Tillage: Can it be a Tool for Slug Management in No-till Field Corn?

J. Whalen, B. Cissel, R. Taylor and P. Sylvester
University of Delaware
Methods: Tillage Implements

Photos: J. McGrath – Un of MD
2010 Tillage Demonstrations
Field #1 – Pre-Plant

90.65% Cover
Field #1: Post Plant Percent Damaged Plants

- No-till
- Disk
- Chisel

17-May, 21-May, 25-May
NCC Field #1: Post Plant Damage Rating

![Bar chart showing post plant damage rating for different tillage methods and dates.]

- **No-till**: Red bars indicate higher damage ratings, with the highest rating on 21-May.
- **Disk**: Blue bars show moderate damage ratings, with the highest on 25-May.
- **Chisel**: Green bars display lower damage ratings, with the highest on 21-May.

Legend:
- Blue: 17-May
- Red: 21-May
- Green: 25-May
Field #2 – Pre-Plant

90.27% Cover
Field #2: Post Plant Percent Damaged Plants

- No-till
- Disk
- Chisel

- 17-May
- 21-May
- 25-May
Field #2: Post Plant Damage Rating

No-till

Disk

Chisel

17-May, 21-May, 25-May
Vertical tillage: Great plains turbo-till: 2 – 3” depth

Photos: J. McGrath – Un of MD
Vertical Tillage

Photos: J. McGrath – Un of MD
## Turbo Till – Grower Fields

<table>
<thead>
<tr>
<th>Location #</th>
<th>Pre-Count Av per sq ft April 5</th>
<th>% Damage May 25</th>
<th>Rating May 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (TT)</td>
<td>11</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>2 (TT)</td>
<td>9</td>
<td>1.25</td>
<td>1</td>
</tr>
<tr>
<td>3 (NT)</td>
<td>7 (5)</td>
<td>76(2)</td>
<td>2.5 (1)</td>
</tr>
</tbody>
</table>
Objectives in 2011

- Identify and document the conditions associated with vertical tillage that could help reduce slug populations and/or the damage caused by slugs in no-till corn systems

- Document the impact of vertical tillage on overall soil health in no-till corn systems

- Identify potential water quality benefits of using vertical tillage in no-till corn systems and start to develop a process to document the impact
Cooperators

- 3 producers in Kent County: 2 with historical slug problems – started with 9 fields pre-planting; ended with 4 fields with paired strips

- Willard Agri-Service: helped producers GPS strips so we can capture yield data

- NRCS: assistance with soil health evaluations
Slug Sampling in 5-10 locations per field

Shingle Sampling: 1 ft$^2$ sampling units; placed between the previous year’s crop rows and cleared residue from below each shingle; weekly counts on adults and juveniles

Egg Surveys in 1 sq ft area next to shingles: used Ron Hammond’s video
Strips Established and Fields Planted

- Slug Population Assessments
  (a) Shingles back in fields after corn was planted – 2 weeks approx.
  (b) Counted damaged plants per 10 ft – new damage
  (c) Damage ratings - 0-4 rating scale
    0 = no damage; 1 = only one leaf showing damage (less than 25% defoliation);
    2 = all leaves showing moderate damage (25-50% defoliation); 3 = all leaves consumed except one remaining intact (greater than 75% defoliation);
    4 = completely removed at ground level.
  (d) Shingles back in the fall after harvest - ??

