Possible Allelopathic Effects of *Cynara cardunculus* on Native Coastal Sage Scrub Species

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Background

Friends of Los Peñasquitos Canyon Preserve

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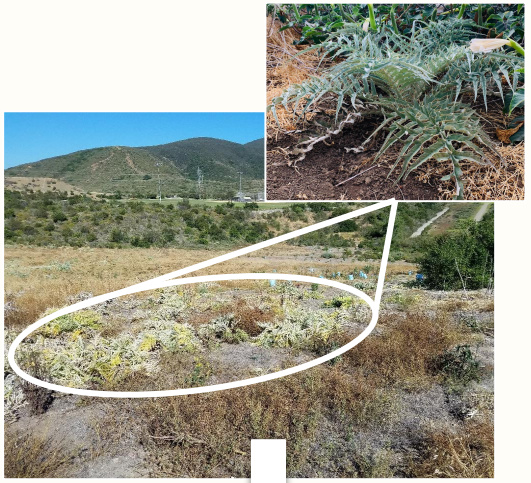
2024


















ARWEE
TRAIL


BLACK MOUNTAIN
RESTORATION PROJECT
OUR CURRENT PROJECT
FRIENDS OF LOS PENASQUITOS CANYON PRESERVE
BLACK MOUNTAIN RESTORATION
BEFORE
AFTER
HABITAT HISTORY
SLC
Parent Alliance
of Senior
Student
Leadership
Club

Living thistle (Source: FlowerAlley)

Artichoke Thistle

Forms dense monocultures: Outcompetes native plants, disrupts ecosystems

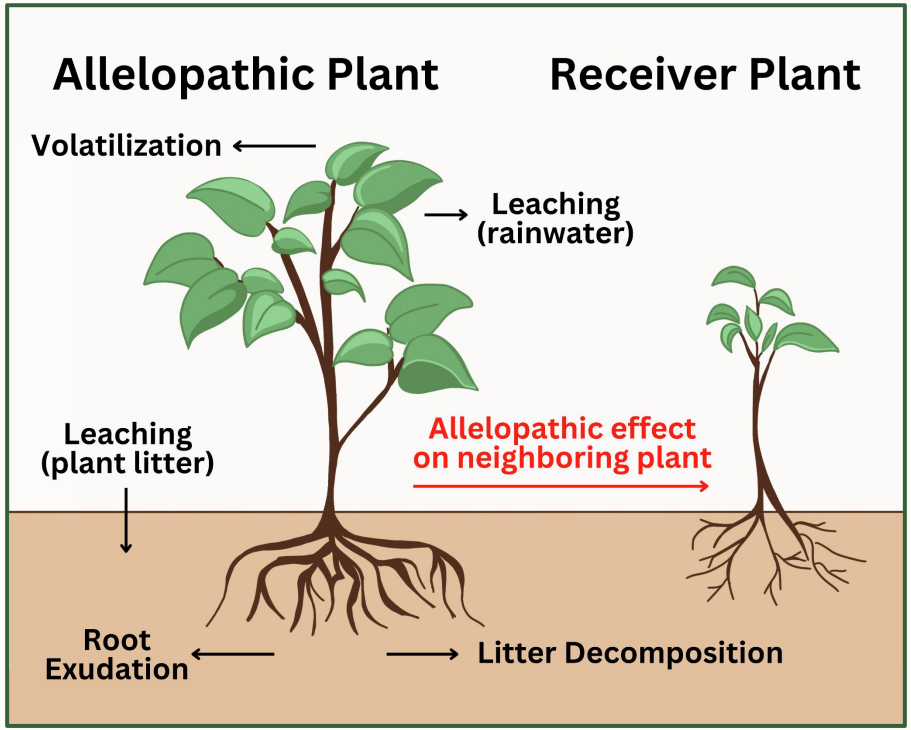
Spreads aggressively: Deep roots, thousands of wind-dispersed seeds

Harms wildlife: Reduces habitat for native species

Alters soil & ecosystem functions: Impacts carbon cycling, nutrient balance

Infested approximately 150,000 acres across at least 31 of the 58 counties in California

Allelopathy



Graphic created by presenter

Which parts, if any, of decaying and living artichoke thistle have a negative allelopathic effect on the germination proportion and rate of plants native to the coastal sage habitat?

