Nematode management in row crops

Zane Grabau
zgrabau@ufl.edu  @UFcropnematodes
Panhandle Row Crop Short Course 2020
Outline

• Overview of nematodes in row crops
• Nematode management
  – Resistance
  – Crop rotation
  – Nematicicides
Nematodes in row crops: Root-knot nematodes

- Root-knot nematodes
- Affect most crops
  - Species varies by crop
- Common and damaging
Nematodes row crops: Sting nematode

- Problem on most row crops
  - May vary by population
- Very damaging in localized areas; no galling
- Only in very sandy soil (90%)
Nematodes in row crops: Reniform nematode

- Affects cotton & soybean
- Subtle symptoms
- Heavier soil optimal (80% sand)
- Other nematodes also infect row crops.
- **If you suspect a nematode problem, sample!**
Outline

• Nematodes in row crops
• Nematode management: How do strategies compare?
  – Nematicides
  – Resistance
  – Crop rotation
## Nematode management: nematicides

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Labelled row crops (FL)</th>
<th>Timing</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telone</td>
<td>all</td>
<td>Preplant</td>
<td>Fumigant</td>
</tr>
<tr>
<td>Velum Total*</td>
<td>Cotton, peanut</td>
<td>In-furrow</td>
<td>Liquid</td>
</tr>
<tr>
<td>Propulse*</td>
<td>Corn, peanut</td>
<td>In-furrow (corn) Pegging (peanut)</td>
<td>Liquid</td>
</tr>
<tr>
<td>AgLogic 15GG</td>
<td>Cotton, peanut</td>
<td>1. In furrow 2. Pegging</td>
<td>Granular</td>
</tr>
<tr>
<td>Vydate C-LV/Return XL</td>
<td>Cotton, peanut</td>
<td>1. At-planting 2. Pegging</td>
<td>Liquid</td>
</tr>
<tr>
<td>Counter 15G</td>
<td>Corn</td>
<td>In-furrow</td>
<td>Granular</td>
</tr>
</tbody>
</table>

* Velum and Propulse have same active for nematodes: fluopyram.

Cost? $40-80/acre for nematicides
Nematode management: nematicidal seed treatments

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Active ingredient</th>
<th>Labelled crops</th>
<th>First launch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeris</td>
<td>Thiodicarb, Imidicloprid</td>
<td>Cotton</td>
<td>2008</td>
</tr>
<tr>
<td>VOTiVO</td>
<td>Live <em>Bacillus firmus</em></td>
<td>Cotton, soybean, corn</td>
<td>2010</td>
</tr>
<tr>
<td>Avicta</td>
<td>Abamectin</td>
<td>Cotton, corn, soybean</td>
<td>2011</td>
</tr>
<tr>
<td>COPeO/ILeVO</td>
<td>Fluopyram</td>
<td>Cotton/soybean</td>
<td>2014</td>
</tr>
<tr>
<td>BioST Nematicide 100</td>
<td>Dead <em>Burkholderia</em></td>
<td>Cotton, soybean, corn</td>
<td>2017</td>
</tr>
<tr>
<td>AVEO EZ Nematicide</td>
<td>Live <em>Bacillus amyloliquefaciens</em></td>
<td>Soybean, corn</td>
<td>2018</td>
</tr>
</tbody>
</table>

Cost? $18/acre? Included in seed cost?
Nematicide efficacy data

- Multi-year cotton
  - In-furrows
  - Seed treatments
- Preliminary corn data
Velum Total rate trials: 3 years at Quincy station

2016 RN abundances at harvest (Protected Fisher’s LSD at $P<0.05$)

2017 RN abundances at 46 DAP (2 trials combined)
Fluopyram affected cotton yield (3 trials combined)

$57/acre return even at $.62 cotton
Velum Total vs. AgLogic: 2 years at Quincy station

RN root abundances at midseason (2 trials combined)
Nematicide seed treatments: 4 years at Quincy station

