2012 Was The Warmest Year on Record

Chicago, IL: Jan – June, 2012

Contiguous US: June 2011 – 2012
...And 2012 Was a Very Dry Year
Where did all these bugs come from and where might they be going?

Components of an IPM Program

• Monitoring and Sampling (inspect)
• Pest Identification (what pest)
• Decision-making (what action(s))
• Intervention (take action (s))
• Follow-up (re-inspect)
• Record-keeping (write it down, history)
• Education (learn)
Variegated cutworm, black cutworm, yellow-striped armyworm, fall armyworm, and Loopers.

- Tomatoes, soybeans, alfalfa, potato, AND MINT
- Hostas, petunias, and lots & lots of other things

May 2012

June 2012
Mint Insect Control: Variegated Cutworm & Loopers

- Early season leaf damage / stand loss
- Mid to later season leaf damage / localized

Variegated cutworm larvae
Alfalfa looper larvae
Cabbage looper larvae
Cutworm & Looper Control

Established Thresholds: 2-3 larvae ft²

Early Season:
- Lorsban 4E broadcast (1-2 lb ai/ac)
- Lorsban Advanced

Mid to Late Season:
- Orthene 90S (1.0-1.3 lb ai/ac)
- Lannate LV (0.7-0.9 lb ai/ac)
- Intrepid 2F (0.2-0.25 lb ai/ac)
- Avaunt 30 WDG (0.07 lb ai/ac)

Variegated cutworm: early larvae
Reduced-Risk Foliar Registrations – Worm Pests

- **Radiant®SC (spinetoram) - registered**
  - **Blackhawk (spinosad) – researchable (2012)**
    - Macroyclic lactone (spinosad: MoA group 5)
      - Use rate 4 - 12 oz / ac (Lepidoptera)
    - 10-14 days persistence (improved photostability)
    - Very low impact on beneficials
  - **Not currently registered for use**

- **Coragen™ (chlorantraniliprole)**
  - Anthranilic diamide (MoA group 28)
    - Use rate 3.5 - 5 oz (Lepidoptera) +MSO 5% v/v
  - 14+ days persistence
  - Very low impact on beneficials and low toxicity
  - Ovicidal activity
Reduced Risk Foliar Options
Registration 2006 - OMRI

- **Entrust® SC (spinosad)**
  - Macroyclic lactone (spinosad: MoA group 5)
    - Use rate 1.25 - 2 oz / A
    - Control of onion thrips
  - 7-10 days persistence (photostability)
  - Very low impact on beneficials
  - Low mammalian toxicity
Benevia 10OD (cyantraniliprole)

- Anthranilic diamide (MoA group 28)
  - Use rate 6.7 – 13.5 fl oz (Lepidoptera ++) +MSO 5% v/v
- 14+ days persistence
- Very low impact on beneficials and low toxicity
- Ovicidal activity
  - Anticipated Approval late 2013

- Fruiting vegetables, Cucurbits, Tuberous and Corm vegetables,
  Leafy vegetables, Brassicas, Bulb vegetables, Mint, etc…
- Loopers, cutworms, mint root borer
Mint Flea Beetle: Seasonal Ecology & Control

Non-chemical Control – Rotation; Do not retain infested stand past 4 years

Threshold - 25 adults/100 sweeps on stubble or presence of larval damage is evident

http://mint.ippc.orst.edu/mfbcycle.htm
Mint Flea Beetle: Chemical Control

- Chemical: target summer adults in August after harvest on stubble.

- Materials: Malathion 57EC
  - 0.7 to 1.0 lb. a.i./A, 7 day phi
Lannate LV
  - 0.065 to 0.9 lb. a.i./A, 14 day phi
Actara 35 WDG
  - 1.5 to 3.0 oz/A, 7 day phi

- Online Phenology Model: degree-days (DD), using a base temperature of 41°F, accumulated from Jan. 1 (Morris, 1990)

  1st instar larvae 405 DD
  2nd instar larvae 575 DD
  3rd instar larvae 775 DD
  Prepupae 1045 DD
  Pupae 1370 DD
  Adults 1555 DD

http://pnwpest.org/cgi-bin/ddmodel
**Garden fleahopper**

**Peppermint 2012**

- *Halticus bractatus* (Hemiptera: Miridae)
  - Foliar-feeding, polyphagous pest
    (bean, beet, cabbage, celery, cucumber, eggplant, lettuce, pepper, potato, pumpkin, squash, tomato, and numerous weeds)

