Increasing Field Vegetable Yield and Resilience to Abiotic and Biotic Stresses Through Soil Microbial Engineering

LEAD RESEARCHER

Herve Van Der Heyden
Research scientist with Agriculture and Agri-Food Canada
Saint-Jean-sur-Richelieu Research and Development Centre

This research activity is working to develop, validate and implement bacterial inoculum to improve field vegetable yield and plant diseases while reducing fertilizer and pesticide inputs. This year, the researchers tested 45 candidate bacterial strains against four phytopathogenic *Pythium* species and *Sclerotinia sclerotiorum*. Several strains have shown sustained inhibitory effects on these pathogens for up to three weeks.

Thirty-three of these strains, all part of *Pseudomonas fluorescens* or *P. putida*, have shown restricted effects against the same five plant pathogens in vitro. Eighteen of these *Pseudomonas* strains proved effective against *Pythium* species, while 10 strains showed a restricted effect on *S. sclerotiorum*. Overall, two strains were highly effective in vitro at controlling *P. ultimum*, *P. irregulare* and *P. sylvaticum* (strains 249 and 829), while strains 901, 113, and 1126 showed good in vitro control of *P. tracheiphilum*. Strains 942 and 611 offered some control of *S. sclerotiorum.*

As the research activity moves into the final years, researchers are focusing on biocontrol approaches. The team is using proprietary bacterial strains, isolated from Canadian vegetable farms, that have been shown to promote plant growth, control pathogens and improve drought tolerance. Researchers are doing laboratory and greenhouse experiments along with small-scale field trials.

This year, the research team is extending their screening to include additional plant pathogens and starting greenhouse trials. The team will assess the persistence and durability of the resistance effects revealed by the bacterial strains. They plan to continue evaluating these strains against a wider range of plant diseases and document the impacts of plant growth-promoting rhizobacteria (PGPRs) on multiple crop species. The team wants to determine the effects of PGPRs at various crop growth stages to provide a better understanding of their practical applications, maximizing their agricultural benefits.

KEY TAKEAWAYS:

- Thirty-three strains, all part of *Pseudomonas fluorescens* or *P. putida*, have shown restricted effects against the same five plant pathogens in vitro. Eighteen of these *Pseudomonas* strains proved effective against *Pythium* species, while 10 strains showed a restricted effect on *S. sclerotiorum*.
- Researchers are using proprietary bacterial strains, isolated from Canadian vegetable farms, that have been shown to promote plant growth, control pathogens and improve drought tolerance. They are being tested against various diseases and on multiple crop species.