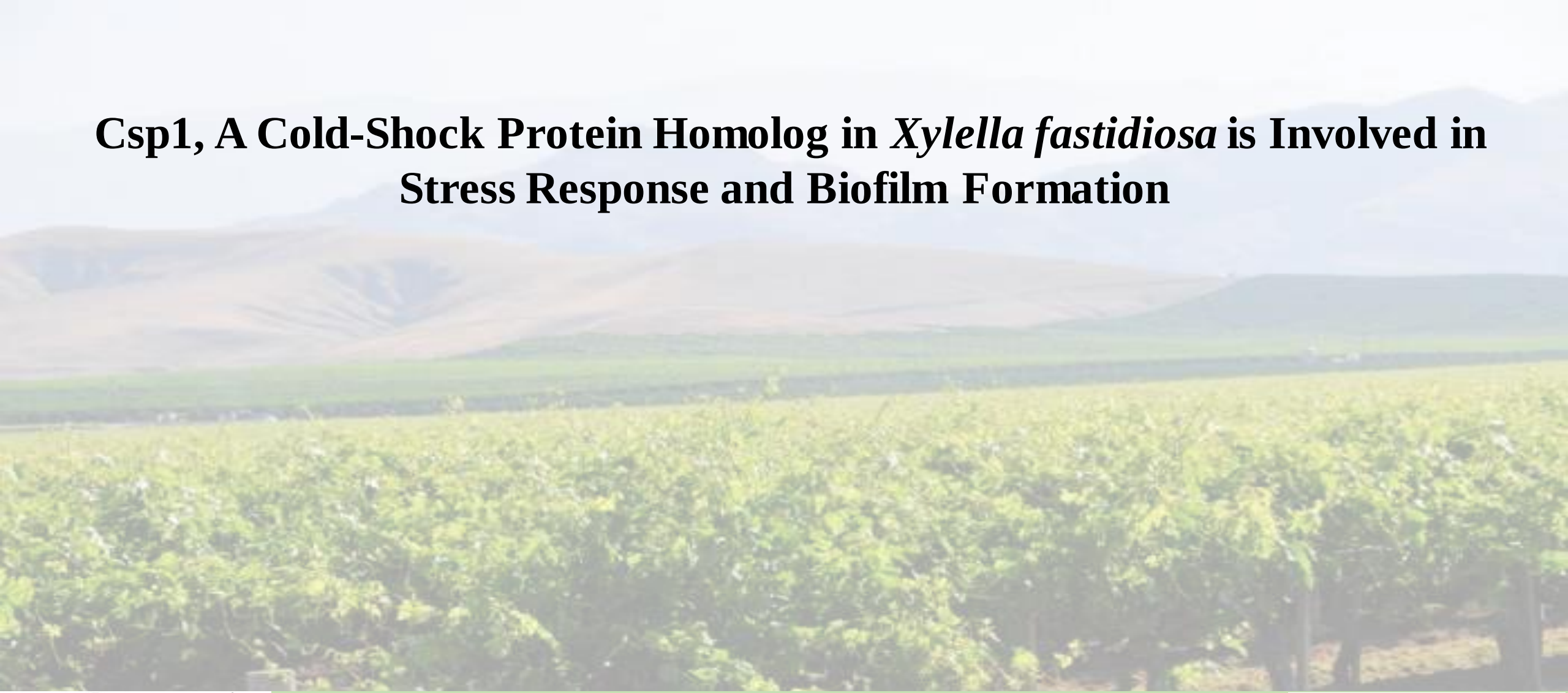
Csp1, A Cold-Shock Protein Homolog in *Xylella fastidiosa* is Involved in Stress Response and Biofilm Formation