Cynara cardunculus will exhibit allelopathic effects that impact germination for native species.

H1

Living and decaying leachates will negatively impact the germination success of native species.

H2

Living and decaying leachates will negatively impact the germination time of native species.

H3

Living leachates will have the greatest negative impact on the germination success and germination time of native species compared to decaying leachates.

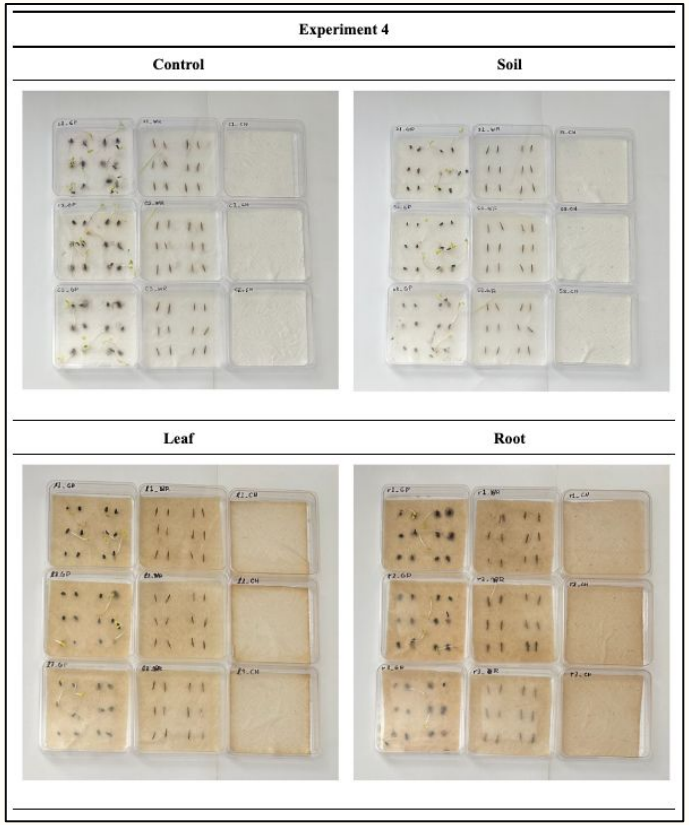
H4

Leaf leachates will have the strongest negative impact on germination success and time compared to root and soil leachates.

Part 1/2: Setup & Observation

Experiment 3			
Leachate Type	**Initial Mass (Raw Material)**	**After 1:10 dilution and filtering**	**After 50% dilution**
Leaf leachate	7 grams	31 grams	62 grams
Soil leachate #1	298 grams	54 grams	N/A
Soil leachate #2	276 grams	42 grams	N/A
Soil leachate #3	311 grams	63 grams	N/A
Root leachate	7 grams	46 grams	92 grams

Part 2: Observation



Native Species:

- Purple needlegrass
- California buckwheat
- Black sage
- Coulter's horseweed
- San Diego gumplant
- Wildrye

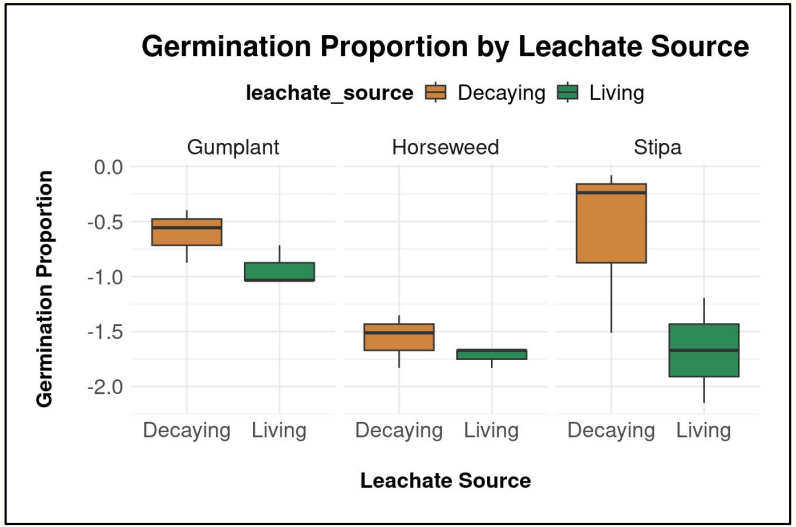
Treatments:

