

Student research team sequences genome of bacterium discovered in Virginia Tech garden

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Maureen Farrell, a sophomore majoring in biological sciences in the College of Science at Virginia Tech, inoculates tomato plants with *P. syringae* bacteria in the Vinatzer laboratory. Credit: Virginia Tech Photo

Under the supervision of a Virginia Tech plant pathologist, a group of high school, undergraduate, and graduate students isolated and characterized a formerly unknown group of bacteria.

The bacteria strain belongs to the plant pathogen species *Pseudomonas*

syringae. One bacterium of this group, strain 642, was isolated at the Hahn Horticulture Garden and is the first bacterium isolated on the Virginia Tech campus to have its genome sequenced.

"I collaborate with John Kowalski's high school students at the Roanoke Valley Governor's School for Science and Technology, undergraduate students from Concord University in West Virginia, and graduate students at Virginia Tech to teach about the role of bacteria in the environment and, in particular, their importance to plants, using a hands-on approach," said Boris Vinatzer, assistant professor of plant pathology, physiology, and weed science in the College of Agriculture and Life Sciences.

Found on a wide variety of plants, many strains of *P. syringae* cause [plant diseases](#) such as bacterial blight, spot, speck, stripes, and canker. When springs are wet and cool, *P. syringae* can severely reduce crop yield and quality. However, *P. syringae* strain 642 does not cause disease on any tested plant species.

"Because the bacterium we isolated and sequenced is nonpathogenic itself but is very similar to pathogens, we can compare its genome to the genomes of the closely related pathogens and see what mechanisms bacteria use to cause disease and how bacteria evolve to become pathogens," Vinatzer said.

When Vinatzer genetically analyzed this unique group of *P. syringae* bacteria two years ago, he compared it with other bacteria that had been studied by researchers in the past. He was surprised when he found that the first genetically engineered bacterium ever released into the environment in 1987 belonged to this same group of bacteria. Nearly 30 years ago, Steve Lindow, a researcher at the University of California at Berkeley, had genetically engineered this bacterium to protect plants from frost by deleting a gene that makes a protein causing water to

freeze at relatively high temperatures.

"Also a bacterium isolated in upstate New York by Cornell University researchers belongs to the same group of bacteria and was found to control a fungus that causes a disease of apple," Vinatzer added.

Maureen Farrell, of Aldie, Va., a sophomore majoring in biological sciences in the College of Science, and Christopher Clarke, of Atlanta, Ga., a graduate student in the Department of [Plant Pathology](#), Physiology, and Weed Science, are now trying to determine whether the bacterium has the same effect on a pathogen causing a devastating disease of snap bean in Virginia. "This bacterium could potentially be used to protect crops from many different pathogens, but finding the best way to deploy it in the field is a challenge" said Vinatzer.

"We also found several genes in this bacterium that are similar to genes in a human pathogen, but fortunately know that this [bacterium](#) cannot cause disease in humans since it stops growing at 30 degrees Celsius," Vinatzer said.

Provided by Virginia Tech

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