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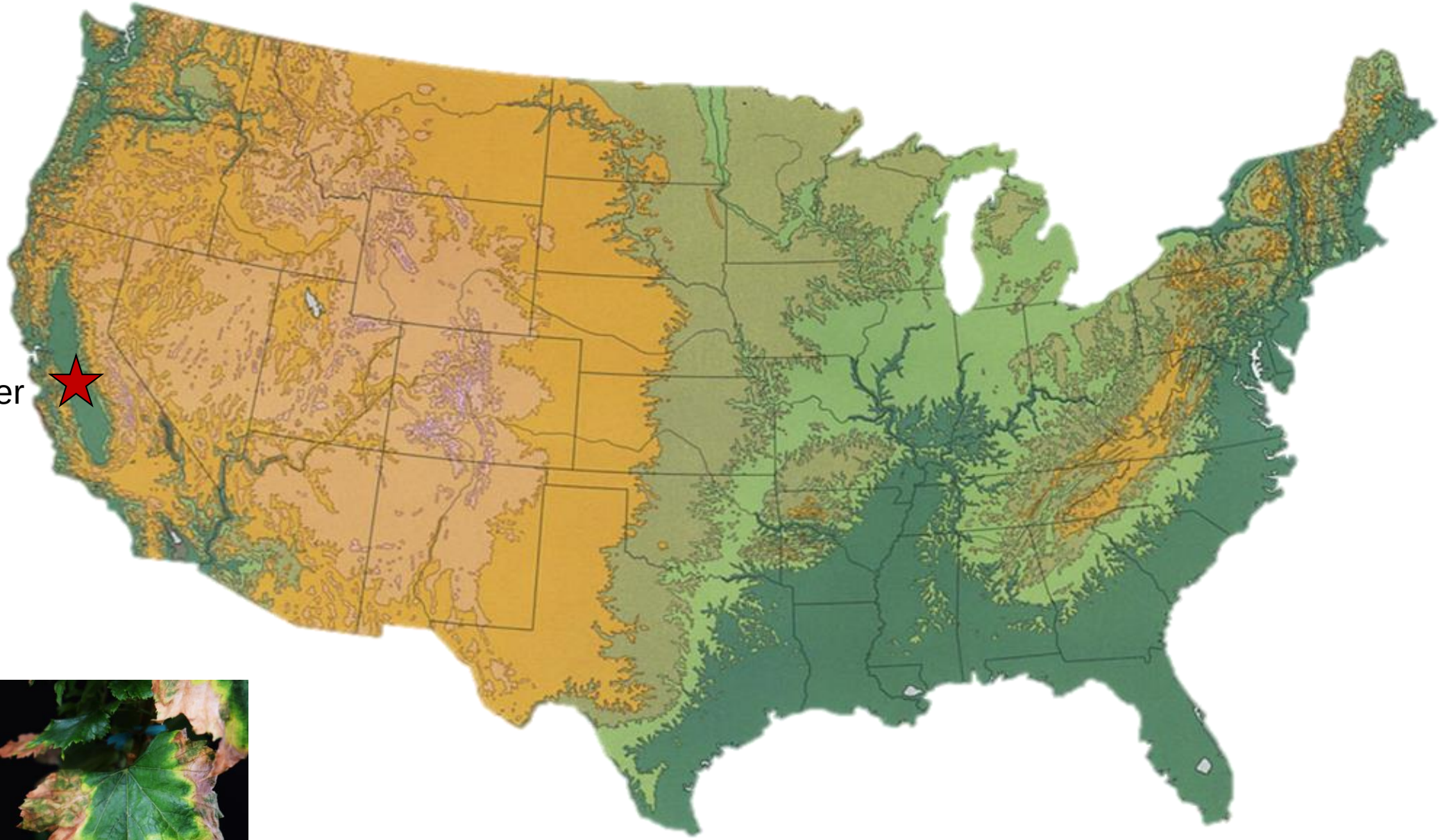
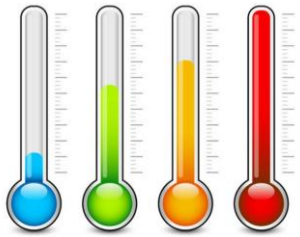
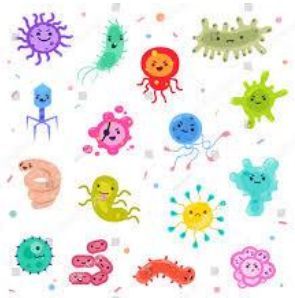
3rd European conference on Xylella fastidiosa 2021


Parlier

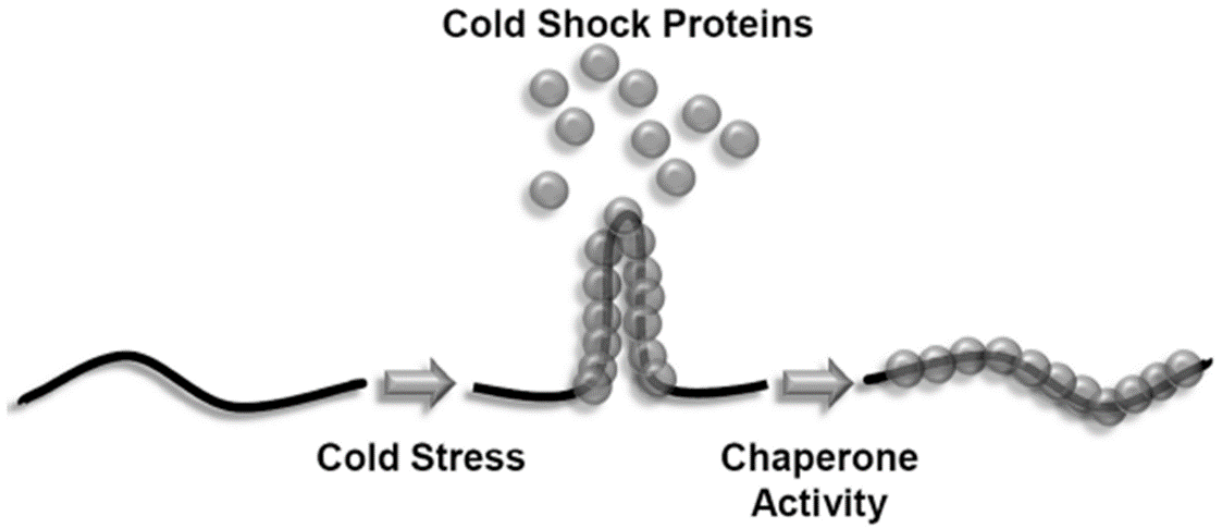
Bacteria encounter many environmental/host stressors





