Isolation & Identification of Bacteria from the Rhizosphere of native plant, *Ceanothus velutinus*, and their potential as biofertilizers

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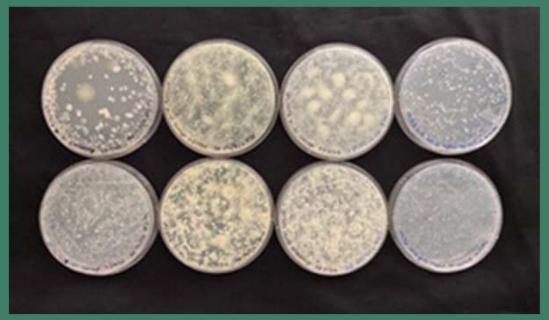
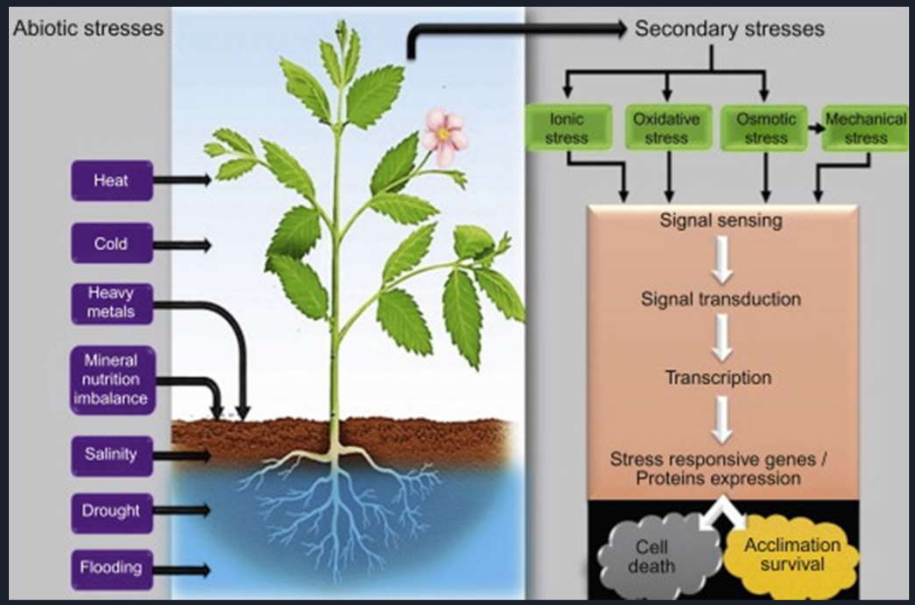
PLANTS, SOILS & CLIMATE



Background


Abiotic stresses
Heat
Cold
Heavy metals
Mineral nutrition imbalance
Salinity
Drought
Flooding
Secondary stresses
Ionic stress
Oxidative stress
Osmotic stress
Mechanical stress
Signal sensing
Signal transduction
Transcription
Stress responsive genes / Proteins expression
Cell death
Acclimation survival

Background

- Rhizosphere
- Plant Growth Promoting Rhizobacteria (PGPR)

