New Insecticides

LATMC 2008

Natalie Hummel
Michael Stout

Department of Entomology
Rice Research Station
Insect Problems - 2007

- Early-season pests
  -- Rice water weevil
  -- Fall armyworm
  -- Rice Leaf-miner
- Late-season pests
  -- Rice stink bug
  -- Stem borers
- New pest?
  – Panicle Rice Mite
Warning

• Be sure to read and follow all chemical label recommendations
• Most chemicals recommended cannot be applied near Crawfish ponds
• Consult county agent for crawfish-rice recommendations.
Adult overwintering

Adult feeding

Larval feeding

Mating and oviposition

RWW Life Cycle

Feeding site

Head

Feeding site
Flooding

Weeks since flooding

3  6

2  4  5  1

Adult feed + oviposit

Larvae feed, injure roots

Foliar

Weeks since flooding

Flooding

Adult feed + oviposit

Larvae feed, injure roots

Foliar
Rice water weevil

*Damage*

- Pruned roots
- Decreases yield
- 10% yield loss X 6000 lbs/acre X $10/cwt = - $60/acre
Rice water weevil

Management

• Cultural
  – Delayed flooding
    • Rice is at the 5-leaf stage or beyond
  – Early planting → Early March
  – Draining fields → soil must crack

• Chemical
  – Pyrethroids, Dimilin, Trebon
# Insecticides for Weevil Control

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Class</th>
<th>Formulation/Use Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karate, etc.</td>
<td>Pyrethroids</td>
<td>Early Post-flood</td>
</tr>
<tr>
<td>Rynaxypyr (Dermacor)</td>
<td>Anthranilic diamide</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>Clothianidin</td>
<td>Neonicotinoid</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>Thiomethoxam</td>
<td>Neonicotinoid</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>Dinotefuran</td>
<td>Neonicotinoid</td>
<td>Granular – pre- or post-flood</td>
</tr>
</tbody>
</table>
Problems with *Pyrethroids*

- Inadequate control
- Environmental damage
- Incompatibility with crawfish production
  1. Pyrethroids extremely toxic to crawfish
     - LC50 < 1 ppb
  2. Co-cultivation of rice and crawfish
     - Rotation - location
## Insecticides for Weevil Control

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Class</th>
<th>Formulation/Use Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karate, etc.</td>
<td>Pyrethroids</td>
<td>Early Post-flood</td>
</tr>
<tr>
<td>Rynaxypyr (Dermacor™)</td>
<td>Anthranilic diamide</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>Clothianidin (Cruiser)</td>
<td>Neonicotinoid</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>Thiomethoxam</td>
<td>Neonicotinoid</td>
<td>Seed treatment</td>
</tr>
<tr>
<td>Dinotefuran</td>
<td>Neonicotinoid</td>
<td>Granular – pre- or post-flood</td>
</tr>
</tbody>
</table>
Pyrethroid Alternatives

• Have exhibited efficacies as good as, or better than, the pyrethroids

• Pesticides in trials & number of years:
  1. Thiomethoxam 4+ yrs of testing
  2. Rynaxypyr (Dermacor™) 3 yrs of testing
  3. Clothianidin 2 yrs of testing
  4. Dinotefuran 4 years of testing
# Seed treatments
Rynaxypyr, Clothianidin & Thiomethoxam

<table>
<thead>
<tr>
<th><strong>Advantage</strong></th>
<th><strong>Disadvantage</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ease of use</td>
<td>1. Prophylactic approach</td>
</tr>
<tr>
<td>2. Highly effective</td>
<td>2. Restricted to drill-seeded rice</td>
</tr>
<tr>
<td>1. Large larvae died</td>
<td></td>
</tr>
<tr>
<td>before damaging roots</td>
<td></td>
</tr>
<tr>
<td>3. Reduced drift</td>
<td></td>
</tr>
<tr>
<td>4. Less release of</td>
<td></td>
</tr>
<tr>
<td>insecticide into the</td>
<td></td>
</tr>
<tr>
<td>environment</td>
<td></td>
</tr>
</tbody>
</table>
Dermacor™
Louisiana Field Trials
2005-2007

Untreated

Dermacor™ seed treatment

Crowley, LA
Rice Research Station
72 days after planting
2007 Dermacor™ Trial
LSU AgCenter Rice Research Station
Cocodrie