Bacteria cold shock-domain proteins (CSPs) are nucleic acid binding proteins that help bacteria adapt to stress

- Destabilizes secondary structures in target mRNA during cell stress
- Gene Expression: Transcriptional activator, transcriptional anti-terminator

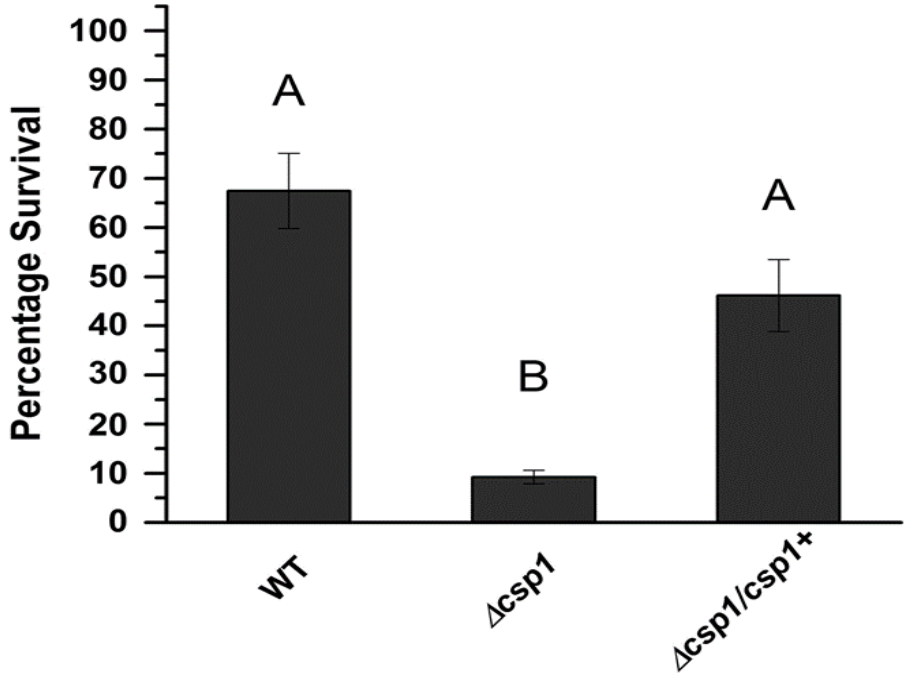


BACKGROUND

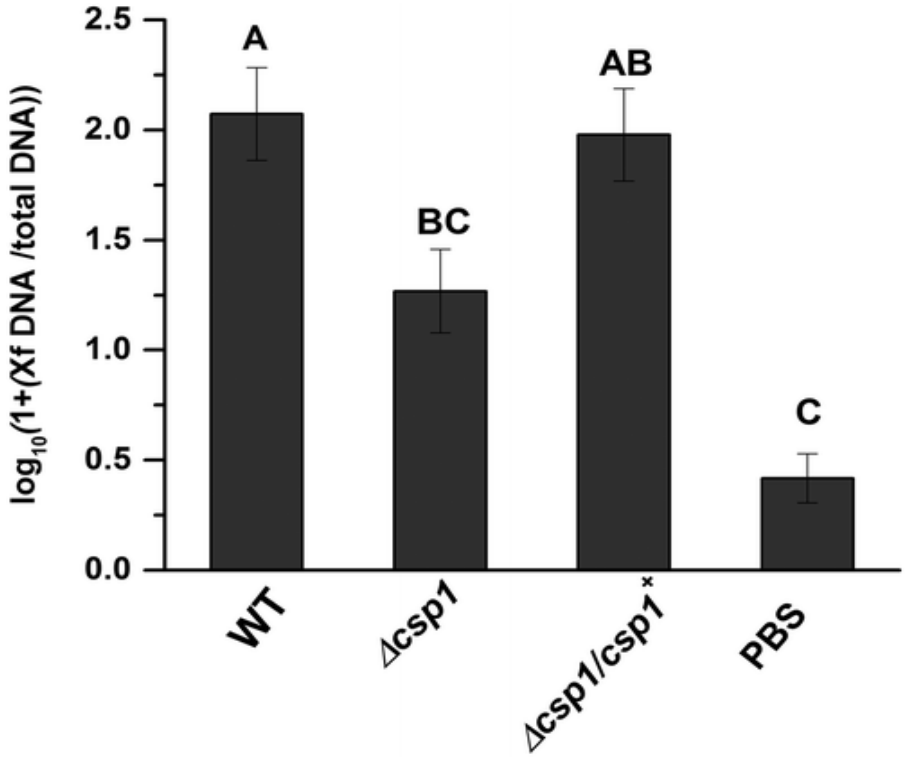
- Bacterial plant pathogen *Xylella fastidiosa* (*Xf*) has two **temperature-independent** CSP homologs, Csp1 & Csp2.

