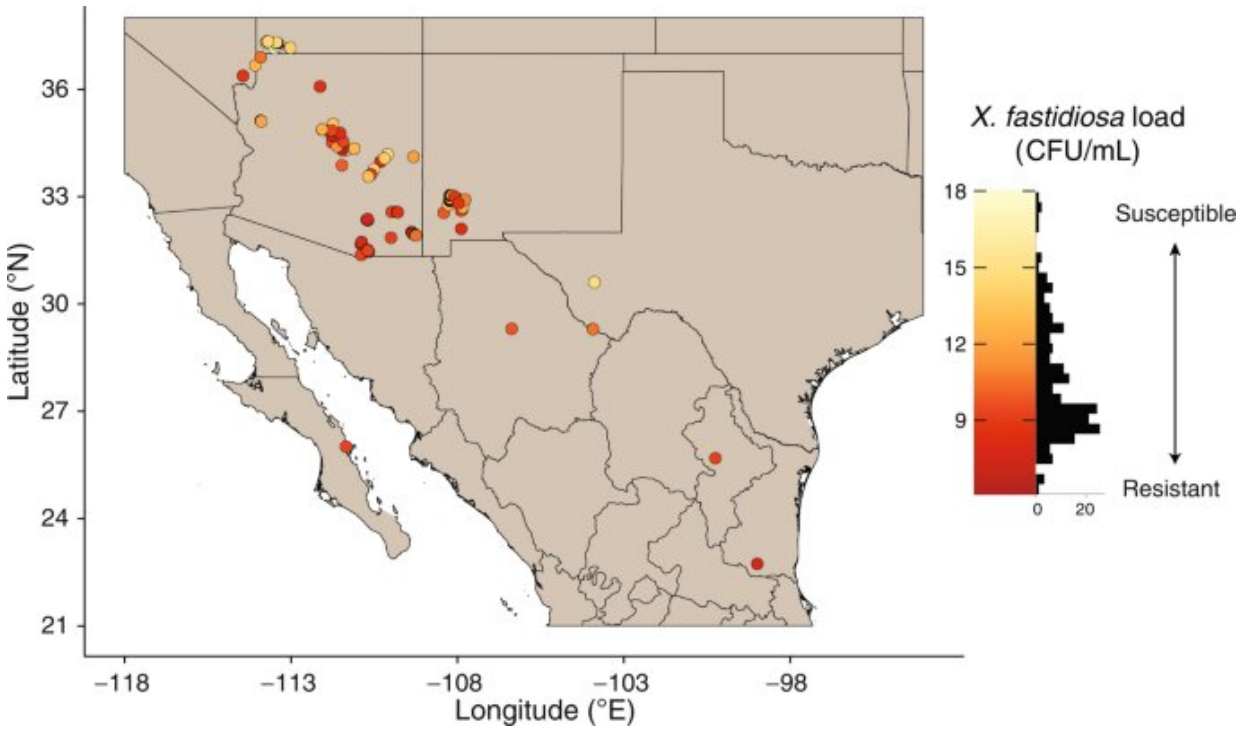
Study reveals potential breakthrough in grapevine disease resistance

June 15 2023



Vitis arizonica sampling and phenotypes. A map of the Southwestern United States and Northern Mexico indicates sampling locations of the n = 167 V. arizonica accessions used in this study. The color of sample locations (circles) are colored according to their resistance phenotype, as measured by bacterial load (CFU/mL). The histogram of phenotypes (in CFU/mL) is to the right of the map. Map generation relied on information from GADM, a publicly available database (http:gadm.org). Credit: *Communications Biology* (2023). DOI: 10.1038/s42003-023-04938-4

A team of scientists—including UC Irvine's Distinguished Professor of Ecology & Evolutionary Biology Brandon Gaut and UC Davis's Professors of Viticulture & Enology Dario Cantù and Andy Walker—has made a significant breakthrough in the battle against a devastating disease affecting grapevines. Their study, recently published in *Communications Biology*, reveals the discovery of candidate genes for disease resistance in wild grape plants, offering hope for the future of the agriculture industry.

Xylella fastidiosa is a bacterium responsible for infecting various crops, including grapes, coffee, almonds, citrus and olives. This disease has posed a significant challenge for farmers worldwide, with no known resistant varieties in major crops. However, building on a long-term project at UC Davis, the research team focused their attention on a wild grape species, Vitis arizonica, which exhibits natural resistance to the bacterium.

Through genetic mapping and genome-wide association studies, the researchers identified potential genes that could be introduced into grapevines to enhance their resistance. These findings have the potential to revolutionize the agricultural industry, offering a solution to a multibillion-dollar problem caused by Xylella fastidiosa.

One intriguing aspect of the study is the correlation between resistance genes and climate. The researchers discovered that the resistant genes were predominantly found in warm climates, indicating that the pathogen's presence is more prevalent in these regions. By projecting climate change scenarios, the team predicts the future impact of the disease on various crops, including grapes and almonds.

"This study highlights the importance of scientific research in addressing the challenges posed by climate change and plant pathogens," said Gaut, who led the research at UCI. "Understanding the genetic basis of

resistance and the influence of climate on disease prevalence is crucial for developing effective strategies to protect our crops and ensure food security."

The implications of this research extend beyond grapevines and offer insights into the genetic mechanisms of resistance in other susceptible crops. By harnessing the power of genetics, genomics, and studying wild plant relatives, scientists can identify valuable resistance traits that could enhance crop resilience against Xylella fastidiosa and similar pathogens.

"Preserving, maintaining and genetically characterizing plant collections is paramount in our pursuit of discovering valuable genes for grape breeding programs," said Cantù, who led the research at UC Davis. The study's findings underscore the urgency of continued scientific research in agriculture, especially in the face of climate change. By unraveling the complex interactions among genes, pathogens and climate, researchers can develop targeted solutions to mitigate the devastating effects of plant diseases, safeguarding global food production.

The publication of this paper represents a significant milestone in the fight against Xylella fastidiosa and sets the stage for future advancements in crop protection and climate-adaptive agriculture. The collaboration between UCI and UC Davis scientists serves as a testament to the importance of interdisciplinary research in tackling pressing challenges.

More information: Abraham Morales-Cruz et al, Multigenic resistance to Xylella fastidiosa in wild grapes (Vitis sps.) and its implications within a changing climate, *Communications Biology* (2023). DOI: 10.1038/s42003-023-04938-4

Provided by University of California, Irvine