Ceanothus velutinus **(Snow Brush)**

- Native to Utah
- Resiliency to dry, cold, harsh conditions

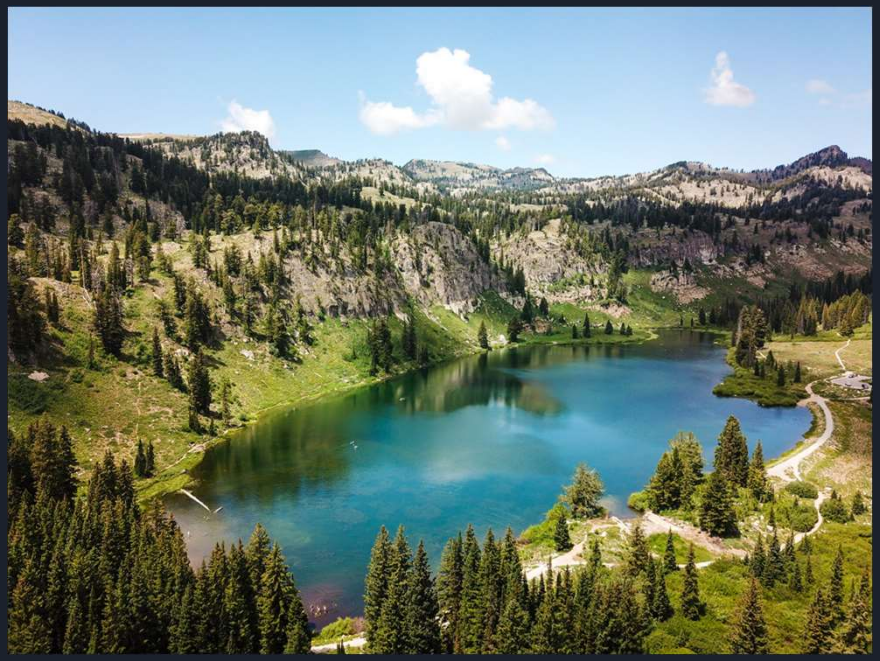
Objectives

- Isolation of bacteria from the rhizosphere of *Ceanothus velutinus*
- Identification of isolated bacteria
- Determine role of identified bacteria in plant growth under stresses

