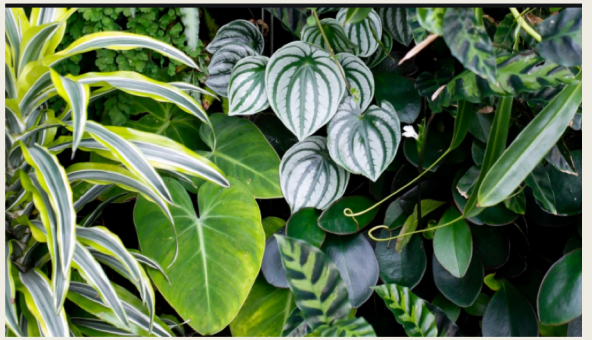
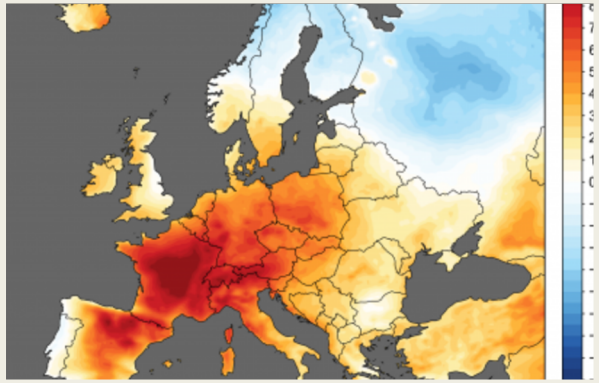
https://foliacollective.com/



COMPARING LEAF HEAT TOLERANCE WITHIN PLANT SPECIES NATIVE TO SOUTHERN CALIFORNIA



https://wheat.org/tag/heat-tolerance/

Adriana Fung

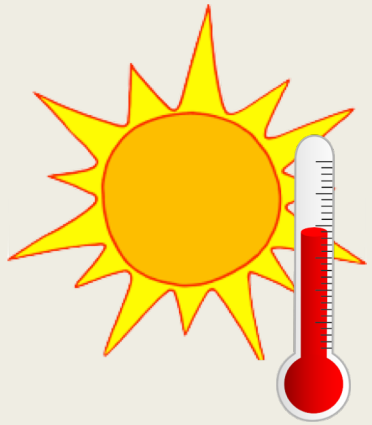
08.03.2020

Summer Undergraduate Research Conference, Occidental College 2020

OVERVIEW

- Importance of the issue
  - *Why is it important?*
  - *How can this research help the environment?*
- Adaptability of plant heat tolerance
  - *Hypothesis*
- Species and variation of plants in study
- Focal points of research
  - *How to measure heat tolerance*
  - *Results*
- Further research

IMPORTANCE OF STUDY



- Understanding consequences of Global Warming
  - *Temperatures to increase in the future*
  - *Morphoanatomical and physiological changes*
- Prevention of overheating
- Help with future planting

https://patch.com/california/malibu/designing-your-garden-california-native-plants-0

https://patch.com/california/malibu/designing-your-garden-california-native-plants-0

Adaptability of Plant heat tolerance

- HYPOTHESIS (1)
  - *Differences within species can be as important than between species*
- HYPOTHESIS (2)
  - *Plants from hotter habitat can tolerate higher heat.*

Heteromeles arbutifolia

- Also known as Toyon
- Grows mainly in full sun
- Adaptations to heat tolerance
  - *Steep leaf angle*
  - *Xeromorphic characteristics*
    - Drought tolerance
- In comparison to previous studies
  - Immature vs. mature leaves
  - Sun vs. shade leaves

https://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=4140

https://www.calfloranursery.com/plants/heteromeles-arbutifolia

Prunus ilicifolia

https://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=6894

https://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=6894

- Also known as Hollyleaf cherries
- Abundant in two different environments
  - *Chaparral (*ilicifolia)
  - *Island (Lyonii)*
- Being exposed to higher heat can lead to in species variation of higher heat tolerance
  - *Specific leaf area (SLA)*

