Varroa Mite IPM Program for New England Honey Beekeepers
Webinar Details

• Welcome

• A recording of this webinar will be available within a week at

http://www.neipmc.org/go/ipmtoolbox
We Welcome Your Questions

• Please submit a question at any time using the Q&A feature to your right at any time.

• If you’d like to ask a question anonymously, please indicate that at the beginning of your query.
Webinar Presenters

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Outline

• Honey Bee Health
  – United States
  – Massachusetts
  – Maine

• Varroa Mites
  – Biology
  – Case Study
  – Sampling & Management

• IPM Program Grant

• Future/Next Steps
Some Questions for You
HONEY BEE HEALTH
2017–2018 U.S. Annual Loss = 34%–40%
[USDA Acceptable Level of Loss = 18%]
Honey Bee Health Issues

CCD

Pollination Transport
<table>
<thead>
<tr>
<th>Disease/pest</th>
<th>Causative agent</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adult Parasites</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varroa mites</td>
<td>The parasitic mite, <em>Varroa destructor</em></td>
<td>Presence of adult mites, deformed wings</td>
</tr>
<tr>
<td>Tracheal mites</td>
<td>The parasitic mite, <em>Acarapis woodi</em></td>
<td>K-wings, morbidity</td>
</tr>
<tr>
<td>Nosema</td>
<td>The <em>Nosema apis</em></td>
<td>Diarrhea, distended abdomens</td>
</tr>
<tr>
<td><strong>Brood Pathogens</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American foulbrood (AFB)</td>
<td>The bacterium <em>Paenibacillus larvae</em></td>
<td>Diarrhea, scales, ropy scale</td>
</tr>
<tr>
<td>European foulbrood (EFB)</td>
<td>The bacterium <em>Melissocciara spinosissima</em></td>
<td>Abnormal larvae, foul smelling brood, non-ropy remains, no scale</td>
</tr>
<tr>
<td>Chalkbrood</td>
<td>The <em>Nosema apis</em></td>
<td>White or black mummies in cells or on bottom board</td>
</tr>
<tr>
<td>Sackbrood</td>
<td>A viral infection</td>
<td>Brown larvae in the curled “canoe” shape</td>
</tr>
<tr>
<td><strong>Pests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wax moths</td>
<td>Larvae of <em>Galaria mellonella</em></td>
<td>Silk cocoons and/or tunnels</td>
</tr>
<tr>
<td>Small hive beetle (SHB)</td>
<td>Larvae of <em>Aethinda tumida</em></td>
<td>Wet combs, maggot-like larvae</td>
</tr>
</tbody>
</table>

+ other viruses

“Parasites, Pathogens and Pests, Oh My!”
MDAR HB Health Survey [2015–18]

- 479 beekeepers; 12 counties; 2,687 colonies
- Backyard/Hobbyist beekeeper
- Beekeeping <6 years
- Never had a mentor
- Attended a Bee School course
- Start with package bees, Langstroth hives
- Queens aged >2 years
- Inspected by MDAR
- 2017/18 Reported Colony Losses = 50%
  - 2017/18 Losses attributed to:
    - Varroa mites (19%), Viruses (5%), CCD (5%), EFB (1%), Nosema (1%)
    - Queen issues (11%), Starvation (9%)
    - Environmental factors (24%), Natural disaster (6%), Pesticides (1%)
Maine Losses

2016/2017 Loss: 53%
  • Summer: 6%
  • Winter: 47%

2017/2018 Loss: 43%
  • Summer: 7%
  • Winter: 36%

<table>
<thead>
<tr>
<th>County</th>
<th>N</th>
<th>Summer Loss (%)</th>
<th>Winter Loss (%)</th>
<th>Total Loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Androscoggin</td>
<td>9</td>
<td>8.0</td>
<td>18.4</td>
<td>26.4</td>
</tr>
<tr>
<td>Aroostook</td>
<td>5</td>
<td>4.5</td>
<td>68.2</td>
<td>72.7</td>
</tr>
<tr>
<td>Cumberland</td>
<td>57</td>
<td>8.9</td>
<td>32.0</td>
<td>40.9</td>
</tr>
<tr>
<td>Franklin</td>
<td>3</td>
<td>4.0</td>
<td>12.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Hancock</td>
<td>9</td>
<td>3.1</td>
<td>21.5</td>
<td>24.6</td>
</tr>
<tr>
<td>Kennebec</td>
<td>19</td>
<td>5.5</td>
<td>38.4</td>
<td>43.8</td>
</tr>
<tr>
<td>Knox</td>
<td>12</td>
<td>5.6</td>
<td>33.3</td>
<td>38.9</td>
</tr>
<tr>
<td>Lincoln</td>
<td>11</td>
<td>3.8</td>
<td>42.3</td>
<td>46.2</td>
</tr>
<tr>
<td>Oxford</td>
<td>11</td>
<td>5.1</td>
<td>43.6</td>
<td>48.7</td>
</tr>
<tr>
<td>Penobscot</td>
<td>22</td>
<td>4.8</td>
<td>48.7</td>
<td>53.4</td>
</tr>
<tr>
<td>Piscataquis</td>
<td>1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sagadahoc</td>
<td>9</td>
<td>11.5</td>
<td>38.5</td>
<td>50.0</td>
</tr>
<tr>
<td>Somerset</td>
<td>2</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Waldo</td>
<td>9</td>
<td>12.5</td>
<td>9.4</td>
<td>21.9</td>
</tr>
<tr>
<td>Washington</td>
<td>5</td>
<td>17.2</td>
<td>72.4</td>
<td>89.7</td>
</tr>
<tr>
<td>York</td>
<td>28</td>
<td>5.6</td>
<td>42.4</td>
<td>47.9</td>
</tr>
</tbody>
</table>
Losses 2017/2018

