Agricultural Insect Management

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Topics
- Banks grass mite management
  - New miticides
  - Managing pests in farm-stored grain

BIOLOGY AND MANAGEMENT OF CORN SPIDER MITES

HIGH PLAINS INTEGRATED PEST MANAGEMENT GUIDE FOR COLORADO, WESTERN NEBRASKA, MONTANA, AND WYOMING

highplainsipm.org

CORN SPIDER MITES

CORN SPIDER MITES: PEST STATUS
- BGM is native
- Pest of various grass crops
- Key pest of Colorado corn

TSM  BGM
CORN SPIDER MITES: LIFE CYCLE (BGM)

- Egg, 3 immature stages, adult
- Egg to adult in 10 – 20 days
- In lab, 70x increase per generation

CORN SPIDER MITES: LIFE CYCLE (BGM)

- Overwinter as orange-yellow fertilized females on alternate grass hosts
- Walk or “balloon” back to corn in spring

CORN SPIDER MITES: FACTORS FAVORING BGM

- Infestations start on undersides of lower leaves
- Gradually move into upper part of plant
- Most damage occurs between pollen shed and denting

Severe BGM chlorosis results first in death of leaf edges, then the entire leaf

25 year average grain yield loss at Rocky Ford – 22%

- Drought stress
- Post-reproductive growth stages
- No TSM
- Insecticides
- Low rainfall
- Few natural enemies
- >95F temperatures
INFLUENCE OF IRRIGATION ON CORN SPIDER MITES
Iliff – 2007

CORN SPIDER MITES: BIOLOGICAL CONTROL

• 35 natural enemies
• 1 fungal disease
• Commercial releases not cost effective

CORN SPIDER MITES: ACTION THRESHOLDS
Preventive Treatments

• No conventional threshold
• Seven yes/no questions are used to assess mite risk

CORN SPIDER MITES
Effect of Insecticides

Spider Mite Management Options

• Preserve biological control
• Preventive miticides
• Reactive miticides
• Preventive vs. reactive depends on local resistance problems, other pests

Biological control is often the only control needed for spider mites in corn

02/26/2011
**CORN SPIDER MITES: PREVENTIVE MITICIDE QUESTIONS**

- Crop near tasseling?
- Most plants infested?
- Parts of crop drought stressed?
- Mite predators scarce?

≥3 “Yes” answers indicates reasonable need for preventive treatment

**CORN SPIDER MITES: PREVENTIVE MITICIDE QUESTIONS**

- Max temps ≥ 95°F for next 2 weeks?
- Field history of mite problems?
- TSM problems expected?

**PREVENTIVE MITICIDES**

<table>
<thead>
<tr>
<th></th>
<th>2006 (26)</th>
<th>2007 (20)</th>
<th>2010 (20)</th>
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<tbody>
<tr>
<td>Onager 1E, 12 oz</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Oberon 4SC + dimethoate, 4 + 16 oz</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Oberon 4SC, 4 oz</td>
<td>4</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Comite II + dimethoate, 36 + 16 oz</td>
<td>5</td>
<td>8</td>
<td>10</td>
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<tr>
<td>Comite II, 36 oz</td>
<td>24</td>
<td>20</td>
<td>19</td>
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</table>

*Total treatments in trial in ()

**MITES/5 LEAVES, AERIALLY-APPLIED MITICIDES, OLATHE, CO 2010**

- Damage in lower 1/3 of plant and colonies in middle 1/3

**CORN SPIDER MITES: ACTION_THRESHOLDS**

- Texas A&M dynamic threshold

**REACTIVE MITICIDES**

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<td>Capture</td>
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<td>6</td>
<td>8</td>
<td>9</td>
<td>23</td>
<td>14</td>
</tr>
<tr>
<td>Capture + dimethoate</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>8</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Dimethoate</td>
<td>10</td>
<td>11</td>
<td>15</td>
<td>14</td>
<td>19</td>
<td>6</td>
</tr>
<tr>
<td>Agri-Mek**</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>--</td>
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</tbody>
</table>

*Total treatments in trial
**abamectin: only potential new product
CORN SPIDER MITES: CHEMICAL CONTROL (BGM)

- Control improves up to 3 GPA
- Comite improves up to 5 GPA
- pH for dimethoate
- Surfactants?