Measuring heat tolerance

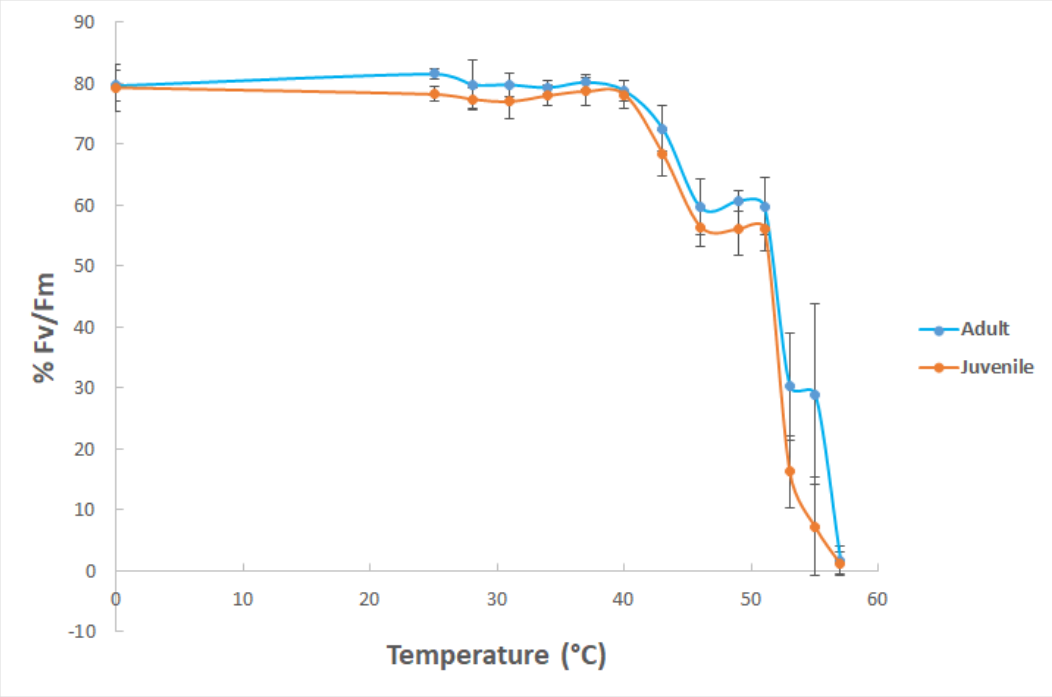
- Photosynthesis
  - *Most important leaf process*
  - *Sensitive to temperature*

- Using Chlorophyll fluorescence
  - *Measures damage from excess light*
  - *Fv/Fm*
    - Photosystem II inactivation

https://ppsystems.com/chlorophyll-fluorescence/

Immature vs. Mature leaves

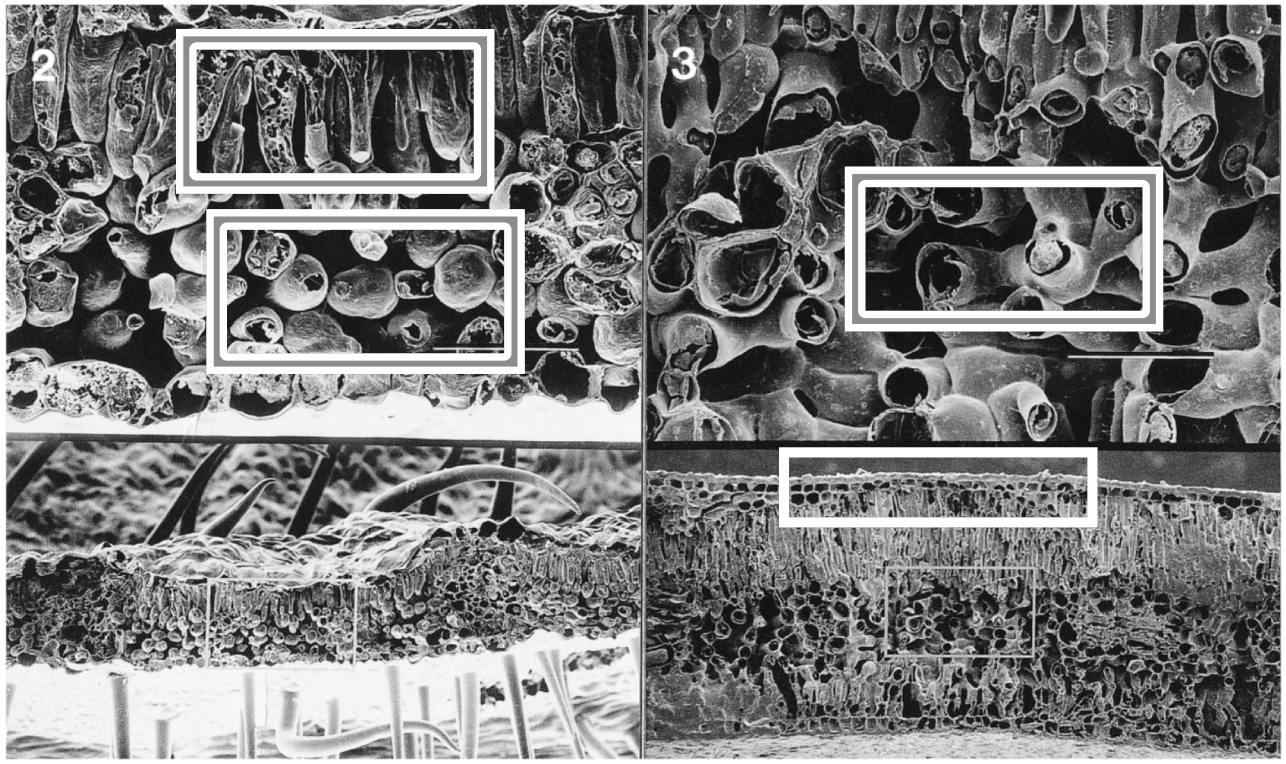
- Pine needle data measured previously in BIO 380 lab
  - *Thermotolerance curve of chlorophyll fluorescence*



