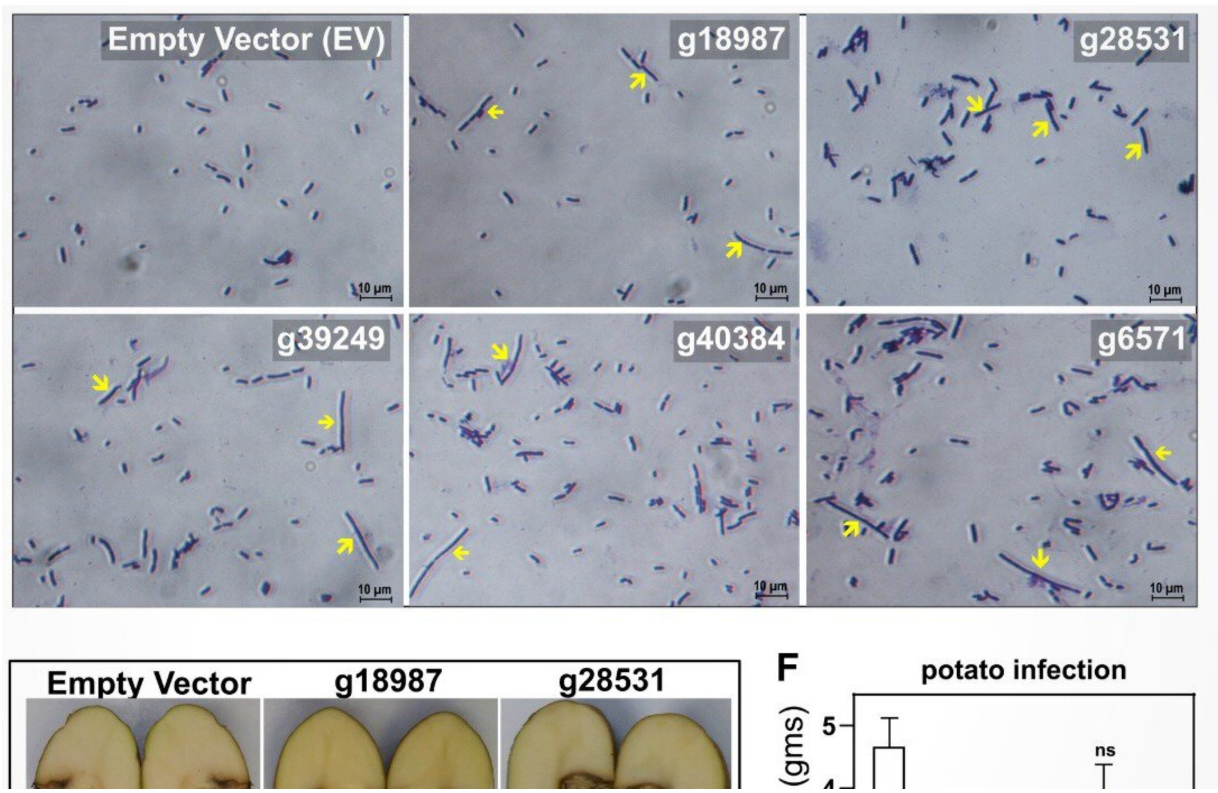
# Newly identified protease inhibitors may aid uninhibited potato cultivation

December 16 2022




A portion of figure 4 from the authors' study, depicting protease and motility inhibition and cell morphology effects of M6 potato protein on Pectobacterium brasiliense Pb1692 (top), plus two of the study's authors: first author Dr. Janak R. Joshi (bottom left) and corresponding author Dr. Adam L. Heuberger (bottom right). Credit: Janak R. Joshi, Kitty Brown, Amy O. Charkowski, and Adam L. Heuberger

As humans domesticated plants, they saved certain seeds to plant in the next growing season based on desirable traits. Susceptibility to diseases popped up on this path to domestication, but wild varieties of plants could fight off these pathogens. Today, most cultivated potato varieties are susceptible to soft rot and black leg disease—caused by *Pectobacterium* species—but struggle to combat the pathogens like their wild ancestor. Specific resistance genes are currently unknown, posing *Pectobacterium* as a major threat to global potato production and food security.

To help subdue this threat, Janak Joshi and colleagues from Colorado State University recently conducted a study, published in *Molecular Plant-Microbe Interactions* (*MPMI)*, investigating how wild potato from South America (*Solanum chacoense* M6) can tolerate these *Pectobacterium*-caused diseases.

They had revealed in a previous study that wild potato produces molecules called metabolites, which reduce disease virulence by interrupting the bacteria's communication system and stopping their ability to degrade plant cell walls. In the authors' latest research, they compared the protein profiles of wild and domestic potato, discovering a second set of molecules—called protease inhibitors—that also prevents bacterial malignance.

This exciting discovery led the researchers to clone DNA for several protease inhibitor genes and purify the proteins they encode. While testing the proteins' effects on bacteria, Joshi and colleagues found that these proteins cause the bacteria to change shape and oddly clump together, inhibit their ability to degrade plant cells, and even hinder their motility.

With their research, the authors aim to breed a next generation of potato varieties that resists pathogens durably and independently, reducing rot waste and chemical sprays. Corresponding author Adam Heuberger comments, "Our finding is the *second* resistance mechanism we observe in this plant species, *S. chacoense*. This supports the idea that wild plant species have evolved with multiple resistance factors, or their own "pyramid" of traits, that can be translated into our food and ornamental plant industries."

A set of defense traits is considered durable because it worsens the bacteria's ability to overcome this resistance. "They may evolve to dodge one molecule, only to be hit in the head by another," Heuberger remarks.

The protease inhibitors identified in this study can benefit potato breeding programs in the long-run and can potentially have a much more immediate effect as purified proteins used to protect plants in the field—hopefully smacking *Pectobacterium* in the head for years to come.

**More information:** Janak R. Joshi et al, Protease Inhibitors from Solanum chacoense Inhibit Pectobacterium Virulence by Reducing Bacterial Protease Activity and Motility, *Molecular Plant-Microbe Interactions* (2022). DOI: 10.1094/MPMI-04-22-0072-R

Provided by American Phytopathological Society

Citation: Newly identified protease inhibitors may aid uninhibited potato cultivation (2022, December 16) retrieved 23 June 2024 from https://phys.org/news/2022-12-newly-protease-inhibitors-aid-uninhibited.html

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