- Deleting *csp1* (Δ*csp1*) in *Xf* strain Stag's Leap reduced osmotic stress tolerance *in vitro* and bacteria titer in grapevines [1].

Osmotic Stress



Bacteria titer



1. Burbank, L. P., and Stenger, D. C. 2016. A Temperature-Independent Cold-Shock Protein Homolog Acts as a Virulence Factor in *Xylella fastidiosa*. Mol. Plant-Microbe Interactions®. 29:335–344

HYPOTHESIS:

- Aside from general single-stranded nucleic acid binding activity, not much is known about the function(s) of Csp1.

- Studies in *E. coli* and other bacteria have shown Csps can alter gene expression via non-specific nucleic acid binding or binding gene promoter sequences[2].

- ***Xf* Csp1 may contribute to stress response & survival by influencing gene expression.**

OBJECTIVES:

1) Further characterize phenotypic differences between WT *Xf* Stag's Leap and Δ*csp1*

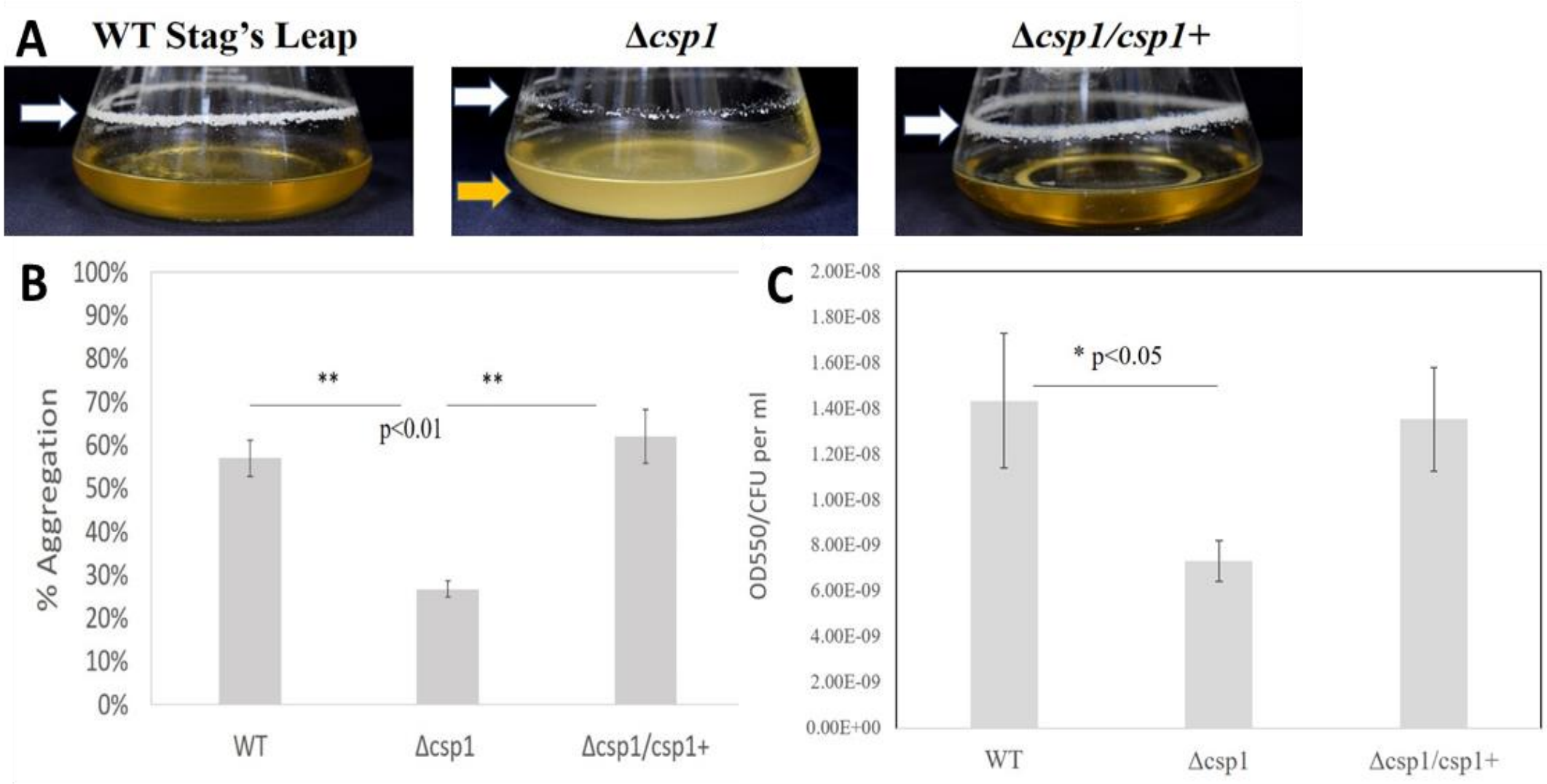
2) Compare transcriptomes of WT and Δ*csp1* under standard growth conditions (28C)