- Juvenile needles were more heat sensitive to temperatures
- Importance of mature leaves

Sun vs. Shade

- Balsamo et al., 2003 paper on leaf morphology and anatomy

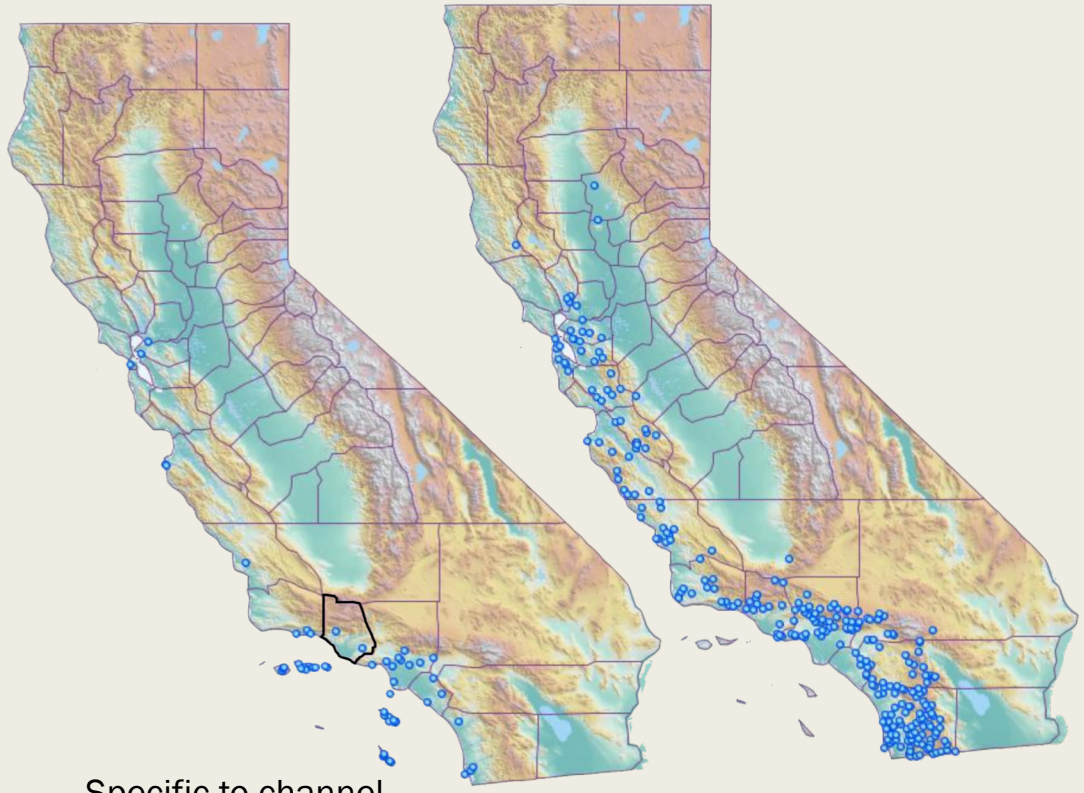


Figs. 2–3. Scanning electron micrograph of *Prunus serrulata* leaf cross section. Top picture photographed at 500×, bottom picture photographed at 130×. Bar = 50 μm. **3.** Scanning electron micrograph of *Heteromeles arbutifolia* leaf cross section. Top picture photographed at 400×, bottom picture photographed at 80×. Bar = 50 μm.

- (2): *Prunus serrulata*
  - *Shade leaves*
    - Single layer of palisade cells
      - *Loose assemblage*

- (3): *Heteromeles arbutifolia*
  - *Sun leaves*
    - Larger cuticle
    - Spongy mesophyll interconnected

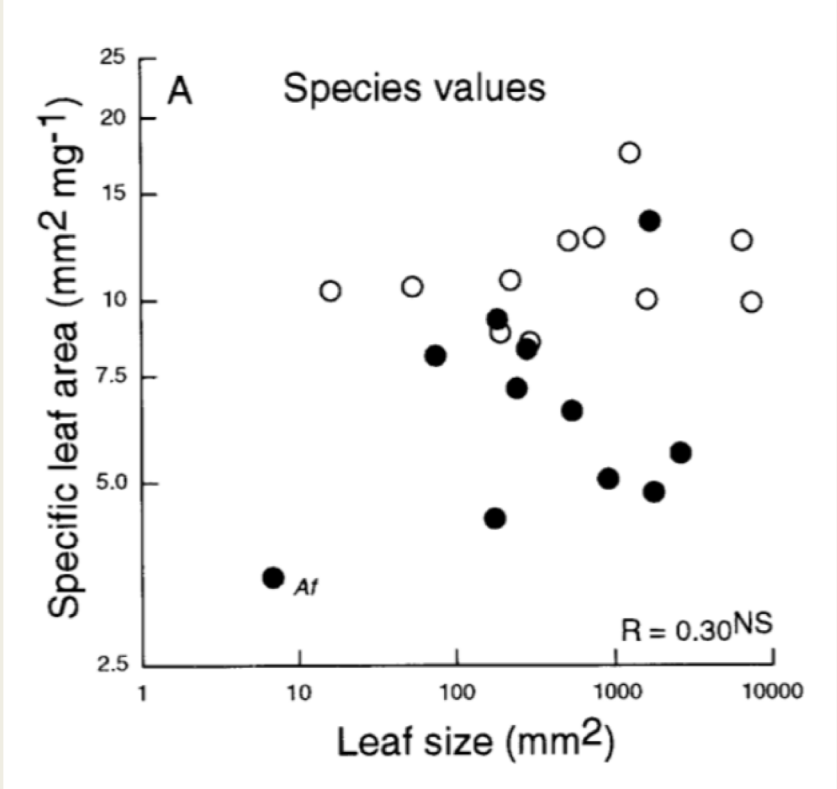
Prunus ilicifolia distribution Island vs. Chaparral



Specific to channel islands

https://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=6896

- Ackerly et al., 2001, SLA & Lead size comparison of island vs chaparral
  - *Unfilled dot = Island*
  - *Filled dot = chaparral*



Drought tolerance related to heat tolerance

- Less well studied
- Timing plays an important role of adaptation
  - *During drought*
  - *After drought*
- preliminary hypothesis

Further research

- What's next
  - *Focusing on variation of native plant leaves*
  - *Other processes and traits will be examined*
    - Physiological
      - *Stomatal conductance*
      - *Cuticular conductance*
      - *Chlorophyll content and conductance*
    - Anatomical
      - *Cuticular waxy layer thickness*
      - *Leaf thickness*
      - *Leaf area*

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- Valladares, Fernando, and Robert W. Pearcy. The Functional Ecology of Shoot Architecture in Sun and Shade Plants of Heteromeles Arbutifolia M. Roem., a Californian Chaparral Shrub. *Oecologia*, vol. 114, no. 1, 1998, pp. 1–10., doi:10.1007/s004420050413.

THANK YOU