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Old World Climbing Fern (*Lygodium microphyllum*)
Issues with *Lygodium*

- Aggressive, blanketng, growth habit
- Year round spore production and dispersal
- Tolerance to flooding and fire
Management

• Ground treatments
  • Backpack application
    • Glyphosate (3% v/v)

• Aerial treatments
  • Metsulfuron-methyl

• Biocontrol
  • Neomusotima conspurcatalis
  • Floracarus perrepae

(Hutchinson and Langeland 2007)
<table>
<thead>
<tr>
<th>Herbicides/ Tank Mixes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundup Custom</td>
<td>Glyphosate</td>
</tr>
<tr>
<td>Garlon 3A</td>
<td>Triclopyr (Amine)</td>
</tr>
<tr>
<td>Vastlan HL</td>
<td>Triclopyr (Choline)</td>
</tr>
<tr>
<td>Trycera</td>
<td>Triclopyr (Acid)</td>
</tr>
<tr>
<td>Method</td>
<td>Aminocyclopyrachlor</td>
</tr>
<tr>
<td>Escort</td>
<td>Metsulfuron</td>
</tr>
<tr>
<td>Method + Escort</td>
<td>Aminocyclopyrachlor + metsulfuron</td>
</tr>
<tr>
<td>ProcellaCOR EC</td>
<td>Florpyrauxifen benzyl</td>
</tr>
<tr>
<td>ProcellaCOR SC</td>
<td>Florpyrauxifen benzyl</td>
</tr>
<tr>
<td>Clipper</td>
<td>Flumioxazin</td>
</tr>
<tr>
<td>Stingray</td>
<td>Carfentrazone</td>
</tr>
<tr>
<td>Roundup Custom + Clipper</td>
<td>Glyphosate + Flumioxazin</td>
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</tr>
<tr>
<td>Londax</td>
<td>Bensulfuron</td>
</tr>
<tr>
<td>Permit</td>
<td>Halosulfuron</td>
</tr>
<tr>
<td>Sharpen</td>
<td>Saflufenacil</td>
</tr>
<tr>
<td>Newpath</td>
<td>Imazethapyr</td>
</tr>
<tr>
<td>Basagran</td>
<td>Bentazon</td>
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</table>
Advances in herbicide technology warrant testing on OWCF

• New triclopyr formulations
  • Acid and choline forms

\[
\begin{align*}
\text{Cl} & \quad \text{N} & \quad \text{O} & \quad \text{Cl} & \quad \text{Cl} \\
\text{Cl} & \quad \text{H}_3\text{C} & \quad \text{O} & \quad \text{F} & \quad \text{F} & \quad \text{Cl}
\end{align*}
\]

• New aquatic active ingredient
  • Florpyrauxifen-benzyl
Objectives

• Evaluate triclopyr formulations for OWCF control against glyphosate in ARM Lox NWR

• Examine potential efficacy of florpyrauxifen-benzyl on OWCF in ARM Lox NWR

• Long term goal of increasing the tools for managers
Study Locations

- Fort Pierce
- Okeechobee
- Wellington
<table>
<thead>
<tr>
<th>Study</th>
<th>Active ingredient/formulation</th>
<th>Application Dates</th>
<th>%v/v or rate g/ha</th>
<th>Rate (kg ae/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Triclopyr amine</td>
<td>Wellington: December 2016</td>
<td>3.0%, 1.5%</td>
<td>4.0, 2.0</td>
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<tr>
<td></td>
<td>Triclopyr choline</td>
<td></td>
<td>2.2%, 1.1%</td>
<td>4.0, 2.0</td>
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<tr>
<td></td>
<td>Triclopyr acid</td>
<td></td>
<td>3.1%, 1.6%</td>
<td>4.0, 2.0</td>
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<tr>
<td></td>
<td>Glyphosate</td>
<td>Okeechobee: May 2017</td>
<td>3%</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td>Untreated</td>
<td></td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2</td>
<td>Floryprauxifen-benzyl (EC)</td>
<td>Ft. Pierce: March 2017</td>
<td>29 g/ha</td>
<td>0.03</td>
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<tr>
<td></td>
<td>Floryprauxifen-benzyl (EC)</td>
<td></td>
<td>58 g/ha</td>
<td>0.06</td>
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<tr>
<td></td>
<td>Floryprauxifen-benzyl (EC)</td>
<td>Okeechobee: May 2017</td>
<td>87 g/ha</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>Glyphosate</td>
<td></td>
<td>3% v/v</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td>Untreated</td>
<td></td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

NIS added to each treatment at 0.5% v/v
Data Collection

• % Visual Cover of live (green) OWCF

• 1m² sub-samples from 4 quadrats within each plot

• 0, 60, 180, 360 DAT
OWCF Response to Triclopyr Formulation (180 DAT)

P_{Trt x Site} < 0.001
OWCF Response to Triclopyr Formulation (360 DAT)

P_{Trt x Site} = 0.006

- Okeechobee
- Wellington

Factors:
- Amine (3%)
- Amine (1.5%)
- Choline (2.2%)
- Choline (1.1%)
- Acid (3.1%)
- Acid (1.6%)
- Gly (3%)
- Unt

Graph showing OWCF % Cover with letters indicating significant differences.
OWCF Response to Florpyrauxifen-Benzyl (180 DAT)

$P_{\text{Trt x Site}} = 0.02$

- OWCF % Cover

- FP-B 29 g/ha: b
- FP-B 58 g/ha: bc
- FP-B 87 g/ha: C
- Gly (3%): c
- Unt: A

**Legend:**
- Okeechobee
- Ft Pierce
OWCF Response to Florpyrauxifen-Benzyl (360 DAT)

\[ \text{Okeechobee} \quad \text{Ft Pierce} \]

FP-B 29 g/ha  
FP-B 58 g/ha  
FP-B 87 g/ha  
Gly (3%)  
Unt

\[ P_{\text{Trt x Site}} = 0.02 \]
Trial Conclusions

• Multiple triclopyr formulations are potential alternatives to glyphosate
  • Some significant variation in formulation efficacy at 12 MAT between sites
    • Hydrology related
    • Current mesocosm studies addressing this

• Florpyrauxifen-benzyl
  • Documented its efficacy on OWCF
  • Very slow acting
  • Somewhat less consistent than glyphosate
  • Need to refine rates/formulations
  • Evaluate selectivity
Mid Level Data

![Bar chart showing % Cover for different treatments including 'Trycera 1.1% v/v', 'Vastlan 1.1% v/v', 'Garlon 3A 1.5% v/v', 'Rndup Cust 3% v/v', and 'Untreated'. The chart compares the 'Baseline', '90DAT', and '180DAT' samples.]
Aerial Treatments
Florpyrauxifen-benzyl
Ongoing and Future Research

• Tree Island Ground Treatments- Currently 40 Islands
  • Florpyrauxifen-benzyl
  • Triclopyr

• Tree Island Aerial Treatments- Currently 20 Islands

• Tree Island Retreatment Intervals- Currently 80 Islands

• Kissimmee River Floodplain Aerial Treatments- 10 acres

• Poodle cutting
  • Florpyrauxifen- benzyl
  • Triclopyr Acid

• Mesocosm studies
  • Hydrology
  • Seasonality

• Herbicide Efficacy and Tank Mixes

• Evaluation of UAS for mapping and treating OWCF

• IPM Studies with USDA
Acknowledgements
Thanks! Questions?

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