3 GPA minimum
- Comite improves up to 5 GPA
- Buffer dimethoate
- Surfactants?

Stored Grain Pests
- Cosmopolitan
- Mostly tropical and subtropical
- Specific temperature and humidity requirements
- Field infestations are rare in temperate areas
- Primarily Coleoptera, Lepidoptera
- Many also pantry pests
- Pests of many items composed of dried plant or animal material

Primary Grain Pests
- Capable of destroying intact grain
- Larvae usually develop within seeds
- aka “Internal infesters”

Lesser grain borer, *Rhyzopertha dominica*
Secondary Grain Pests

- Feed on broken grain and grain fragments
- Losses associated with heating, fungi, off odors
- aka “External infesters”

Stored Grain Economics

- Protection of realized rather than potential profit
Stored Grain

Management

• Similar recommendations worldwide
• Sanitation and environmental management are key elements
• Fumigants are limited
  • Requirements for effectiveness
  • Hazards
• Protectants also limited

Stored Grain

Prevention

• Importance of Time
  • In Colorado properly stored grain is unlikely to have significant insect problems in the first 2-3 years

Stored Grain

Prevention

• Grain quality can’t improve in storage
  • Insects are one source of quality loss
  • Most insect loss can be prevented

Stored Grain

Prevention

• Insect reduction in quality
  • Direct consumption
  • Source of heat and moisture
  • Facilitate 2nd infestation & infection
  • Contaminants
  • Increase molds, fines & dust which interfere with fumigation

Stored Grain

Prevention

• Sources of infestation
  • Infested storage
  • Infested equipment
  • Movement from outside

"02/26/2011"
Stored Grain

Prevention

• Avoid storing new grain on old
  • Old grain is a common source of undetected infestations

• A small number of insects can lead to big problems

<table>
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<th>Days</th>
<th>Weevils</th>
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<tr>
<td>0</td>
<td>30</td>
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<tr>
<td>82</td>
<td>390</td>
</tr>
<tr>
<td>105</td>
<td>1473</td>
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<td>178</td>
<td>11,018</td>
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</table>

• Store clean, dry grain
  • Eliminate existing infestations
  • Destroy or feed first few bushels through any equipment

• Importance of temperature
  • Reproduction stops at 60°F
  • All activity stops at 50°F
  • Some mortality due to starvation
  • Complete mortality expected after 48 hours below 0°F

• Importance of Moisture
  • Low moisture inhibits insect reproduction & development
  • Increased stress from obtaining moisture metabolically
  • 12% grain moisture is ideal for insect management, but may not be practical in some environments
Stored Grain

Prevention: Effect of temperature and moisture on weevils produced in 5 months

<table>
<thead>
<tr>
<th>% Grain Moisture</th>
<th>Grain Temperature (°F)</th>
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<tbody>
<tr>
<td></td>
<td>60</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
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<tr>
<td>12</td>
<td>58</td>
</tr>
<tr>
<td>14</td>
<td>951</td>
</tr>
</tbody>
</table>

- **Importance of dockage**
  - Dockage improves insect survival

- **Minimizing dockage**
  - Adjust combine
  - Dry grain carefully
  - Use screening or perforated section on auger
  - Grain spreader

Control

- **Treat bins and equipment**
- **Treat grain entering storage**
- **Retreat if grain becomes infested**
Stored Grain Bin Treatments

- Thorough cleaning first
- Treat 4 - 6 weeks prior to storage to control insects not removed by cleaning
- Retreat if no storage within 3 months

Stored Grain Bin Treatments

- Treat all inside surfaces
- Treat behind partitions
- Treat under floors
- Treat handling equipment

Stored Grain Bin Treatments

- Treat exterior around any openings
- Treat 6 feet of soil around structure
- Treat exterior just prior to fumigation

Stored Grain Bin Treatments

- Beta-cyfluthrin (Tempo SC Ultra)
- Cyfluthrin (Tempo WP)
- Deltamethrin + chlorpyrifos methyl (Storcide II)
- Diatomaceous earth (several)
- Pyriproxyfen (Nyguard)
- S-methoprene (Diacon)

Stored Grain Bin Treatments

- Protectants
  - Diatomaceous earth (several)
  - Deltamethrin + chlorpyrifos methyl (Storcide II, wheat only)
  - Pirimiphos methyl (Actellic, corn only)
  - S-methoprene (Diacon)
  - Synergized pyrethrins (Pyronyl Crop Spray)

Stored Grain Bin Treatments

- Protectants (top dress, head space)
  - Bt (several, top dress only)
  - Deltamethrin + chlorpyrifos methyl (Storcide II, wheat only)
  - Diatomaceous earth (several)
  - Dichlorvos (Prozap Insect Guard, head space)
  - Pirimiphos methyl (Actellic, corn only)
  - S-methoprene (Diacon)
  - Synergized pyrethrins (Pyronyl Crop Spray)
Applying protectants

Stored Grain

• **Fumigants**
  - Aluminum phosphide (several)
  - Phosphine + CO₂ (ECO₂Fume)
  - Sulfuryl flouride (Profume, in phaseout)