

## Potato blight: From Irish famine to Salinas Valley

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Research at the Salinas USDA office has helped follow the origins of the disease that caused the Great Famine in Ireland, all the way back to its roots – in Mexico.

Though the Irish strain has since died out, the disease still persists in the Salinas Valley – in tomato crops.

“It’s still a problem today,” said Frank Martin, a Salinas native and plant pathologist at the USDA. “It hasn’t gone away.”

Potato late blight and tomato blight are caused by the same organism: a fungus-like, single-celled microbe called *Phytophthora infestans*. The organism thrives in wet environments and produces long-lived spores that travel in the wind. It causes potatoes to turn black, wilts leaves and infects the stems.

Europe remained free from potato blight for three centuries after the Spanish introduced potatoes in the 1400s. Then, in 1845, the organism showed up suddenly in Belgium. It spread rapidly through mainland Europe and then to the United Kingdom and Ireland. The resulting Great Famine was especially devastating in Ireland because its population was so dependent on potatoes. One million people died and another million emigrated.

To find out where this devastating strain of potato blight came from, Martin worked with researchers at the Sainsbury Laboratory in the United Kingdom and the Max Planck Institute for Developmental Biology in Tübingen, Germany.

The research group compared entire DNA sequences from 11 historical strains and 15 modern strains of *Phytophthora infestans*. By looking at similarities and differences in their DNA sequences, they created a family tree of different blight strains. The historical strains came from European herbariums that collected and preserved infected potato and tomato leaves from 1845 to 1896. These strains are like fossils in that they represent older forms of the organism.

The roots of the blight family tree start in Toluca Valley, Mexico, where scientists believe the disease originated. It travelled through the US in the 1800s and then jumped across the Atlantic Ocean to Europe in 1845, where it caused tremendous devastation.

The researchers determined that the organism that caused the Great Famine was a truly pandemic strain that spread throughout Europe and then went extinct after potato breeding programs developed a tuber resistant to the bug.

Though the origin of modern strains is still unclear, researchers believe that they also came from the US and then spread to Africa, Asia and South America.

Once an outbreak begins, it is difficult to contain. The organism can create spores that will last for years, waiting for the perfect damp environment where they will germinate and spread.

“About the only thing you can do,” Martin said, “is plant resistant varieties and spray.”

Unfortunately, many strains are resistant to the fungicides that farmers traditionally use to prevent the outbreaks.

“With the new resistance to pesticides, it makes it harder for growers to fight it,” Martin said.

Globally, farmers lose over \$6 billion per year on damaged crops and the costs of spraying fungicides.

In a more modern application, Martin is working on developing tests that will rapidly detect *Phytophthora infestans* as well as other related organisms that cause plant diseases worldwide. About 120 different species of *Phytophthora* exist. Some of these diseases already exist in the U.S., such as the organism that caused Sudden Oak Death. Others are common in foreign countries, but Martin says that we need to be vigilant to prevent these diseases from taking hold in the U.S.

In Salinas Valley, tomato growers feel the effects of *Phytophthora infestans* outbreaks most keenly. The same organism that turns potatoes to mush also causes tomato plants to wither, and fruits to turn black.

Wayne Gularte, a tomato farmer for Rincon Farms in Gonzales, said that he lost about half of his crop this year to tomato blight. The disease also affected tomato growers in the San Joaquin Valley, he said.

A little rain or some heavy fog can create the perfect damp environment to set off an outbreak. Gularte says there are preventative sprays that protect the fruit before it rains. Once the blight sets in, there is nothing the farmer can do to save his tomato crop.

“You don’t even want to pick those,” he said. “They start turning to garbage when you ship them.”

Tomato harvesting wrapped up this year in October, but next year Gularte said he plans to spray more aggressively to prevent a new outbreak.