Sample Collection

Sample Collection - Multiple Elevations

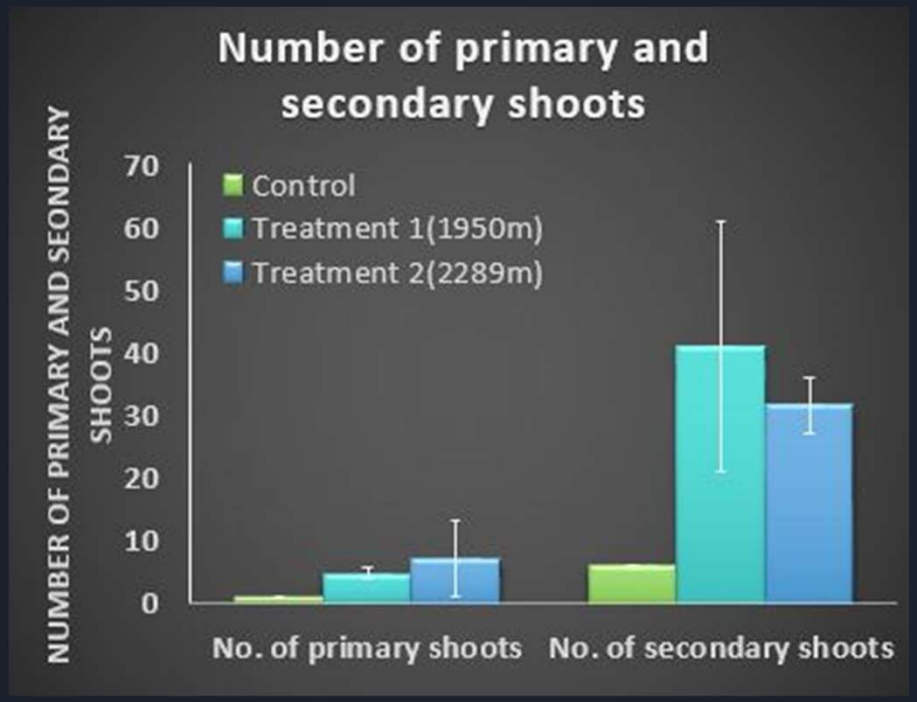
Tony Grove, Logan, UT



Washing

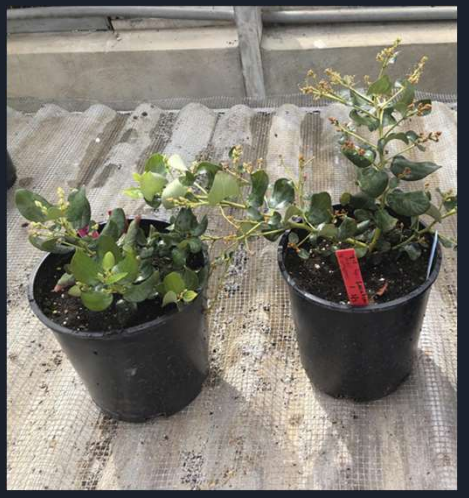
- Phosphate buffer
- Surfactant

Native Soil Aids Growth



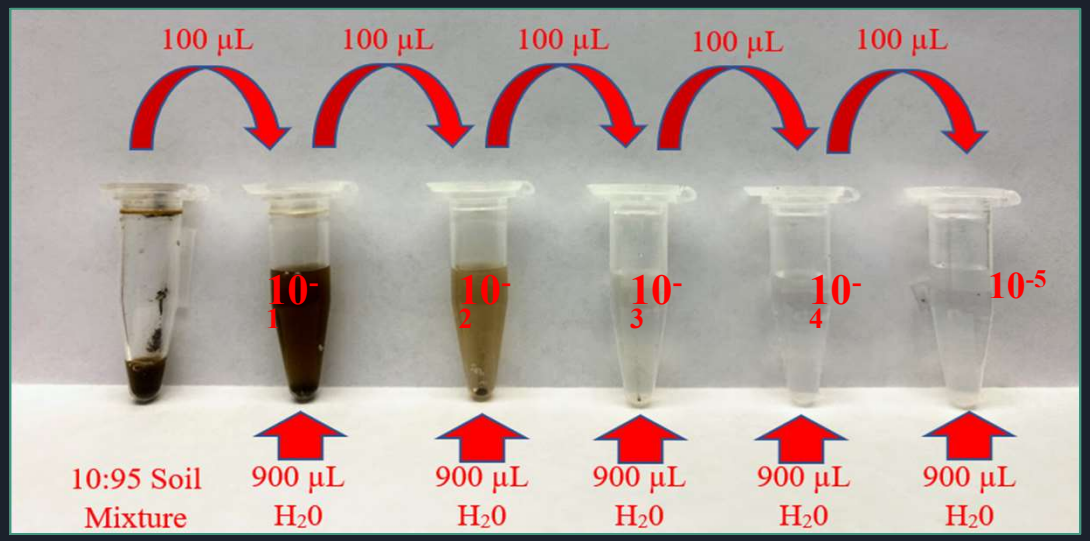
Control after 3 months

Treatment after 3 months



Culturing the Bacteria

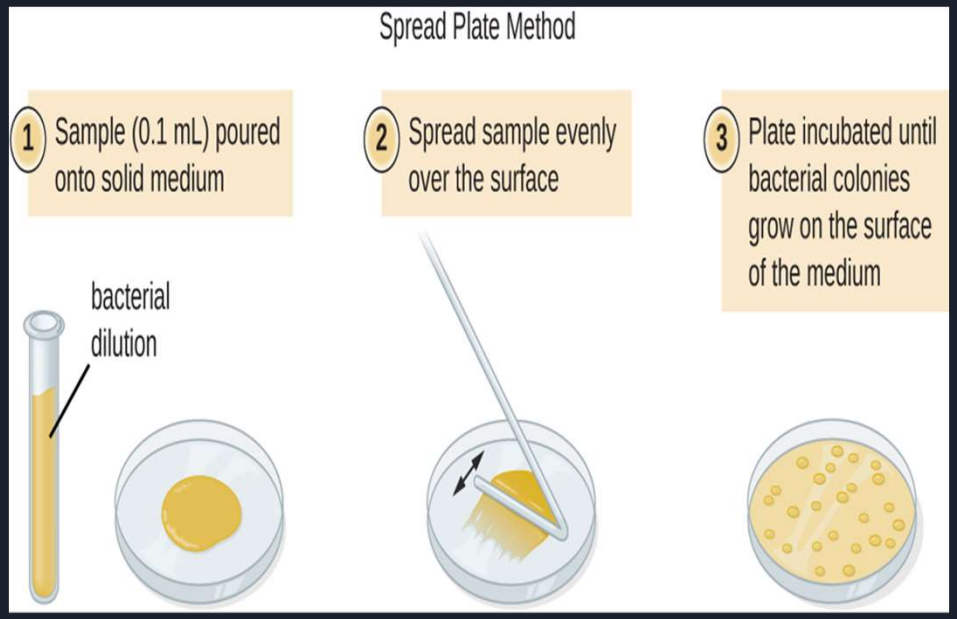
Serial Dilution

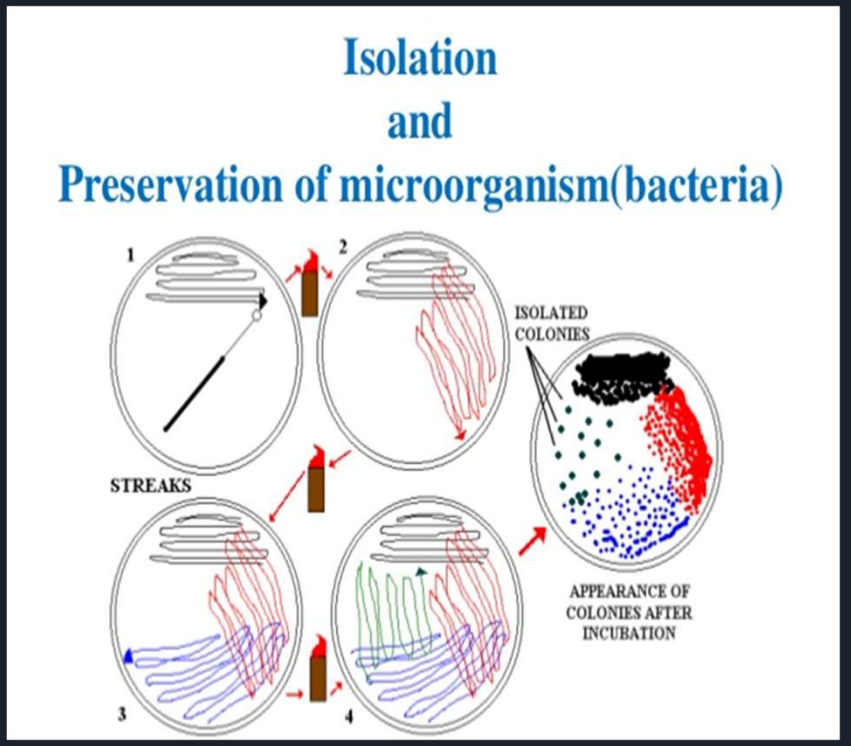


Media

¼ Tryptic Soy Agar
¼ Nutrient Agar
Yeast Mannitol Agar
Actinomycete Isolation Agar
Minimal Media

Methods


Spread Plate Method
1 Sample (0.1 mL) poured onto solid medium
2 Spread sample evenly over the surface
3 Plate incubated until bacterial colonies grow on the surface of the medium
bacterial dilution


Isolation
and
Preservation of microorganism(bacteria)
1
2
ISOLATED COLONIES
STREAKS
3
4
APPEARANCE OF COLONIES AFTER INCUBATION