- 2-3 generations / year (WI and IN)

- overwinters as eggs (forage crops) and can develop large populations in forages
Garden fleahopper
Peppermint 2012

- Damage is whitish and yellow speckling plus frass (black spots)

- Possible explanations for occurrence:
  - rarely considered a problem in commercial vegetable production
  - suppression with insecticides is easily accomplished
  - reductions in broad-spectrum insecticide use in mint and adjoining forage legumes may be partially responsible
Significant Problems in Field Crops
More Heat Related Problems

- Rubus spp.
- Lobelia spp.
- Apium spp.
Two-spotted spider mites, *Tetranychus urticae*

**Occurrence**
- Usually occur in hot dry conditions
- More severe in dusty, road side locations
- Multiple generations on undersurface of leaf

**Damage**
- Adults feed in large numbers on leaf surface causing “silvering”
- Lower surface often covered with webbing
- Late season pest
- Can be ‘flared’ by pyrethroids
Spider mite, Management

**Cultural**
- Maintain good plant growth, irrigation
- Avoid dusty roads

**Biological**
- Several effective predators
- Avoid broad-spectrum insecticides

**Chemical**
- Unless necessary, do not use
- ‘Hormoligosis’: boosts egg production
- Agri-Mek, Acramite, Portal, and Oomite
Reduced-Risk Experimental Acaricides

- **Syngenta (3c Registration)**: two-spotted spider mites
  - abamectin (Agri-Mek® 0.15EC, Abba® 0.15EC, Reaper 0.15EC®): 8-12 fl oz/ac
  - abamectin (Agri-Mek 0.7SC): 1.75 – 2.5 fl oz/ac
    * very fast acting
    * chloride channel activator, MoA Class 6
    * 7-10 days residual activity

- **Nichino America (3c Registration 2010)**: mint bud mite & two-spotted spider mite
  - fenpyroximate (Portal®): 1-2 pts/ac
    * METI, MoA Class 21A
    * 10-14 days residual activity
Reduced-Risk Experimental Acaricides

- Bayer Crop Science (3c registration): mint bud mite, two-spotted spider mite
  - spiromesifin (Oberon® 4SC & 2SC): 4-8 fl oz/acre
    * activity against all stages (eggs)
    * lipid biosynthesis inhibitor, MoA Class 23
    * 8-10 days residual activity
    * low toxicity profile
    * soft on beneficials

  - bifenazate (Acramite®): 12-24 fl oz/acre
    * very fast acting
    * carboxylic acid ester, MoA Class 25
    * 10-15 days residual activity
    * safe on beneficials and predatory mites
Mint Bud Mite
*Floridotarsonemus* spp.

- A Key Pest in Midwest Mint Since 1995

- Widely distributed
- Found on muck and mineral soil
- Most destructive on peppermint
- Squirrelly mint symptoms
- Low oil yield (60-80% reductions)

- Damage increases with stand age
Current Chemical Controls

- Currently both Comite/Omite and Fujimite/Portal are registered for control of Mint Bud Mite in Wisconsin
  - Comite (propargite) is less effective and requires careful spray timing along with high spray volumes
  - Poor persistence (2-3 weeks)
  - B2 carcinogen (human health)

- Kelthane has been voluntarily cancelled in the US.

- Few alternatives to Comite/Omite & Fujimite/Portal
## 2008 Reduced-Risk Experimental Acaricides: At Threshold

