Changing the ‘hack and squirt’ paradigm for woody invasive plant control

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Hack and squirt target area

- Sapwood
- Heartwood
- Cambium
- Outer bark (rhytidome)
- Inner bark (phloem)
How we generally do it in South Florida
Multi-stemmed Plants are Ridiculous
Previous Work

• Dr. James Leary, University of Hawaii
• 1 hack every 12 inches diameter at breast Height (DBH) approximately 4.4 feet
  • 0.5 ml Aminopyralid or Aminocyclopyrachlor at 100%
Research Questions

• Can we reduce the time it takes and the amount of herbicide used to treat invasive plants with hack and squirt?

• Can we get consistent efficacy with a reduced Hack and Squirt method compared to basal bark and cut stump treatments?
Methods and Materials

• Eight Species
  • *Casuarina equisetifolia* – Australian pine
  • *Triadica sebifera* – Chinese tallow tree
  • *Bischofia javanica* – Bishopwood
  • *Schinus terebinthifolius* – Brazilian peppertree
  • *Leucanena leucocephala* – Lead tree
  • *Aleurites fordii* – Tung oil tree
  • *Eugenia uniflora* – Surinam cherry
  • *Melaleuca quinquenervia* – Melaleuca tree
<table>
<thead>
<tr>
<th>Method</th>
<th>Treatment</th>
<th>Active Ingredient</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hack and Squirt</td>
<td>Milestone</td>
<td>Aminopyralid</td>
<td>100%</td>
</tr>
<tr>
<td>Hack and Squirt</td>
<td>Method 240 SL</td>
<td>Aminocyclopyrachlor</td>
<td>100%</td>
</tr>
<tr>
<td>Basal Bark</td>
<td>Garlon 4 Ultra</td>
<td>Triclopyr</td>
<td>20% v/v</td>
</tr>
<tr>
<td>Cut stump</td>
<td>Garlon 3A</td>
<td>Triclopyr</td>
<td>50% v/v</td>
</tr>
<tr>
<td>Untreated</td>
<td>Untreated</td>
<td>No herbicide</td>
<td>0%</td>
</tr>
</tbody>
</table>
Reduced Hack and Squirt
Cut Stump
Methods and Materials

- 20 reps per treatment per species
  - Chinese tallow tree and Tung oil tree had 2 locations located in Gainesville, FL applied in October 2015 and November 2015
  - Remaining species were located in the Coral Springs area and applied in December 2015 and repeated in January 2016
- Randomized complete block design
- Data
  - Analysis of variance using Tukey’s LSD, P-value = 0.05
Size Classifications

- 3 size classes, based on diameter at breast height (DBH)
  - < 4 inches
  - 4 – 8 inches
  - 8 – 12 inches
- Allows us to determine if there is a size limitation to the reduced hack and squirt method
Evaluation of Defoliation

Single Hack

Diagram of a tree showing a single hack.
## Species Comparison

<table>
<thead>
<tr>
<th>Species</th>
<th>Average DBH (in)</th>
<th>DBH Range</th>
<th>Average Stem #</th>
<th>Stem # Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casuarina</td>
<td>4.4</td>
<td>1.5 – 10.75</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chinese Tallow</td>
<td>5</td>
<td>0.7 – 13.3</td>
<td>1.9</td>
<td>1 – 9</td>
</tr>
<tr>
<td>Bishopwood</td>
<td>5.89</td>
<td>1 – 29.75</td>
<td>1.54</td>
<td>1 – 7</td>
</tr>
<tr>
<td>Brazilian Peppertree</td>
<td><strong>13.06</strong></td>
<td>2.25 – 43.25</td>
<td><strong>4.28</strong></td>
<td>1 – 16</td>
</tr>
<tr>
<td>Melaleuca</td>
<td>5.97</td>
<td>1.5 – 14.5</td>
<td>1.1</td>
<td>1 – 3</td>
</tr>
<tr>
<td>Lead Tree</td>
<td>4.95</td>
<td>1.25 – 14.25</td>
<td>1.13</td>
<td>1 – 2</td>
</tr>
<tr>
<td>Surinam Cherry</td>
<td>5.29</td>
<td>2 – 18.5</td>
<td>1.75</td>
<td>1 – 5</td>
</tr>
<tr>
<td>Tung Oil</td>
<td>5.24</td>
<td>1 – 17.25</td>
<td>1.18</td>
<td>1 – 4</td>
</tr>
</tbody>
</table>
Results
No significant difference
Efficacy by DBH
Basal Bark Efficacy by DBH

Defoliation

Casuarina  Lead Tree  Chinese Tallow  Bishopwood  Surinam Cherry  Tung Oil

DBH 1  DBH 2  DBH 3
Affect by Quadrant
No significant difference
Conclusion

• In general, reduced hack and squirt and low volume basal bark treatments required less time than cut stump treatments

• Reduced hack and squirt treatments used less herbicide than both basal bark and cut stump

• One year after treatment, Method and Milestone were not different from cut stump treatment
  • Control from Milestone and basal bark treatments was affected by DBH on Chinese tallow tree, Bishopwood, Melaleuca, and Lead Tree
  • Control from Method was affected by DBH on Lead tree
What do the Milestone and Method Labels Current Say about hack and squirt?

• Milestone: 10%v/v with continuous or overlapping hacks

• Method: current label does not have hack and squirt listed
  • Cut stump: 5-10% in an oil carrier
  • Label update expected from Bayer (soon)
    • Up to 100% v/v, 1 hack/2 inches DBH (Likely)
Next Steps

• Study will continue through 2017
• Reduced herbicide rates and examine herbicide mixes with reduced hack and squirt treatments
• Coordinate with land managers for larger scale test plots
Acknowledgements

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• Dr. Enloe, Carl Della Torre, Andrew Gocek, Jonathan Glueckert, Kyle Thayer, Ian Markovich
Questions?

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Milestone 24C, local need label for control of woody species in Hawaii

- Incision Point Application (IPA) also known as Hack and Squirt
- Make cuts around the tree trunk at a convenient height with a machete, hatchet or similar equipment so that the cuts are about 6 inches apart between centers. Inject ½ to 1 milliliter of undiluted Milestone into the pocket created between the bark and the inner stem/trunk by each cut as soon as possible after cutting. The cambium area next to the bark is the most vital area to wet. Maximum Application Rate: Do not apply more than 7 fl oz per acre of Milestone per year. The total amount of Milestone applied cannot exceed 7 fl oz per acre per year. Spot treatments may be applied at an equivalent broadcast rate of up to 0.22 lb acid equivalent (14 fl oz of Milestone) per acre per annual growing season; however, not more than 50% of an acre may be treated at that rate. Do not apply more than a total of 0.11 lb acid equivalent (7 fl oz per acre of Milestone) per annual growing season.
- Would allow us to treat 207 stems per acre with a single hack per stem
No significant difference
No significant difference
No significant difference
Chinese Tallow Method Quadrant by DBH

No significant difference