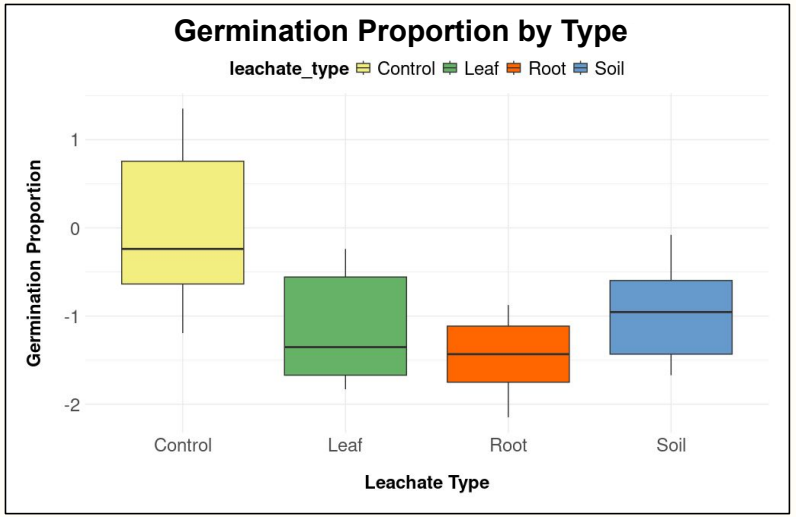
- Soil
- Leaf
- Root
- Control (deionized water)

36 seeds per species per treatment.