- Plant populations – to see if slugs were reducing stand
Strips Established and Fields Planted

- Soil Health Measurements: percent cover, compaction with a penetrometer (8, 16, and 24 inches), infiltration, bulk density for compaction, slake test for soil stability -- indicator of biological activity
- Pitfall Traps for Identification of Beneficial Species
- Yield Data – yield monitor; hand harvested if needed
# Grower # 1 (6 paired strips)

## Pre-Planting

<table>
<thead>
<tr>
<th>Slug Stage</th>
<th>Total Number Shingle Counts (5) March 29 - April 4</th>
<th>Total Number per Square Ft (10) April 11 - 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Marsh Slug – Adults</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Marsh Slug - Juveniles</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grey Garden Slug Adults</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Grey Garden Slug Juveniles</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
## Grower #1 (6 paired strips) Post Planting

<table>
<thead>
<tr>
<th>Date</th>
<th>Tillage Type</th>
<th>Average</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Damage Rating</td>
<td>% Damaged Plants</td>
<td>Slugs/shingle</td>
<td></td>
</tr>
<tr>
<td>May 6</td>
<td>NT</td>
<td>----</td>
<td>7.6</td>
<td>0.2 GG</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>----</td>
<td>8.0</td>
<td>0.3 GG</td>
<td></td>
</tr>
<tr>
<td>May 16</td>
<td>NT</td>
<td>0.7</td>
<td>15.7</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>0.6</td>
<td>17.7</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>May 24</td>
<td>NT</td>
<td>0.3</td>
<td>7.0</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>0.3</td>
<td>6.0</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
# Grower #1 – Soil Health

<table>
<thead>
<tr>
<th>Measure</th>
<th>Value</th>
<th>NT</th>
<th>TT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact – 8”</td>
<td>psi</td>
<td>224</td>
<td>228</td>
</tr>
<tr>
<td>Compact - 16”</td>
<td>Psi</td>
<td>255</td>
<td>270</td>
</tr>
<tr>
<td>Compact-24”</td>
<td>psi</td>
<td>189</td>
<td>203</td>
</tr>
<tr>
<td>Infiltration</td>
<td>secs</td>
<td>643</td>
<td>188</td>
</tr>
<tr>
<td>Cover</td>
<td>%</td>
<td>77</td>
<td>54</td>
</tr>
<tr>
<td>Slug Stage</td>
<td>Total Number Shingle Counts (5) March 21 - April 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marsh Slug – Adults</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marsh Slug - Juveniles</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey Garden Slug Adults</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey Garden Slug Juveniles</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Grower # 2 (3 paired strips) Post Planting

<table>
<thead>
<tr>
<th>Date</th>
<th>Tillage Type</th>
<th>Average</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Damage Rating</td>
<td>% Damaged Plants</td>
<td>Slugs/shingle</td>
</tr>
<tr>
<td>May 18</td>
<td>NT</td>
<td>0.5</td>
<td>12.7</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>0.5</td>
<td>10.6</td>
<td>0.13</td>
</tr>
<tr>
<td>June 3</td>
<td>NT</td>
<td>0.8</td>
<td>18.0</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>0.3</td>
<td>5.3</td>
<td>0</td>
</tr>
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</table>
## Grower #2 – Soil Health

<table>
<thead>
<tr>
<th>Measure</th>
<th>Value</th>
<th>NT</th>
<th>TT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact – 8”</td>
<td>psi</td>
<td>276.7</td>
<td>227.8</td>
</tr>
<tr>
<td>Compact - 16”</td>
<td>Psi</td>
<td>328.9</td>
<td>267.8</td>
</tr>
<tr>
<td>Compact-24”</td>
<td>psi</td>
<td>210.0</td>
<td>190</td>
</tr>
<tr>
<td>Infiltration</td>
<td>secs</td>
<td>115.5</td>
<td>74.7</td>
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<tr>
<td>Cover</td>
<td>%</td>
<td>85</td>
<td>56</td>
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## Grower # 3 A (3 paired strips)
### Pre-Planting

<table>
<thead>
<tr>
<th></th>
<th>Total Number Shingle Counts (5) March 21 - April 4</th>
<th>Total Number per Square Ft (10) April 11 - 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Marsh Slug – Adults</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Marsh Slug - Juveniles</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Grey Garden Slug Adults</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Grey Garden Slug Juveniles</td>
<td>0</td>
<td>13</td>
</tr>
</tbody>
</table>
# Grower # 3A (3 paired strips) Post Planting

