Insect Management Techniques for Organic Rice Production

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Introduction

• About 50,000 acres (20,000 ha) of organic rice in the US---increasing yearly
  – More rice going to organic production due to higher price ($0.23/lb vs $0.12/lb = $0.51/kg vs $0.26/kg) and lower inputs
  – Yields about 1/2 of conventional rice
  – Many Texas organic rice farmers plant on land that has been out of rice production for years (prior fallow or cow pastures)
    • Typical rice field weed seed bank is reduced (biggest constraint = weeds!)
    • Some flood field over the winter to kill weeds and seeds
Main Insect Pests of Rice (Conventional and Organic):

- **Rice Water Weevil (RWW)** *Lissorhoptrus oryzophilus*
- **Fall Armyworm (FA)** *Spodoptera frugiperda*
- **Rice Stink Bug (RSB)** *Oebalus pugnax*
Rice Water Weevil (RWW)

- Native to Southeastern US, but introduced into California, Japan, North and South Korea, China, Taiwan and Europe
- Related species in South America = *Oryzophagus oryzae*
- Lays eggs under water, eggs hatch and larvae move to roots, feed and pupate
RWW Sampling
RWW Core Processing
Low Treatment Thresholds for RWW

- Each larva per 4 inch (10 cm) diam core reduces yield 75 lb/acre (84 kg/ha)!
- RWW populations and damage more severe in organic rice
  - Organic rice flooded earlier (water seeded) when rice is younger and more susceptible
## Economic Injury Levels for RWW at 5000 lb/A

### Estimated Yield (# larvae/pupae per core)

<table>
<thead>
<tr>
<th>Rough rice price ($/cwt)</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>4.0</td>
<td>6.1</td>
<td>8.1</td>
<td>10.1</td>
<td>12.1</td>
</tr>
<tr>
<td>12</td>
<td>2.0</td>
<td>3.0</td>
<td>4.0</td>
<td>5.0</td>
<td>6.1</td>
</tr>
<tr>
<td>18</td>
<td>1.3</td>
<td>2.0</td>
<td>2.7</td>
<td>3.4</td>
<td>4.0</td>
</tr>
<tr>
<td>24</td>
<td>1.0</td>
<td>1.5</td>
<td>2.0</td>
<td>2.5</td>
<td>3.0</td>
</tr>
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</table>
RWW Management

• High plant density dilutes RWW populations and damage; try to achieve a good stand (increase seeding rate, plant later)!!!
  – RWW prefers thin stands
• Shallow flood reduces oviposition sites, but may lead to more weed problems
• Do not drain to control RWWs!!!
  – Soil must dry to cracking to control larvae!!!
RWW Management cont.

- In Texas, later plantings tend to avoid high populations of RWW
- Medium grain varieties (Jupiter, Tesanai) tend to have higher RWW densities, but compensate by good root growth; basically, all varieties susceptible
- Organic farmers in Texas often plant Presidio, Tesanai, Rondo, Mermentau and Sierra (aromatic)
RWW Management cont.

- **Biocontrol**
  - Rodents feed on overwintering RWWs
  - Nematodes attack gut, but in low populations
  - *Beauveria bassiana* infest but again low % mortality

- **No organic chemical control to date**
  - Nematodes; no
  - Agrialoe; no
  - *Bacillus thuringiensis kurstaki*; no
  - Pyrethrins?
  - Ducksalad extract?
Fall Armyworm (FA)

- Defoliates plant, but after seedling stage, can withstand 20% defoliation
- 4-6 instars---each bigger than the last; the larger the larva, the more damage
- Management
  - Increase water depth
  - Egrets and ibises can alert you to populations, but too late!!!
  - Scout fields frequently!!!
FA Management cont.

- *Bacillus thuringiensis*
  - Apply when larvae are small
  - Larvae must ingest product, so kill is not immediate

- Biocontrol
  - Birds
  - *Cotesia* sp.
  - Spiders
  - Biocontrol agent populations too small and not active enough to prevent damage
Rice Stink Bug (RSB)

- Native to Southeastern US
- Piercing-sucking mouthparts; suck juices out of immature grains
- Cause peck and broken grains
- Yield loss?
- Treatment thresholds relatively high; increase as projected yield increases (dilution effect)
Pecky Rice

FIELD PECK
STERILE WATER
UN. BACTERIA
RICE YEAST
AUTO. YEAST
N. CORYLI
## Revised Treatment Thresholds

<table>
<thead>
<tr>
<th>Projected yield (lb/acre)</th>
<th>Heading</th>
<th>Milk</th>
<th>Soft dough</th>
<th>Hard dough</th>
</tr>
</thead>
<tbody>
<tr>
<td>4500</td>
<td>8</td>
<td>10</td>
<td>17</td>
<td>47</td>
</tr>
<tr>
<td>6000</td>
<td>10</td>
<td>14</td>
<td>22</td>
<td>63</td>
</tr>
</tbody>
</table>
RSB Management

- Keep roads mowed (barnyard grass and broadleaf signal grass good hosts)
- Late planting can lead to higher populations at heading
- Better the stand and projected yield, better the dilution effect
- Late maturing varieties more susceptible
- No effective organic-approved chemical
  - Pyrethrins?
RSB Natural Biocontrol

- *Podisus* sp.
- *Beskia aelops*
- *Telenomus* spp.
- Spiders
Occasional Pests

- Rice Seed Midges; Order Diptera: Family Chironomidae; *Cricotopus* spp., *Paratanytarsus* spp., *Chironomus* spp.
  - Larvae are aquatic and feed on germinating rice seeds
  - Stand reducers
Rice Seed Midge Management

- Plant sprouted seed
- Employ pinpoint flood
- Plant asap after flooding
- Increase seeding rate
- Plant late
Occasional Pests cont.

- Rice Leaf Miner (*Hydrellia griseola*)
- South American Rice Miner (*Hydrellia wirthi*)
- Aphids
- Hydrophylid Beetles (*Tropisternus lateralis*)
- Channeled Apple Snail (*Pomacacea canaliculata*)
Figure 1. The rice delphacid and hoja blanca disease: a new threat to Texas rice production. Extensive damage to a ratoon rice field in Southeast Texas (A) caused by the rice delphacid (B) during fall 2015. Chlorotic and necrotic symptoms caused by hoja blanca disease in a rice leaf (C), panicle (D), and entire plant (E) following transmission by the rice delphacid vector in Santander, Colombia.
Questions?