3 trials combined: 49 DAP

4 trials combined
Cotton nematicides summary

- In-furrow nematicides can have value

- Don’t get return every year—environment & efficacy

- Less value with seed treatments in UF trials
  - Better results in other states
Corn nematicide trial

- At Hastings UF station
- Severe sting nematode with other nematodes present
  - High end pressure

1. Untreated control
2. Telone @ 3 gal/acre
3. Telone @ 6 gal/acre
4. Counter 20G @ 4.9 lb/acre
5. Propulse at 8 oz/acre
6. Propulse at 13.6 oz/acre (higher than label limit)
May 23 (48 DAP) at Hastings corn nematicide trial
Nematicide impacts on sting nematode and yield

**Sting nematode counts/100 cc soil**

**Yield (bu/ac). Control and Telone had poor stand due to planter issues**
Outline

• Nematodes in row crops
• Nematode management
  – Nematicides
  – Resistance
  – Crop rotation
Nematode management: resistant cultivars

- Nematode reproduction reduced/eliminated
- Reduces damage, lowers nematode populations
- Pest-specific: mainly root-knot resistance available
Resistant cultivars by crop

- Peanut (highly resistant)
  - Tifguard
  - Georgia 14N
  - TifNV H/L
    - Better yield potential
- Cotton (moderate-high)
  - Variety of root-knot resistant cultivars
  - “Double gene” better
- Soybean (moderate)
  - Some cultivars resistant; mainly cotton root-knot
Resistance: 2019 on-farm peanut nematode trials

- Trials in Jackson and Columbia county
  1. 06G without nematicide
  2. 06G with Velum Total 18 oz/a
  3. TifNV without nematicide
  4. TifNV with Velum Total 18 oz/a
Columbia County trial: severe nematode pressure

Chlorosis and necrosis in 06G, TifNV greener

Sep. 11 (127 days)
Drone imagery of peanut field about 127 dap (By Darren Raj)
TifNV managed root-knot and increased yield
Jackson County: light nematode pressure. TifNV naturally slightly greener.

Sep. 10 (129 days after planting)
Root-knot infestation low; yield greater for 06G than TifNV

Soil counts at harvest
Outline

• Overview and diagnosis of nematodes
• Nematode management
  – Nematicides
  – Resistance
  – Crop rotation
Nematode management: Rotation

- Grow non-host, nematodes decline, yields increase
  - Varies by nematode species

<table>
<thead>
<tr>
<th>Crop</th>
<th>Peanut root-knot</th>
<th>Cotton root-knot</th>
<th>Sting*</th>
<th>Reniform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>Good</td>
<td>Bad</td>
<td>Bad</td>
<td>Bad</td>
</tr>
<tr>
<td>Peanut</td>
<td>Bad</td>
<td>Good</td>
<td>Bad</td>
<td>Good</td>
</tr>
<tr>
<td>Corn</td>
<td>Good</td>
<td>Bad</td>
<td>Bad</td>
<td>Good</td>
</tr>
<tr>
<td>Soybean</td>
<td>Bad</td>
<td>Bad</td>
<td>Bad</td>
<td>Bad</td>
</tr>
</tbody>
</table>

* Grasses are worst for sting, avoid them. Host range varies by sting nematode population.
Rotation x nematicide example

• Sod-based rotation long-term trial
• Infested with reniform nematode
• Short and long rotation
  – Cotton-Cotton-Peanut
  – Cotton-3 years non-host
• In 2017 and 2018 compared with and without Velum
Rotation more effective than nematicide at managing RN abundances

Midseason 2017 data
Lint yield data from 2017 (neither effective in 2018)
Summary

• Know your nematodes: sample

• Different management strategies have value

• Choose strategy that will work for your nematodes and situation
Questions?

• Find the Grabau Lab on Twitter & Facebook: @UFcropnematodes
• zgrabau@ufl.edu