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Active Ingredient</th>
<th>App No.</th>
<th>Appl Rate</th>
<th>14 Jun</th>
<th>21 Jun</th>
<th>28 Jun</th>
<th>6 Jul</th>
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<tbody>
<tr>
<td>Untreated</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>26.5 a</td>
<td>13.2 a</td>
<td>19.2 ab</td>
<td>16.9 a</td>
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<tr>
<td>Comite EC</td>
<td>propargite</td>
<td>2</td>
<td>48 fl oz / A</td>
<td>13.6 b</td>
<td>8.8 b</td>
<td>10.4 b</td>
<td>14.1 ab</td>
</tr>
<tr>
<td>Fujimite 5EC</td>
<td>fenpyroximate</td>
<td>1</td>
<td>40 fl oz / A</td>
<td>4.8 bc</td>
<td>2.1 c</td>
<td>0.8 c</td>
<td>3.0 bc</td>
</tr>
<tr>
<td>Oberon 2SC</td>
<td>spiromesifen</td>
<td>2</td>
<td>8.0 fl oz / A</td>
<td>5.1 bc</td>
<td>0.8 c</td>
<td>1.3 c</td>
<td>1.8 bc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>12.0 fl oz / A</td>
<td>5.6 bc</td>
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<td>0.2 c</td>
</tr>
<tr>
<td>Acramite 4SC</td>
<td>bifenazate</td>
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<td>16.0 fl oz / A</td>
<td>8.6 bc</td>
<td>4.9 bc</td>
<td>7.1 bc</td>
<td>15.2 ab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>24.0 fl oz / A</td>
<td>7.3 bc</td>
<td>7.7 bc</td>
<td>5.3 bc</td>
<td>9.8 b</td>
</tr>
<tr>
<td>Temprano</td>
<td>abamectin</td>
<td>2</td>
<td>8.0 fl oz / A</td>
<td>2.3 c</td>
<td>3.4 bc</td>
<td>5.3 bc</td>
<td>5.6bc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>12.0 fl oz / A</td>
<td>2.8 c</td>
<td>1.5 c</td>
<td>1.4 c</td>
<td>1.9 c</td>
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<tr>
<td>Dimilin 2L*</td>
<td>diflubenzuron</td>
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<td>40 fl oz / A</td>
<td>14.6 b</td>
<td>12.0 b</td>
<td>18.9 ab</td>
<td>17.9 ab</td>
</tr>
</tbody>
</table>

*Not currently registered for use in Wisconsin
# 2009 Reduced-Risk Experimental Acaricides: At Threshold

## Mean number of mint bud mites/bud

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Active Ingredient</th>
<th>App No.</th>
<th>App Rate</th>
<th>25 Jun</th>
<th>2 Jul</th>
<th>9 Jul</th>
<th>16 Jul</th>
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</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>9.8 a</td>
<td>19.3 a</td>
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2008-09 Experimental Summary: At Threshold

- Acaricide applications at threshold reduced bud mite numbers 14-21 days after application.

- Most effective applications included Fujimite / Portal (2.0 pts/A), Temprano (12 oz/A), and Oberon (12 & 16 oz/A).

- Lower rates of Acramite (12 oz/A) and Oberon (8.0 oz/A) did not maintain acceptable population levels longer than 14 days in either trial year.

- Kelthane has been voluntarily cancelled, but RR-options are available!!
Example of Acaricide Application Sequence
Mint Bud Mite and Two-Spotted Spider Mite

Threshold = 10 mites / bud
Mint Bud Mite Management

Seasonal Population Biology
- overwintering
- development and life history
- seasonal abundance

Treatment Thresholds
- early scouting and surveillance
- > 10 mites / bud
- treat prior to population buildup

Cultural Management
- crop age / crop rotation

Application rates & volume

Perry, C., J. Wyman, and R. Green
http://ipcm.wisc.edu
Vegetable IPM Resources

- **Vegetable Insect Mgmt Web-page**
  - [http://www.entomology.wisc.edu/vegento](http://www.entomology.wisc.edu/vegento)

- **Vegetable Disease Mgmt Web-page**
  - [http://www.plantpath.wisc.edu/wivegdis](http://www.plantpath.wisc.edu/wivegdis)

- **Wisconsin Pest Bulletin**
  - [http://datcpservices.wisconsin.gov/pb/index.jsp](http://datcpservices.wisconsin.gov/pb/index.jsp)
# Acknowledgements

**Wisconsin Mint Board, Inc.**

- Jack’s Pride Farms
- Gumz Muck Farms
- Dennis Zeloski
- David Fisher
- Anders Huseeth
- Scott Chapman

![Bayer CropScience](image)

![Chemtura](image)

**QUESTIONS**