Continuing Project

Improving Tree Seedling Survival with Defense-enhancing Endophytes

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Justification

- Endophytes are bacterial or fungal microsymbionts within plant tissues
- Competitive exclusion and antagonism occur among seed endophytes
- *Bacillus* and *Streptomyces* are known to produce strong antimicrobial compounds

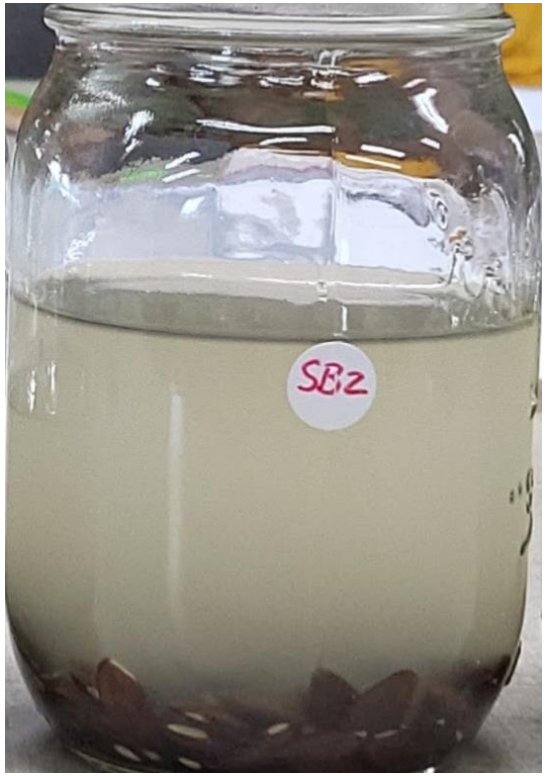
Image Maria Marlin

Hypotheses or Objectives

Objective:

- To enhance survival of susceptible seedlings against virulent strains of devastating pathogens:
  1. *Acacia koa* against *Fusarium oxysporum f. sp. koae*.
  2. *Pinus monticola* against *Cronartium ribicola*.
  3. *Chamaecyparis lawsoniana* against *Phytophthora lateralis*.

