Interactions between the invasive *Schinus molle* (Peruvian pepper tree) with six plant species commonly found in Southern California nature reserves
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Overview

1. Introduce the Brazilian pepper tree’s negative impact
   • Allelopathy
   • Soil legacy effect
2. Why the Peruvian pepper tree may have similar impacts
3. Experimental design and research questions
4. Potential uses of the Peruvian pepper tree in restoration
Research Status:

(Dawkins, 2016)
Big Canyon Nature Park, Orange County
Allelopathy

Soil Legacy

Leaching from leaves by rain, fog, or dew

Volatilization from leaves

Released from decomposing leaves, fruits and twigs

Released from decomposing sloughed roots

Exudation from roots

Juglone production from walnut tree

(Jose, 2002)
Peruvian peppertree

200 female populations removed from the Channel Islands National Park

(Cory & Knapp, 2014; EDDMAPS, 2017)
Grows well in sun and warmth — and shade and cold

Trees and shrubs could be less fussy about the climate than scientists thought. That might be good news as the planet warms.

(A) Probability of occurrence
- < 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- > 0.6

(B) Probability of occurrence
- < 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- > 0.6

(C) Probability of occurrence
- < 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- > 0.6

(Avendaño-González, 2016; Ramírez-Albores et al., 2016)
Voorhis Ecological Reserve
Cal Poly Pomona, Pomona

Sycamore Canyon Trailhead
Puente Hills Preserve, Whittier
Research Questions

1. Do either genders of the Peruvian pepper tree exhibit direct allelopathy from leaf litter in Southern California plant communities?

2. What is the likelihood of a soil legacy effect for the Peruvian pepper tree?

3. Can we use and manage pepper trees for the benefit of native plant communities?
Predictions and Hypothesis

• We predicted that the pepper tree treatments would be non-selective and will reduce the germination and dry biomass of all six species.

• We expected that soil and mulch of male plants will be more allelopathic than female plants (Avendaño-González et al., 2016).
Mulch & Soil Experiment

*Brassica nigra*  
(Black mustard)

*Bromus madritensis*  
(Foxtail brome)

*Silybum marianum*  
(Milk thistle)

*Amsinkia intermedia*  
(Fiddleneck)

*Phacelia ramosissima*  
(Branching phacelia)

*Stipa pulchra*  
(Purple needle grass)
Allelopathic Mulch

Female Fruits  30 g
Female Leaves  30 g

Male Flowers  30 g
Male Leaves  30 g
Field Transects

- Chino Hills State Park
- Puente Hills Preserve
- Voorhis Ecological Reserve
Results—mulch germination

No Significant Differences

B. nigra
S. marianum
S. pulchra
P. ramosissima
Results—mulch biomass

Native Biomass
- *A. Intermedia* Root Shoot
- *P. Ramosissima* Root Shoot
- *S. Pulchra* Root Shoot

Invasive Biomass
- *B. madritensis* Root Shoot
- *B. nigra* Root Shoot
- *S. marianum* Root Shoot
Results—soil germination

No Significant Differences

- **B. nigra**: 18-24%
- **P. ramosissima**: 10-25%
- **S. marianum**: 65-76%

Soil Type

- **Control**
- **Female**
- **Male**
Results—soil biomass

Native Biomass

- *A. intermedia*  
  - Root
  - Shoot

- *P. ramosissima*  
  - Root
  - Shoot

- *S. pulchra*  
  - Root
  - Shoot

Invasive Biomass

- *B. madritensis*  
  - Root
  - Shoot

- *B. nigra*  
  - Root
  - Shoot

- *S. marianum*  
  - Root
  - Shoot
20 native and 10 invasive plant species

*Stipa lepida* (Foothill needle grass)

*Phacelia ramosissima* (Branching phacelia)
Takeaways & implications for management

• Allelopathy and soil legacy effects are not as pounced as the Brazilian pepper tree
• Male mulch had a positive effect on growth depending on species
• We can prune existing populations to encourage native species
• Focus on removing female pepper trees first to avoid further spreading
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