Plant growth-promoting bacteria in lettuce for resilience against enteropathogens

[1]Marissa Lee Sang, [2]Diksha Klair, [2,3]Shirley A. Micallef

[1]Integrated Life Sciences Honors College, College Park, MD, [2]Department of Plant Science and Landscape Architecture, College Park, MD, [3]Centre for Food Safety and Security Systems, College Park, MD

INTRODUCTION

- Plant growth-promoting bacteria (PGPB) may improve plant growth by providing resilience to biotic and abiotic stress through various mechanisms.
- PGPB may have potential to promote food safety of vegetables, but the effects of PGPB on enteropathogens on plants are still unknown.

OBJECTIVE

Evaluate PGPB for 1) direct antagonistic effects against an environmental strain of *Salmonella* Typhimurium and a foodborne illness outbreak strain of *Escherichia coli* O157:H7 *in vitro*, and 2) the ability to confer enhanced resilience to enteric pathogens in lettuce.

METHODOLOGY

Antagonistic Assay

- *In vitro* antagonistic assays were screened for observance of possible antimicrobial compounds secreted against *Salmonella* Typhimurium and *E. coli* O157:H7 (Figure 1).

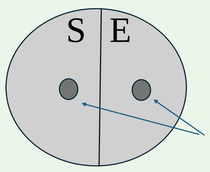

Figure 1: 7 log CFU/ml of PGPB suspension was dropped onto lawns of *Salmonella* Typhimurium and *E. coli* O157:H7 on TSA plates to observe inhibition.

Salmonella Retrieval

- Lettuce seeds, 'Rouge d'Hiver' were inoculated with single strain suspensions of 7 log CFU/plant, 3- and 6- days post-germination (Figure 2).

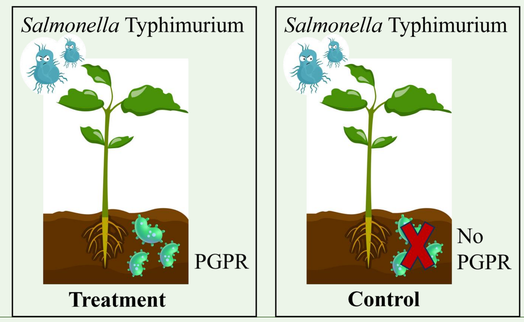

Figure 2: Leaf populations of *Salmonella* Typhimurium were enumerated by direct plate counting on Tryptic Soy Agar 24 h after leaf inoculation with 5 log CFU/leaf.

RESULTS

Antagonistic Assay

- On the TSA media plates, no antimicrobial effect was observed for any of the screened isolates against *Salmonella* Typhimurium and *E. coli* O157:H7 .

Salmonella Retrieval

- In total, 9 out of 12 leaf endophytes root colonization, reduced the *Salmonella* retrieval 24 h post inoculation in comparison to the control.
- In addition, root colonization of 5 rhizoplane and 2 root endophytes from Bok choy reduced *Salmonella* retrieval on 'Rouge d'Hiver' in comparison to the control.
- Root colonization with BC17, identified as *Pseudomonas fluorescens*, has significantly restricted *Salmonella* population inoculated on leaves of 'Rouge D'Hiver' (p=0.0011), compared to controls.

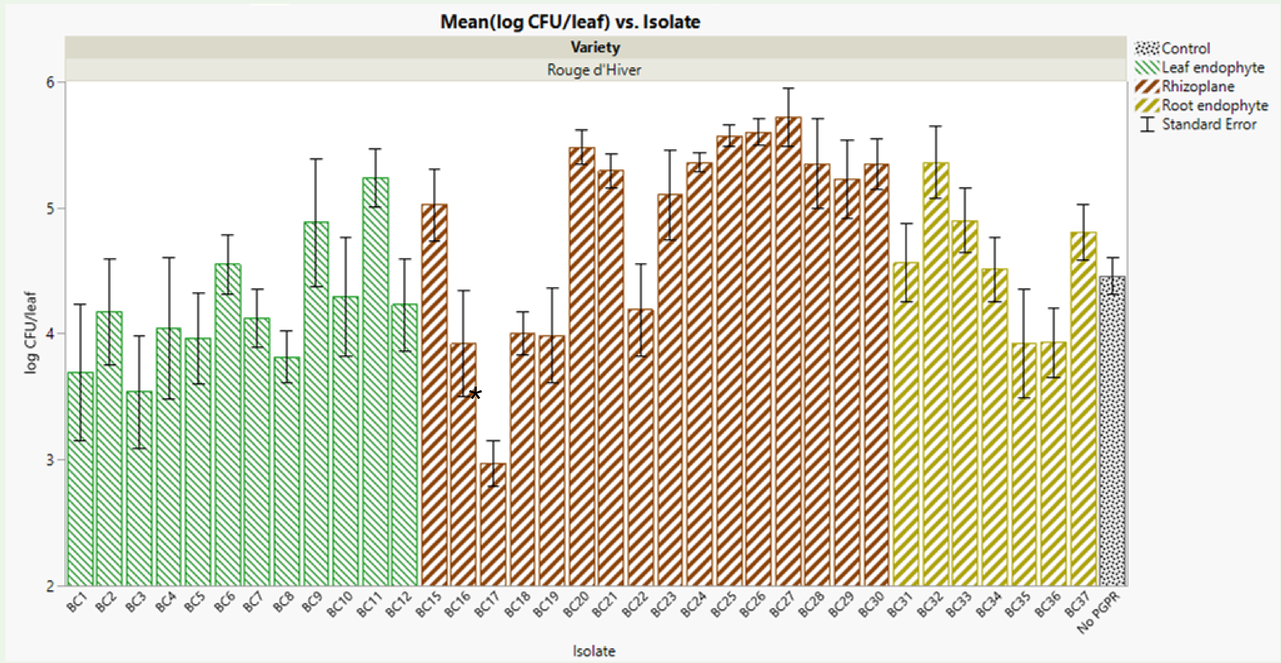

Figure 3: *Salmonella* Typhimurium retrieval (log CFU/leaf), 24 h post inoculation from leaves of 'Rouge d'Hiver' romaine lettuce plants. Special character (*) denotes significant differences by Dunnett's method (p<0.05) within lettuce variety.

CONCLUSION

Our research highlights the prospect of leveraging microbial interactions to achieve sustainable and safe crop production during environmental challenges.

ACKNOWLEDGEMENTS

Research is supported by CFS3, University of Maryland Graduate Assistant Fellowship to DK.