<table>
<thead>
<tr>
<th>Date</th>
<th>Tillage Type</th>
<th>Average</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Damage Rating</td>
<td>% Damaged Plants</td>
<td>Slugs/shingle</td>
</tr>
<tr>
<td>May 9</td>
<td>NT</td>
<td>----</td>
<td>1.3</td>
<td>1.3 GG</td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>----</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>May 16</td>
<td>NT</td>
<td>2.0</td>
<td>76</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>1.7</td>
<td>63</td>
<td>0</td>
</tr>
<tr>
<td>May 24</td>
<td>NT</td>
<td>1.4</td>
<td>68.7</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>1.3</td>
<td>60.7</td>
<td>0.2</td>
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</table>
## Grower #3-A – Soil Health

<table>
<thead>
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<th>Measure</th>
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<th>TT</th>
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</thead>
<tbody>
<tr>
<td>Compact – 8”</td>
<td>psi</td>
<td>184.7</td>
<td>208.7</td>
</tr>
<tr>
<td>Compact - 16”</td>
<td>Psi</td>
<td>201.3</td>
<td>210.3</td>
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<tr>
<td>Compact-24”</td>
<td>psi</td>
<td>164.7</td>
<td>172</td>
</tr>
<tr>
<td>Infiltration</td>
<td>secs</td>
<td>292.8</td>
<td>75.5</td>
</tr>
<tr>
<td>Cover</td>
<td>%</td>
<td>73</td>
<td>54</td>
</tr>
</tbody>
</table>
# Grower # 3 B (3 paired strips)

## Pre-Planting

<table>
<thead>
<tr>
<th></th>
<th>Total Number Shingle Counts (5) March 21 - April 11</th>
<th>Total Number per Square Ft (10) April 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs (sq ft)</td>
<td>48</td>
<td>0</td>
</tr>
<tr>
<td>Marsh Slug – Adults</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Marsh Slug - Juveniles</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grey Garden Slug Adults</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Grey Garden Slug Juveniles</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
## Grower # 3B (3 paired strips) Post Planting

<table>
<thead>
<tr>
<th>Date</th>
<th>Tillage Type</th>
<th>Average</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Damage Rating</td>
<td>% Damaged Plants</td>
<td>Slugs/shingle</td>
</tr>
<tr>
<td>May 9</td>
<td>NT</td>
<td>1.5</td>
<td>67.3</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>1.4</td>
<td>44.7</td>
<td>0.2</td>
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<tr>
<td>May 16 *</td>
<td>NT</td>
<td>1.3</td>
<td>40.7</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>0.7</td>
<td>17.3</td>
<td>0.2</td>
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<tr>
<td>May 24</td>
<td>NT</td>
<td>0.7</td>
<td>33.3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>1.1</td>
<td>46.7</td>
<td>0</td>
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</tbody>
</table>
# Grower #3-B – Soil Health

<table>
<thead>
<tr>
<th>Measure</th>
<th>Value</th>
<th>NT</th>
<th>TT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact – 8”</td>
<td>psi</td>
<td>206.7</td>
<td>202.7</td>
</tr>
<tr>
<td>Compact - 16”</td>
<td>Psi</td>
<td>235.3</td>
<td>221.3</td>
</tr>
<tr>
<td>Compact-24”</td>
<td>psi</td>
<td>198</td>
<td>178</td>
</tr>
<tr>
<td>Infiltration</td>
<td>secs</td>
<td>307.7</td>
<td>43.8</td>
</tr>
<tr>
<td>Cover</td>
<td>%</td>
<td>76</td>
<td>49</td>
</tr>
</tbody>
</table>
Summary

- Trend for Growers #2 and 3 – turbo till less plant damage – is it significant?? – need true replication

- Soil Health:
  - compaction generally same in no-till and turbo tilled areas at least to 24”
  - infiltration faster in turbo tilled
  - Bulk Density: similar numbers in 2 locations (grower #2 and 3A)