Determining the Feasibility of Biological Control of a Weed Target

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Invasive plants
Biological Control

Positive
- Safe (Host specific)
- Self perpetuating
- Spreads to new areas
- Environmentally friendly
- High return on investment

Negative
- High up front cost
- Slow
- Will not eradicate pest
- Doesn’t always “stick”
However.....

• Not all weeds are amenable to biocontrol

• Several challenges.....
  – Closely related (or chemically similar) to
    • economically important species
    • threatened/ endangered species
      – Difficult to find host-specific agents
  – Conflicts of interest
    • Beekeepers
    • Nurseries/Horticulture
    • Culturally significant
Feasibility studies.....

- Biocontrol is expensive on the front end
  - Difficulty in finding host-specific biocontrol agents
  - Potential conflicts of interest

- Prudent to do a feasibility study before start of biocontrol program
  - Cost-effective
  - Can uncover hidden challenges before the initiation of a BC program
  - Assist in determining likelihood of success
Feasibility study

– Nature of damage (ecological/economic)
– Origin/ geographic distribution
– Taxonomy/ closely related plants (molecular/traditional)
  • Potential risks to native plants
– Secondary plant chemistry (relevance to herbivory)
– Recommended species test list
– Conflicts of interest
– Recommendations
Earleaf acacia

- Native to Northern Australia, Papua New Guinea, and Indonesia
- Introduced into US intentionally ornamental
  - Hawaii - 1920s
  - Florida - 1930s
Nature of damage
( ecological/economic)

• Allelopathic
• Host for the lobate lac scale
• Brittle wood paired with weak branch crotches
  – badly damaged during wind storms/hurricanes
• Allergenic (pollen)
Origin/ geographic distribution

- Native to Northern Australia, Papua New Guinea, and Indonesia
Origin/ geographic distribution

EDDMapS, 2016
Taxonomy

• Molecular phylogeny
  – extracted DNA from subfamilies Mimosoideae, Caesalpinioideae, and Papilionoideae
    • emphasis on the native Mimosoideae taxa (most closely related to earleaf acacia)
  – rbcL gene
  – Sequences from 335 taxa (extracted and GenBank)

• Identify potential risks to closely related native plants
Recommended species test list

• Based on molecular phylogeny,
• Threatened and endangered plants,
  – Fabaceae and closely related families
• Economically important species
• Plants with similar secondary plant chemistry
Conflicts of Interest

• Used as an ornamental (not recommended)
• Medicinal (potential)
  – antifilarial (Ghosh et al. 1993), an anticestodal (Ghosh et al. 1996), and an antifungal (Mandal et al. 2005)
• Supplemental food source for big cypress fox squirrels (endangered)
Preliminary foreign surveys

- Leaf feeders (5)
- Stem/leaf gallers (3)
- Leaf miners (1)
- Seed feeders (2)
- Sap suckers (1)
Recommendation for earleaf acacia

- No evidence to abandon pursuing a BC program
- Potential for success in finding host specific agent
- Next steps:
  - Continue with foreign surveys
  - Begin preliminary host range testing of candidate agents (in native range)
Acknowledgements

• Zizah Blair – USDA-ARS
• Zack Ramilevich – USDA-ARS
• Bradley Brown - CSIRO
• Jeff Makinson - CSIRO
• Ryan Zonneveld - CSIRO