Rynaxypyr rate (mg a.i./seed)

Rice water weevil larvae per core sample

85% control, 25 dpf
2007 Dermacor™ Trial

LSU AgCenter Rice Research Station

Hybrid

Rice water weevil larvae per core sample

Rynaxypyr rate (mg a.i./seed)

- **Control**
- **0.025**
- **0.05**
- **0.1**

- 18 dpf
- 25 dpf
- 32 dpf
Question: Does Dermacor kill eggs or larvae?
Feeding Experiment – leaves from seedlings

% mortality @ 72 hours

Rynaxypyr rate (mg a.i./seed)

Rice water weevil (adult)
Fall armyworm (neonate)
# Neonicotinoids: systemic activity

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Rate (grams ai/100kg seed)</th>
<th>RWW mortality, 72 hrs</th>
<th>FAW mortality, 72 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothianidin</td>
<td>0</td>
<td>13%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>97%</td>
<td>36%</td>
</tr>
<tr>
<td>Thiomethoxam</td>
<td>0</td>
<td>17%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>115</td>
<td>90%</td>
<td>20%</td>
</tr>
</tbody>
</table>
Thiomethoxam seed treatment, 2007

Larvae per core sample

- UTC
- 80
- 95
- 115
- 135
- Icon

Cruiser grams ai/100 kg seed

25 20 15 10 5 0
Post-flood granule (Dinotefuran)

**Advantage**
1. More compatible with water-seeded rice?
   - By comparison to seed treatment
2. “Rescue” treatment
   - Use only when larvae present on roots

**Disadvantage**
1. May not be as effective as seed treatments
2. Not as easy to use as seed treatment
### Dinotefuran, pre/post split and post-flood, 2006

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Larvae per core sample ± s.e. on:</th>
<th>May 30</th>
<th>June 7</th>
<th>June 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated control</td>
<td></td>
<td>19.9 ± 2.1</td>
<td>23.8 ± 5.0</td>
<td>19.3 ± 7.0</td>
</tr>
<tr>
<td><strong>Karate Z</strong>, 0.03 lbs ai/acre, 1 d post-flood</td>
<td></td>
<td>0.3 ± 0.2 *</td>
<td>2.4 ± 0.8 *</td>
<td>6.1 ± 2.2</td>
</tr>
<tr>
<td><strong>Dinotefuran</strong>, 240 gm ai/acre, pre + post split</td>
<td></td>
<td>0.8 ± 0.3 *</td>
<td>0.6 ± 0.3 *</td>
<td>2.6 ± 1.0 *</td>
</tr>
<tr>
<td><strong>Dinotefuran</strong>, 360 gm ai/acre, post treatment</td>
<td></td>
<td>17.4 ± 2.0 (before)</td>
<td>4.9 ± 0.8 *</td>
<td>1.2 ± 0.3 *</td>
</tr>
</tbody>
</table>

An * denotes a mean significantly different from control mean (Tukey, $P < 0.05$) in the same column.
Effect of granular dinotefuran applied to weevil-infested, greenhouse-grown plants

Dinotefuran - greenhouse experiment

Effect of granular dinotefuran applied to weevil-infested, greenhouse-grown plants

Days after treatment

Larvae per plant

- Untreated
- DTFRN
New Insecticides - Summary

1. 4 insecticides
   – Multiple years of testing for efficacy against the rice water weevil
   – Seed treatments provide excellent control
     • Drill-seeded rice
   – May be much more compatible with crawfish production than pyrethroids – *Mike will discuss in later presentation*
   – Granular Dinotefuran
     • may be “rescue” or curative treatment
     • may be suitable in water-seeded rice
Acknowledgments

Collaborators
Ray McClain, LSU RRS
Gary Barbee, Agronomy

Graduate Students
Srinivas Lanka

Research Associates
Rita Riggio
Marty Frey
Ryan Pousson

Funding
La. Rice Research Board
USDA, Pest Management Alternatives Program
Natalie A. Hummel, Ph.D.
Rice Extension Entomologist
LSU AgCenter
nhummel@agcenter.lsu.edu
Cell: 225-223-3373
Office: 225-578-7386