Part 3: Analysis

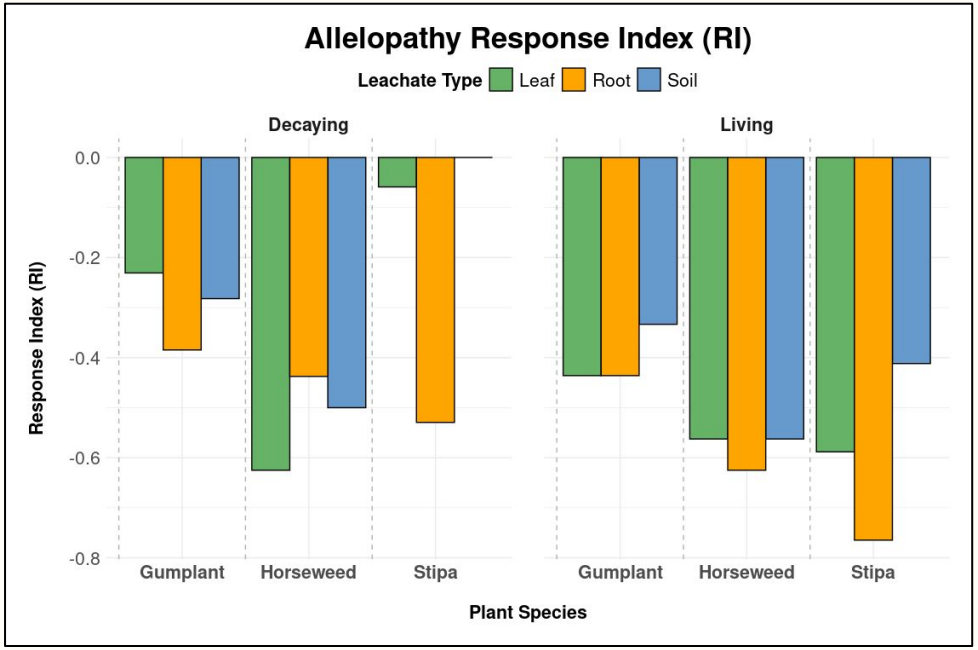
1 Germination Proportion





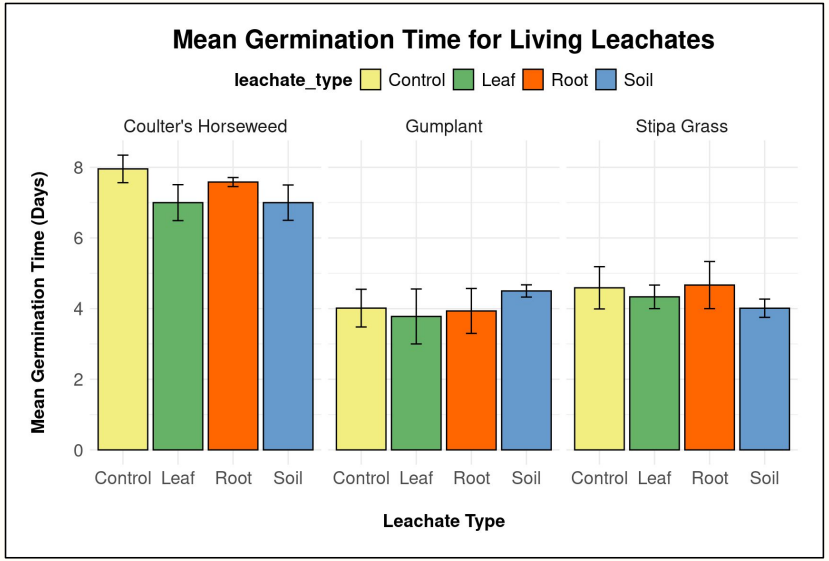
Part 3: Results & Analysis

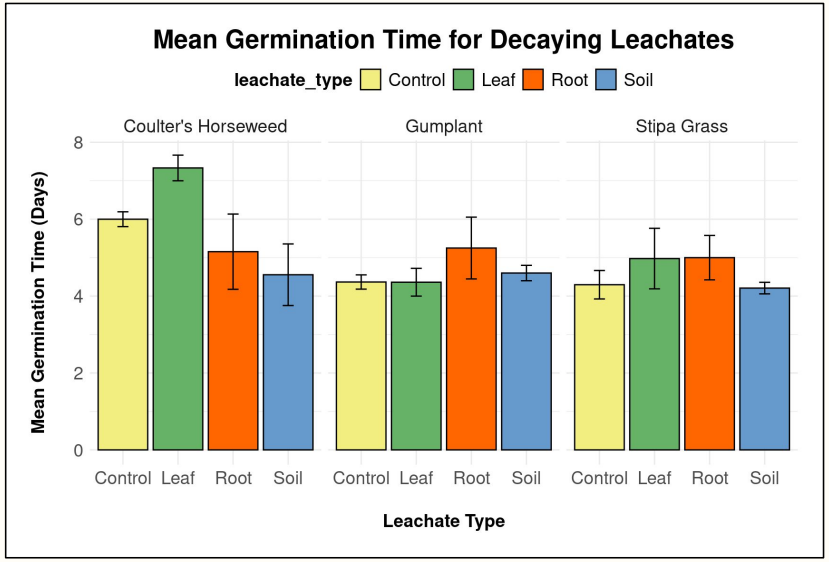
1 Germination Proportion - Allelopathy Response Index



Part 3: Results & Analysis

2 Germination Time





Cynara cardunculus did exhibit allelopathic effects that impacted germination for native species.

H1 - Supported

Native germination success was negatively impacted by living and decaying thistle leachates.

H2 - Not Supported

Native germination time was not impacted by living and decaying leachates.

H3 - Partially Supported

For certain species, living leachates reduced germination success more than decaying leachates; no exhibited difference in germination time.

H4 - Not Supported

Leaf leachates did not have a stronger negative impact on germination success and time compared to root and soil leachates.

Conclusion

Takeaways & Applications

- Artichoke thistle poses a serious challenge for native plant restoration
- Insight into plant-plant interactions
  - Certain species are more resilient (e.g San Diego gumplant)
- Allelopathic effects deteriorate with age
  - Prioritize removal of living thistles

Future Research

- Pinpointing the most toxic allelochemicals
- Understanding soil persistence
- Expanding species testing
- Field validation

California Native Plant Society

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