3) Identify differentially expressed genes of interest and create *Xf* deletion mutants and complements

2. Phadtare et al. Journal of Bacteriology Mar 2006, 188 (7) 2521-2527

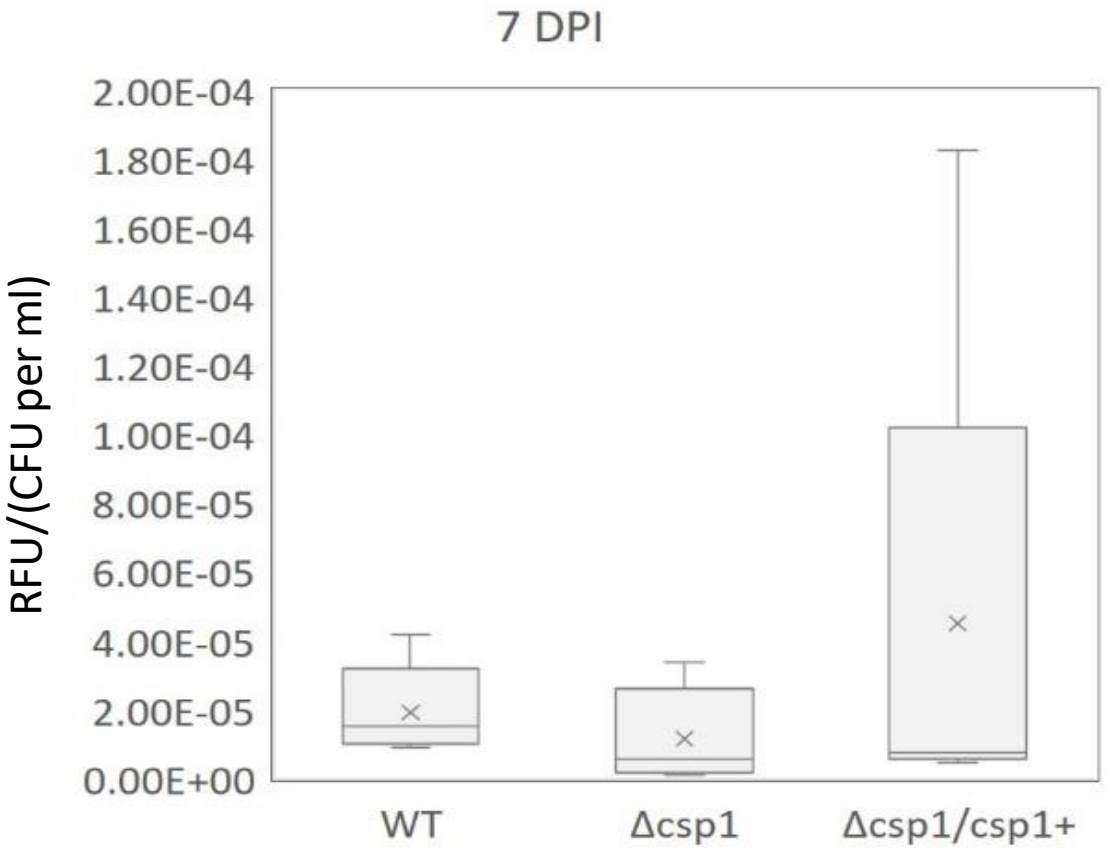
RESULTS

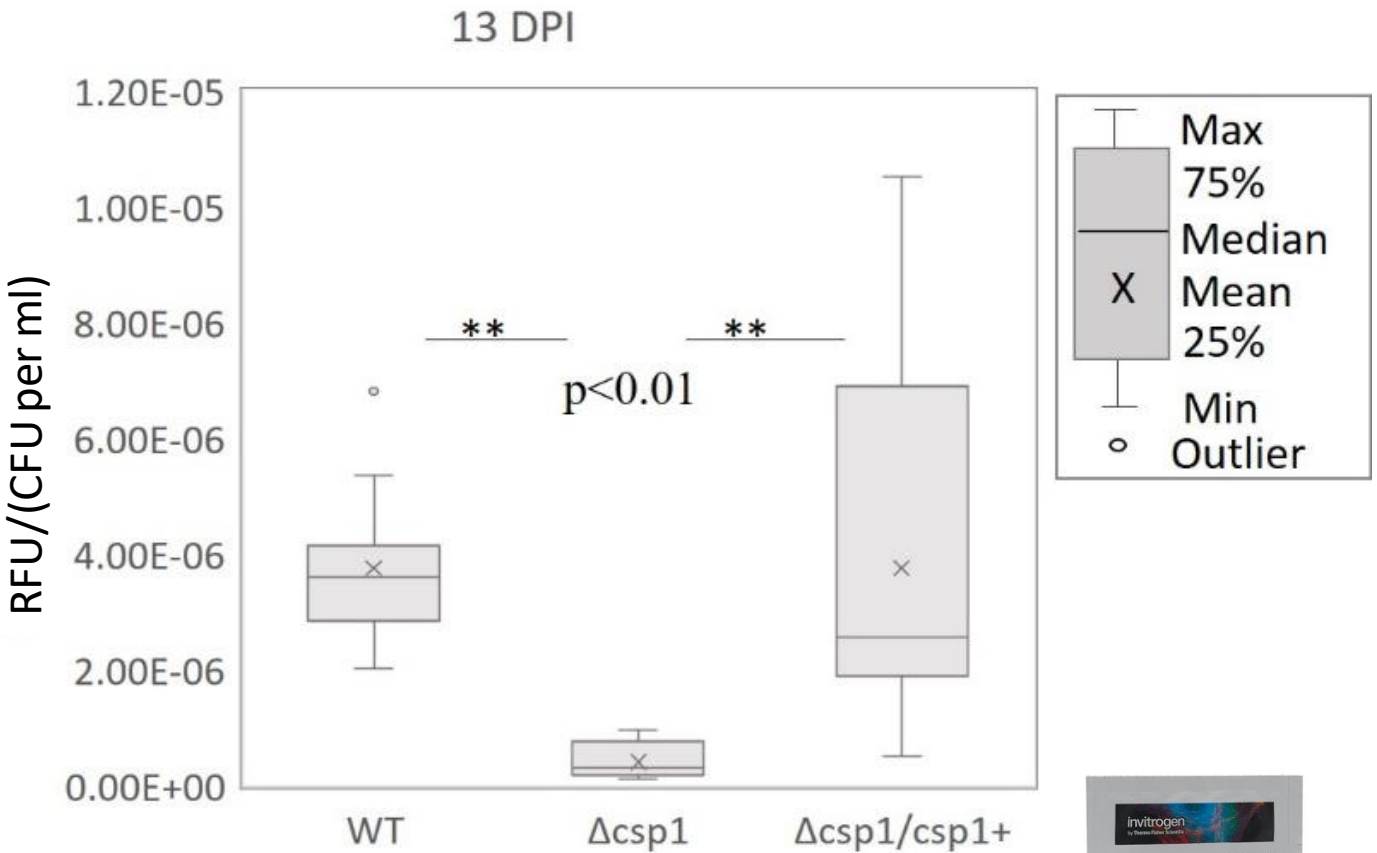
1. *Xf Δcsp1* showed reduced cellular aggregation and attachment



RESULTS

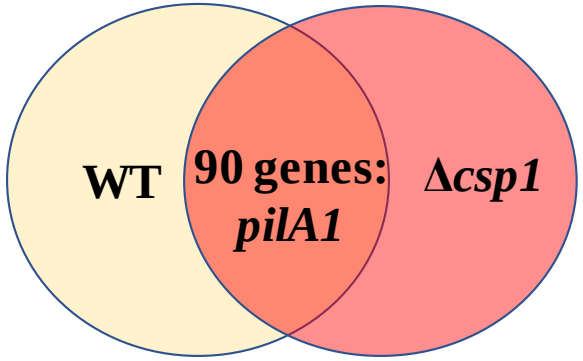
2. *Xf Δcsp1* showed reduced long-term survival *in vitro*





RESULTS

3) Several motility and attachment-related genes were differentially expressed in *Xf* Δ*csp1* at 28C