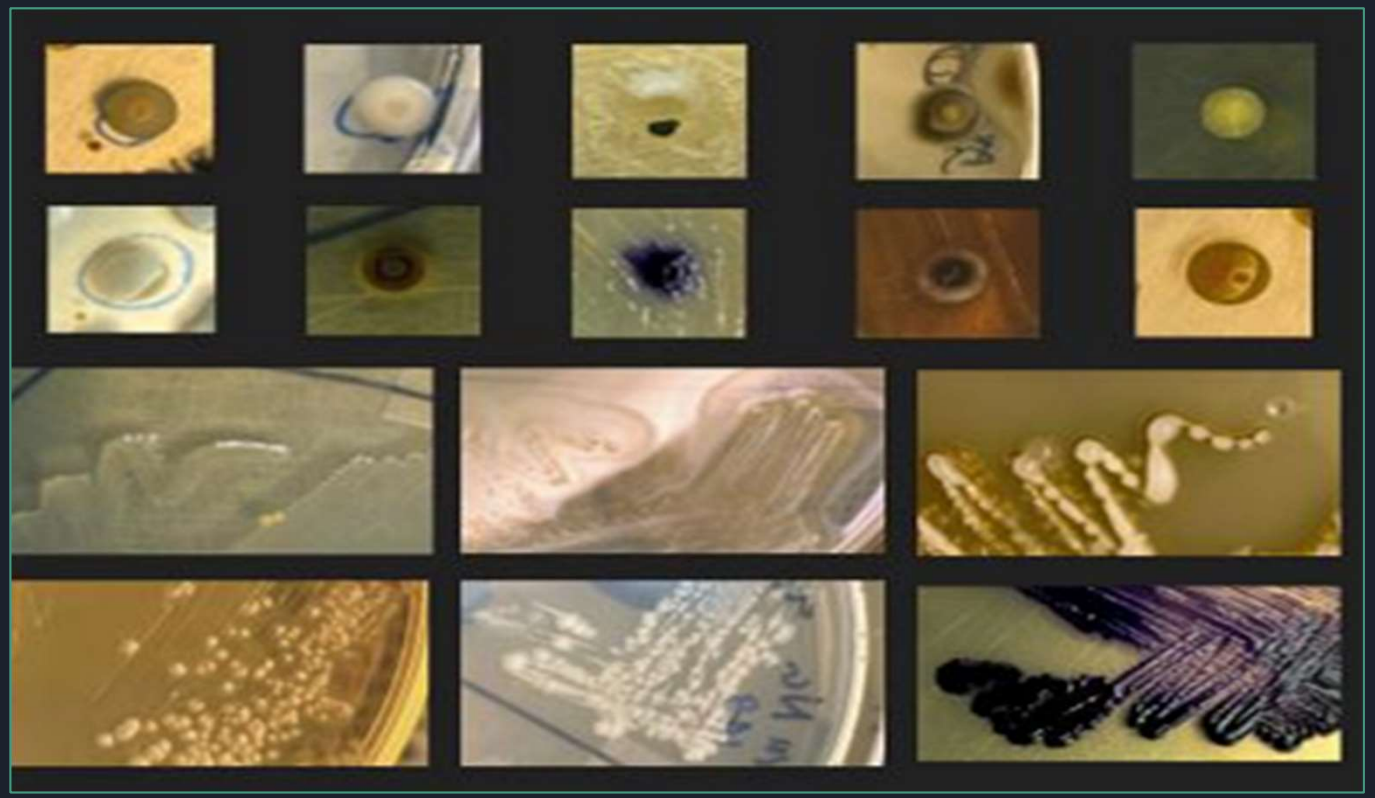
Identification

200 Colonies Isolated

70 Colonies Sequenced

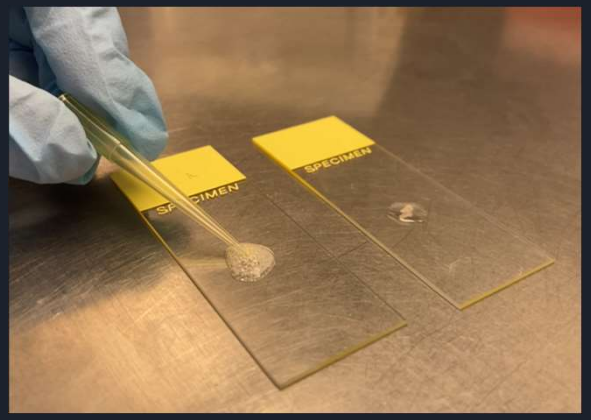
by 16S rRNA

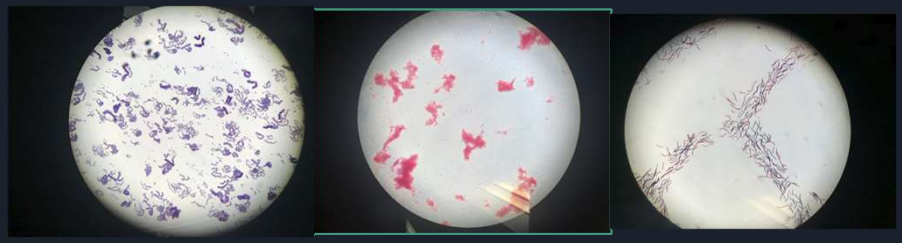
Evaluation of Characteristics



Pertinent Qualities

- Catalase Reaction
- Gram Staining
- Siderophore production
- IAA Production
- Nitrogen Fixation
- Phosphate Solubilization





Results

Testing

- Catalase positive 75.38%
- Siderophore production 38.71%

Sequencing

- 23 different genuses, with various species
  - Streptomyces 21.21%
  - Pseudomonas 22.76%
- Coined PGPR 21.15%

Traits by Literature Review	No. Colonies
Secondary Metabolite Production	13
Nutrient Uptake - Nitrogen Fixation - Phosphate Solubilization - Iron	24 6 10 8
Biocontrol Agents (antibiotics and pesticide use)	18
Soil Remediation	8
Harsh climate resistant	14

Future Research and Implications

- Identification of more bacteria
- Validation of growth promoting characteristics
- Potential as biofertilizers as a natural solution to environmental stressors

Thanks for Listening!

Katie Webb

Hayden Johns

Image Citations

“NASA Research Confirms It's a Small World, After All.” NASA, NASA, www.jpl.nasa.gov/news/nasa-research-confirms-its-a-small-world-after-all/.

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Dumroese, R. Kasten, Thomas D. Landis, and Tara Luna. "Raising native plants in nurseries: basic concepts." Gen. Tech. Rep. RMRS-GTR-274. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station. 84 p. 274 (2012).