Methods



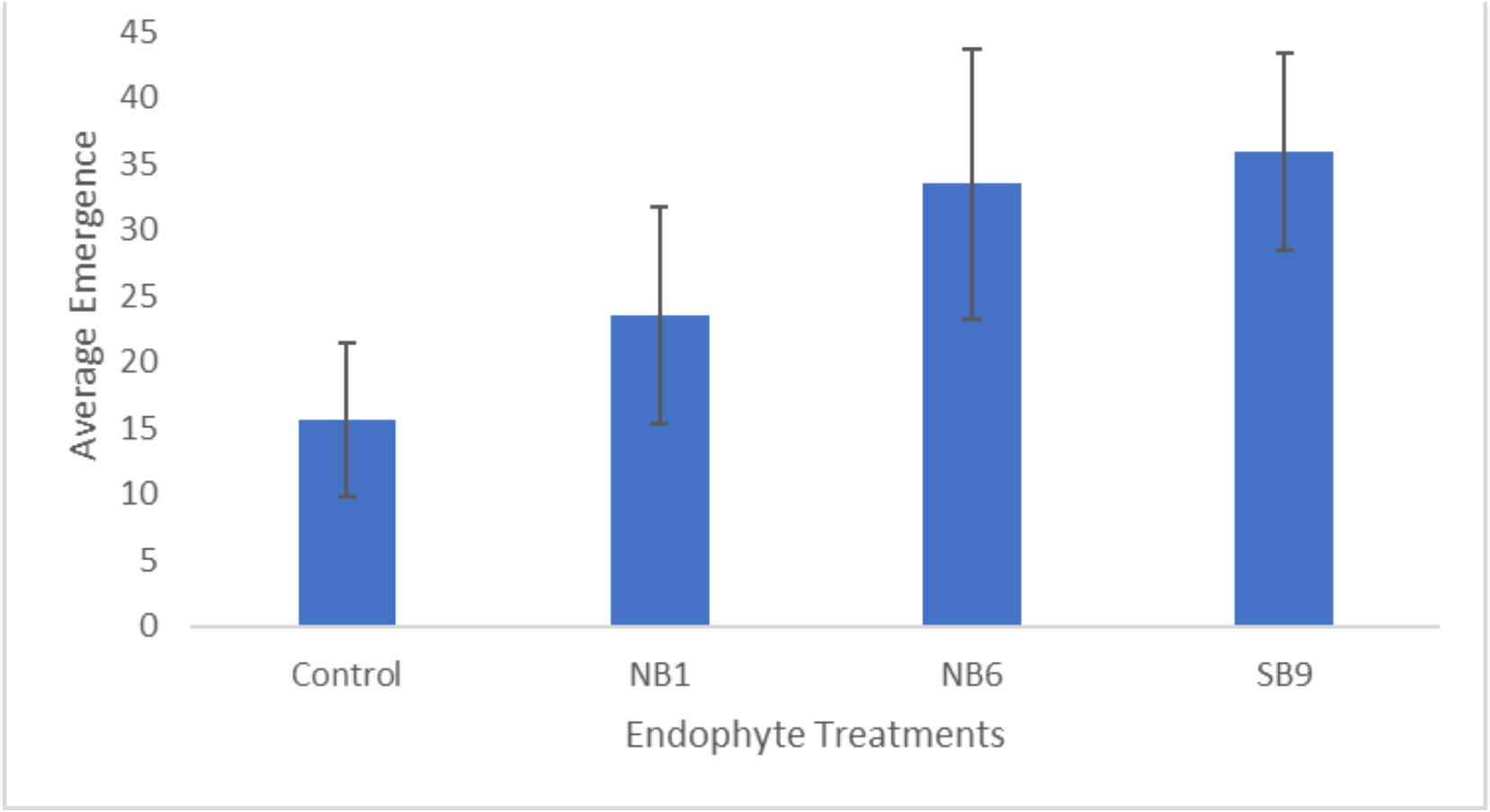
Methods

Image by Richard Sniezko

Image by Michael Kaufmann

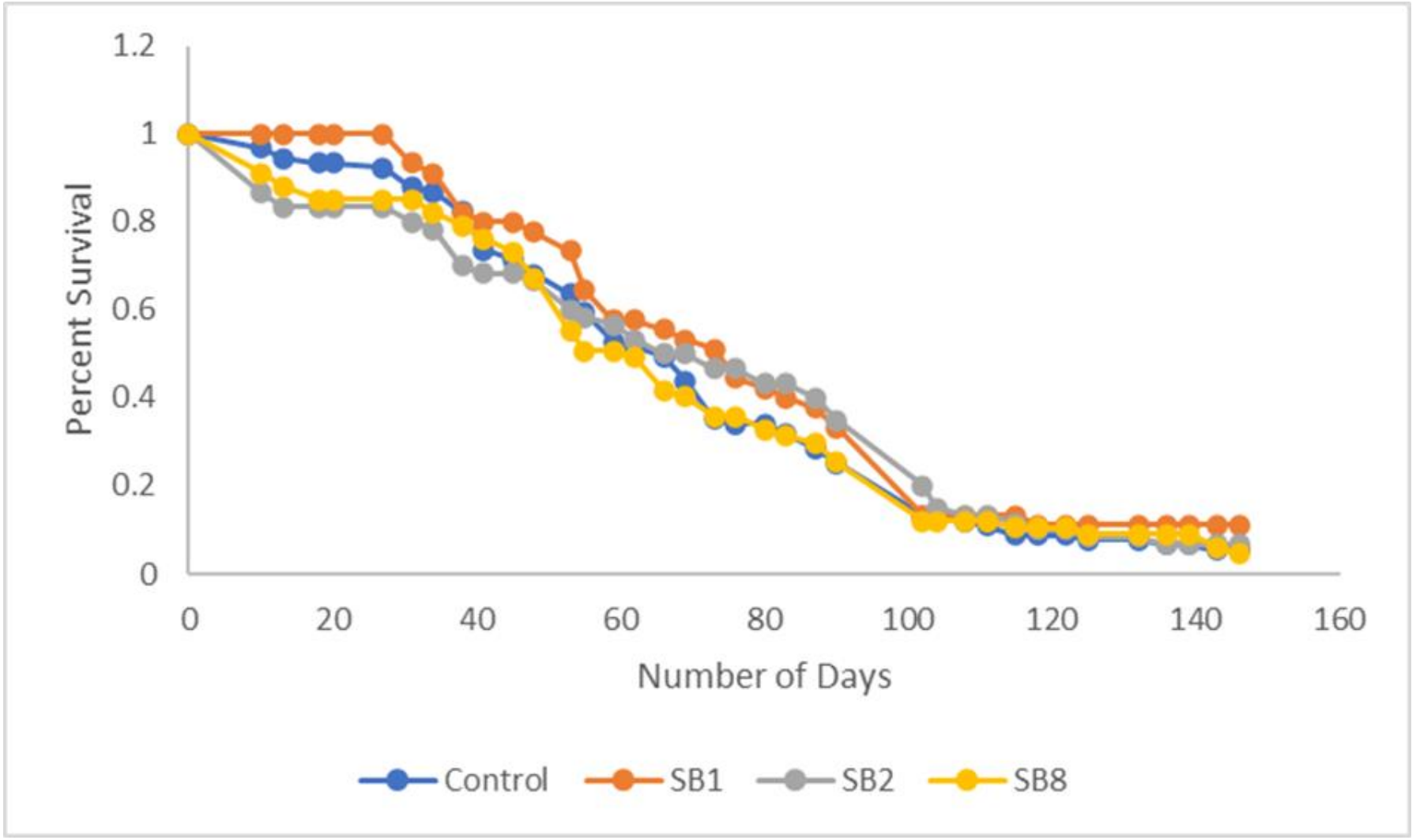
Major Findings

POC seedling emergence:
One-way Anova -
p-value 1.65e-12; F-value 2.72



Koa survival curve:

Major Findings



Deliverables

- POC seed and foliar bacteria had a positive effect on seedling emergence.
- One koa seed bacterium prevented mortality for the initial 30-day period, no long-term significance.
- WWP inoculated with blister rust end of September, data will begin in the next two months.
- POC growth comparison data end of November, root rot trial begins end of January.

Company Benefits

Image 4

Image 3

Image 1


Image 8

Image 2

Image 5

Image 6

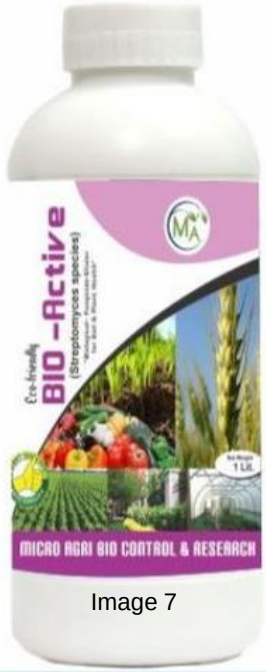


Image 7

Recommendations

- POC seed coming out of stratification in 30 days to repeat enhanced emergence assay.
- Permit in process to receive cultures of the koa wilt pathogen to conduct a repeat trial of seed bacteria #1 in addition to testing other bacterial and fungal isolates.
- Isolated *Bacillus thuringienses* (B.t.) to test on defoliator caterpillar, adlegids, aphids, weevils, and several other pest next year.
- Adding an additional system with black cottonwood (*Populus trichocarpa*) seed and foliar endophytes against leaf rust (*Melampsora* sp.).

Summary

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Image by Abigail Ferson