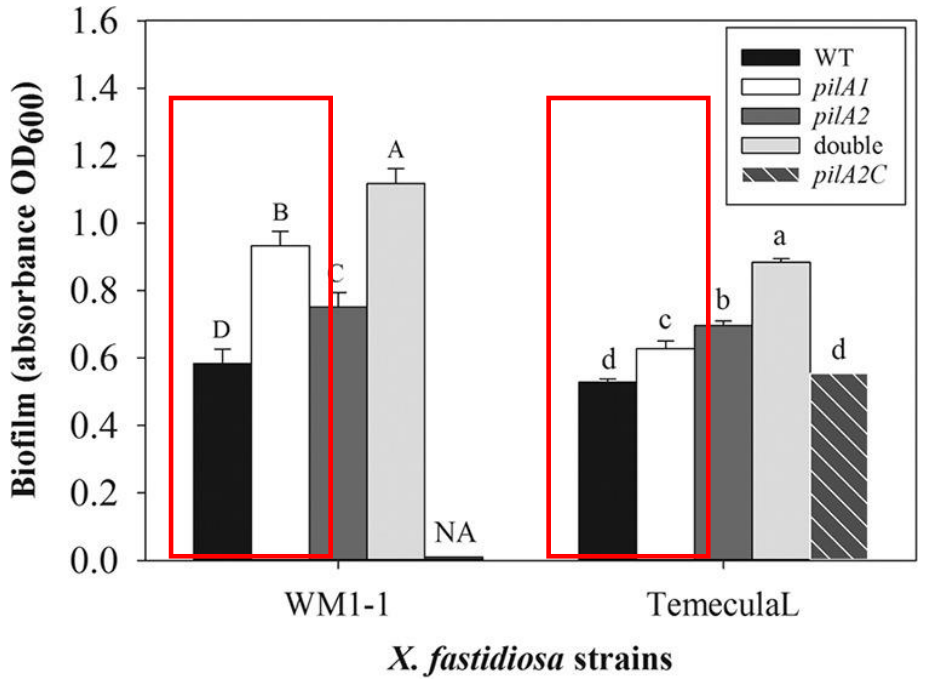


Transcripts per million

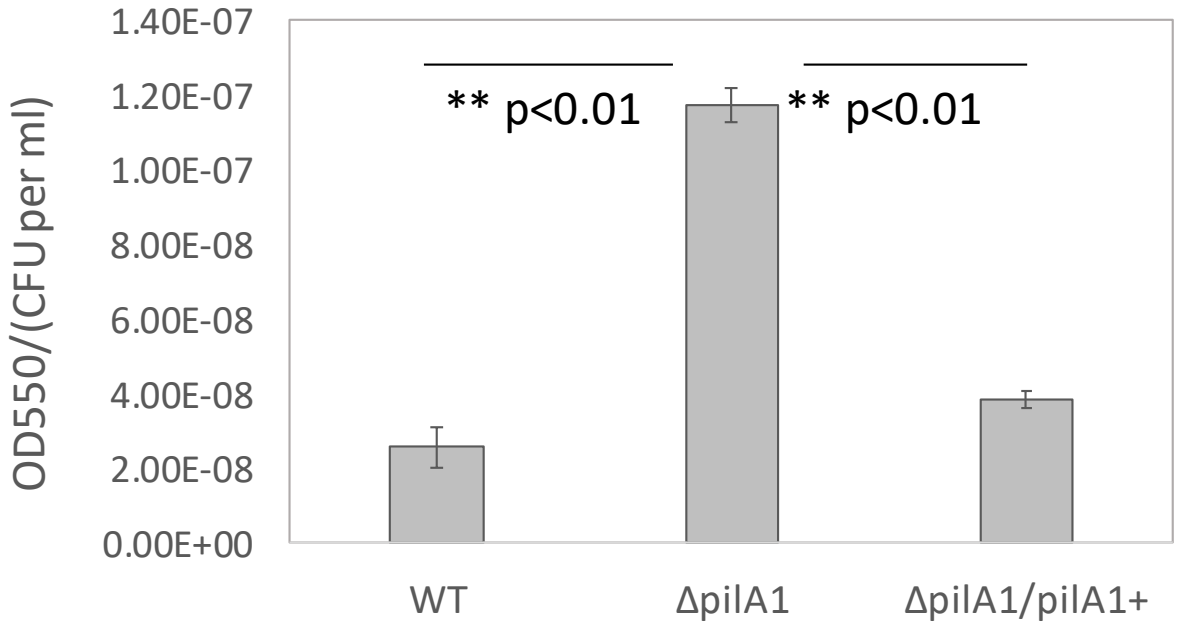
	WT	Δcsp1
pilA1 (PD1924)	202.45	892.96

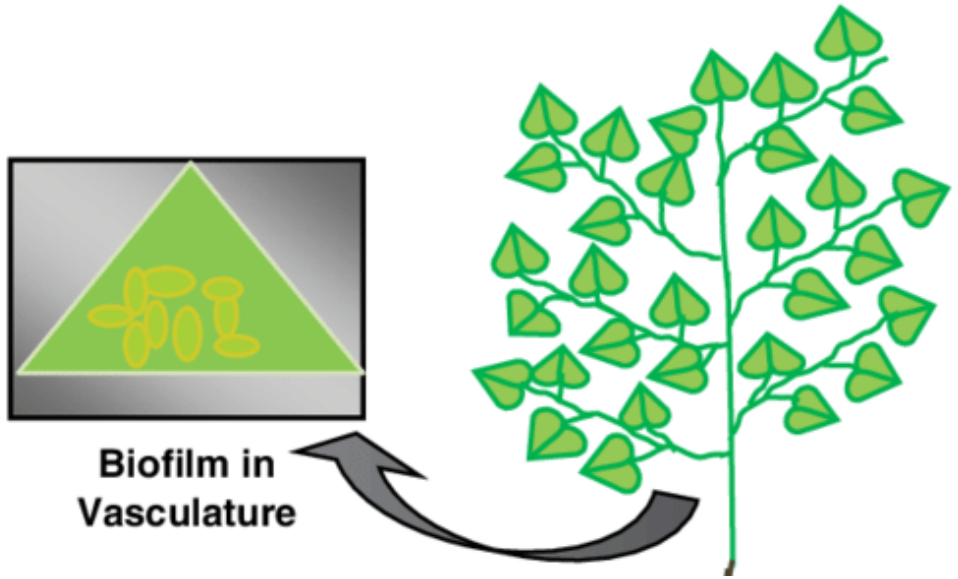
- PilA1: type IV pilin

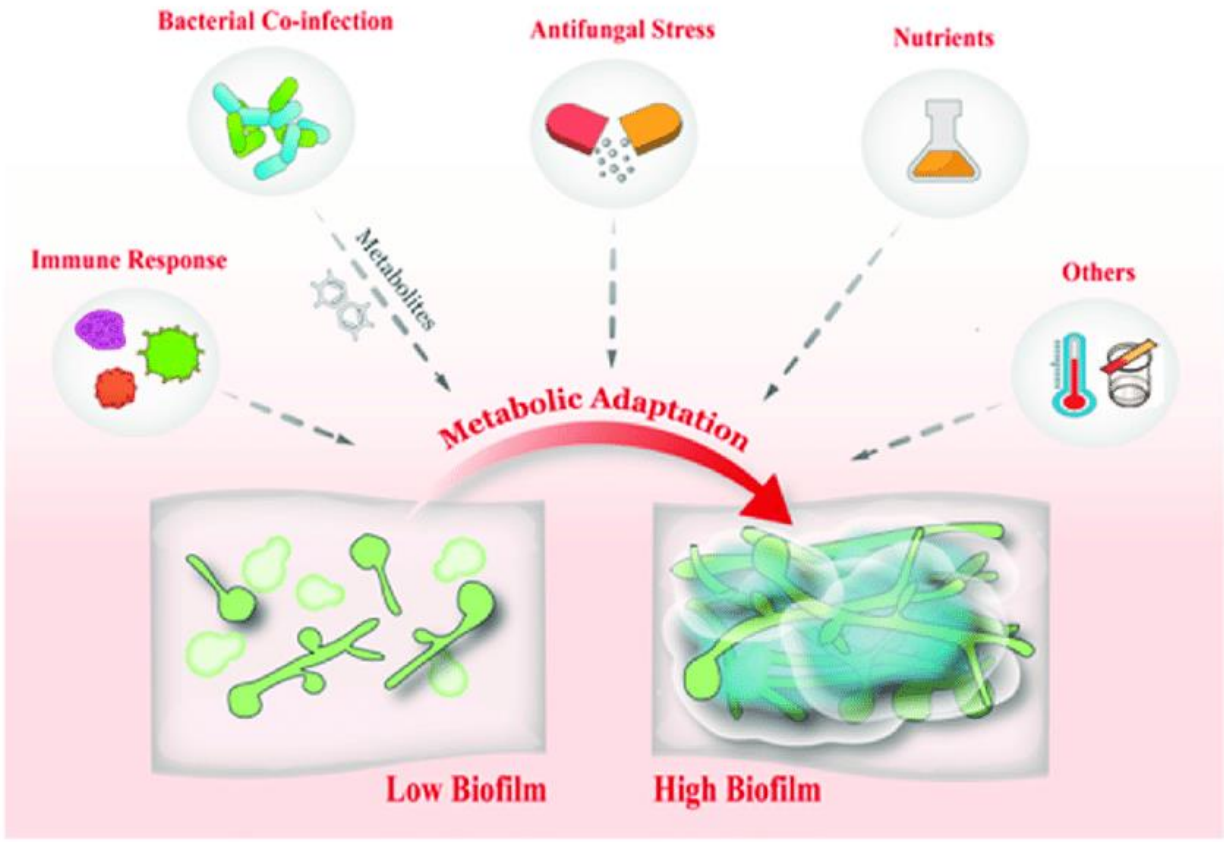
Kandel et al. *Applied and environmental microbiology*, *84*(18), e01167-18.



4) Stag's Leap *ΔpilA1* had increased biofilm formation







- Biofilms are essential to *Xf* vector and plant colonization.
- Bacteria in biofilms are more resistant to stressors.
- Csp1 may contribute to stress tolerance and colonization/survival by influencing expression of genes important for biofilm formation.

Thank You

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3rd European conference on Xylella fastidiosa 2021

XF ACTORS

Xylella Fastidiosa Active Containment Through a multidisciplinary-Oriented Research Strategy

Poster link:
https://zenodo.org/record/4678828#.YIdUSvZFw2w