Insect Management in Reduced Tillage Systems

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What is Reduced Tillage?

- Reduced tillage practices including
  - No-till
  - Ridge-till
  - Strip-till
  - Etc.

- May not result in the minimum 30% residue required to meet the strict, old definition of “conservation tillage”
Reduced Tillage

- May involve the planting of cover crops such as wheat, rye, clover, etc.
- Not all reduced tillage systems are the same
Differences in Weed Control
(Is it weed control or tillage?)

• Conventional-tillage systems
  - Spring tillage: weed control (and seed bed preparation) often occurs several weeks prior to planting, quickly killing weeds
  - Fall tillage: weed control may be similar to reduced-till systems

• Reduced-tillage systems
  - Herbicides substitute for tillage, but weeds die relatively slowly
  - “Burndown” often postponed until shortly before planting
  - Herbicide tolerant or resistant weeds may remain
How Tillage May Impact Insects

• Mechanical
  - Destruction or exposure of soil insects or residue harboring overwintering insect populations

• Ecological
  - Removal of weed hosts for insect pests
  - Lack of residue/habitat for beneficial insects

• Microclimate
  - Seedbeds may warm-up faster in tilled systems (but temperature fluctuations may be greater)
  - Soils may waterlog faster (but also dry more quickly)
  - Affecting plant growth, and thus, susceptibility to insect pests such as thrips (effects may be environment specific)
# Tillage and Thrips

<table>
<thead>
<tr>
<th>Date</th>
<th>Thrips per 10 plants*</th>
<th>Disked</th>
<th>Strip tillage</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 29</td>
<td>23.0 a</td>
<td>23.6 a</td>
<td></td>
</tr>
<tr>
<td>June 6</td>
<td>131.5 a</td>
<td>70.9 b</td>
<td></td>
</tr>
<tr>
<td>June 18</td>
<td>35.5 a</td>
<td>16.8 b</td>
<td></td>
</tr>
</tbody>
</table>

* Means are averages across aldicarb treated and untreated plots (> 95% of population was tobacco thrips).

Lohmeyer et al. (2002), University of Georgia, P < 0.05
Tillage, Cover Crops and Cutworms

Leonard (1995), Louisiana State University, P < 0.05
Tillage vs. Herbicides and Cutworms

Leonard et al. (1993), Louisiana State University, P < 0.05 at all weeks
Tillage and Aphids

DeSpain et al. (1990), Texas A&M
Data for Corpus Christie, 1988, P < 0.001

Leonard (1995), LSU
Mid-season infestations

No-till
Conven-till

Reduced-till
Conven-till

% Infested plants

No./10 plants (seasonal)

Tillage system

Year

Tillage and Aphids

- “Field studies of aphid infestations … indicated that aphid numbers were always lower in conservation-tillage or crop-rotation systems compared to continuous-cotton conventional-tillage systems”

Leser (1995), Texas A&M (TX High Plains)
# Tillage and Fire Ants

<table>
<thead>
<tr>
<th>Cropping / Surface</th>
<th>Ants per 10 m row</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aldicarb</td>
</tr>
<tr>
<td>Tillage</td>
<td></td>
</tr>
<tr>
<td>Rye / Disk</td>
<td>54.3 b</td>
</tr>
<tr>
<td>Rye / No-till</td>
<td>133.3 a</td>
</tr>
<tr>
<td>Monocrop / Disk</td>
<td>48.3 b</td>
</tr>
<tr>
<td>Monocrop / No-till</td>
<td>113.3 ab</td>
</tr>
</tbody>
</table>

McCutcheon (1999), Clemson University, P < 0.05
Tillage and Heliothines

- Tillage can reduce spring emergence of bollworm and tobacco budworm moths emerging from pupae overwintering in cotton fields, but low overwintering populations are usually found in cotton
  - Hopkins (1972), Harris (1998), Roach (1981), Schneider (unpublished), etc.

- If tillage is done in spring, overwintering populations may have already emerged
Insects in Reduced Tillage Systems

- **Cutworms**: elevated risk (highly dependent upon use of cover crops and timing of preplant herbicide application)
  - At-planting or pre-plant insecticides often recommended
- **Thrips**: little net risk (but impacts can vary greatly with environmental conditions)
- **Aphids**: little or increased risk (at least partially dependent upon presence of fire ants)
- **Bollworm/budworm**: increase in overwintering survival
  - Negligible effect on overall size of population?
Other Potential Problems

• False chinch bug
  - More common in reduced-till systems (dispersal from shepardspurse, prostrate spurge, etc.)

• Threecornered alfalfa hopper
  - More common in reduced-till systems
  - Tended by fire ants

• Grasshoppers
  - Lack of soil disturbances increases hatching success
Other Potential Problems

- **Spider mites**
  - More common in reduced-till systems using glyphosate tolerant crops (possible dispersal from cutleaf evening primrose, etc.)

- **Slugs**
  - More common in reduced-till systems
  - Appears more common following corn

- **Snails**
  - Increased numbers in no till, but of little economic importance
Conclusions

- Reduced-till systems are at greater risk to a few insect pests, but these tend to be occasional or minor pests
  - Cutworms, aphids, false chinch bug, grasshoppers, slugs
  - Impact on other, more important pests is generally small
- Risks are dependent upon timing of pre-plant herbicide applications and weather conditions
- Reduced tillage has sporadic but mostly positive impacts on populations of beneficial arthropods
  - Dependent upon species, use of cover crops, etc.
- Greater insect pest problems in reduced-till cotton is not a limiting factor
  - System specific pest management is sometimes needed
  - Awareness of potential problems