Summer:
- Queen loss/failure (13.2%)
- Unknown (11.8%)
- Varroa mites/viruses (8.5%)
- Environmental factors (8.0%)
- 65.6% no summer loss (139)

Winter:
- Environmental factors (33.9%)
- Weak going into winter (29.2%)
- Varroa mites/viruses (21.7%)
- Unknown (17.5%)
- 26.4% no winter loss (56)
Losses 2017/2018

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Inspector reported causes of death

- 25% queen loss, starvation, poor winter
  - moisture, cold snaps, etc.
- 70% varroa mites and viruses
- 5% everything else
  - Foulbrood, Nosema, vertebrates, insect pests, etc.
USDA Beltsville Bee Lab – 2017

• Analyzed 1,631 samples in 2017 from 47 states
  – 604 = brood
  – 1,008 = adults
  – MA was #3 = 128 samples submitted
• Sample Results:
  – Varroa mites
    • avg count= 20.5/100 bees; alcohol wash
    • highest count= 240.5/100 bees; alcohol wash
  – AFB = 16%, EFB = 22%
  – Nosema = 27%
  – Tracheal mites = >1%
Questions
VARROA MITES
*Varroa destructor*

- Discovered in the United States in 1987, from SE Asia
- Small, red to brown, triangular
- Feed off the fat bodies of adult, pupal and larval bees
- One of the largest ectoparasite to host relationship
Varroa Mites

1. Before the cell is capped, the mite crawls down between the larva and cell wall and embeds itself in the brood food.
2. Once the cell is capped and the brood food is eaten the mite is liberated and begins to suck the blood of the prepupa.
3. The mite lays its first egg (a male) 60-hours after capping and lays subsequent eggs (all females) at 30-hour intervals.
4. Mite feces begin to build-up within the cell.
5. Mites continue to develop and feed upon the bee, transferring viruses.
7. Adult female mites leave with emerging honeybee while male and immature mites stay in the cell and die.
Varroasis; or Parasitic Mite Syndrome (PMS); or Idiopathic Brood Disease Syndrome (IBDS)
Varroa mites - Inspection

An **accurate** sampling device is needed to determine when a treatment is needed.

Visual inspections on adult and immature bees gives an index.
How Many Mites Do You See?

14 mites total!
Update: Hive died, IAPV positive

141 mites total!
Sticky board = ~20% of mite population
• Not as accurate during humid weather
• Issues with performing procedures
• Variation count compared to alcohol wash
• Can kill bees too!
Table 2. Comparisons of the pros and cons of each varroa mite monitoring method.

<table>
<thead>
<tr>
<th>Method</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| Powdered Sugar Roll | • Mite levels are determined in a single visit  
|               | • Standard measure of 300 bees allows for colony comparisons       | • Not as accurate as alcohol wash or ether roll because some mites remain on the bodies of bees  
|               |                                                                     | • Can be time consuming if you have many colonies                      |
| Alcohol Wash  | • Mite levels are determined in a single visit  
|               | • Standard measure of 300 bees allows for colony comparisons       | • 300 bees die                                                        |
| Ether Roll    | • Standard measure of 300 bees allows for colony comparisons       | • Bees inside the hive can get agitated from the smell of ether  
|               |                                                                     | • Ether is highly flammable                                              |
| Sticky Board  | • Can monitor mite drop during treatments  
|               | • No bee deaths from monitoring  
|               | • Can detect low levels of mites                                  | • Need to return to the colony 3 days later  
|               |                                                                     | • Doesn’t measure mite levels that are still on bees, only those that fall off  
|               |                                                                     | • Not easy to compare mite numbers across colonies due to variation in colony size and behavior (e.g., grooming, hygienic behavior)  
|               |                                                                     | • Can be difficult to visually discern mites from other hive waste. Ants and scavengers might remove mite bodies |

The MA & ME Bee Teams found the alcohol wash to be the most reliable & easiest for beekeepers to use!
MDAR Colony Loss Survey [2015–18]

Mite Survey Methods

![Graph showing mite survey methods for different years.](image)

- **Alcohol Wash**
  - 2015/16: [Bar height]
  - 2016/17: [Bar height]
  - 2017/18: [Bar height]

- **Sugar Shake**
  - 2015/16: [Bar height]
  - 2016/17: [Bar height]
  - 2017/18: [Bar height]

- **Bottom Board**
  - 2015/16: [Bar height]
  - 2016/17: [Bar height]
  - 2017/18: [Bar height]
Varroa Mite Monitoring

64.2% monitor for Varroa

33.0% sticky board

26.4% sugar shake

19.3% alcohol wash

2016/2017

50.6%

31%

23%

11%

More than a third (~36%) not monitoring!!!
Questions
IPM PROGRAM GRANT
What Is Missing?

- Communication needs
  - Community Beekeeping Approach

- Educational gap
  - Varroa mite biology
  - Monitoring and diagnosis tools
  - Decision making toolkit – IPM knowledge
  - Label and treatment instructions

- Exceptions
  - Northeast bee season
  - Different hive types
A Varroa Mite Program for New England Honey Beekeepers

- Awarded $19,997 grant for 2018–19
- Collaborate with ME Dept of Ag & Bee Informed Partnership (BIP)
  - Varroa mite jars (3,000)
  - Outreach programs – Varroa Mite IPM, brochures (5,000)
  - MiteCheck website
Please Participate!

2018 Varroa Mite Management Survey for New England Honey Beekeepers

This survey has been created as part of the Northeastern IPM Center’s Varroa Mite Program for New England Honey Beekeepers’ grant to determine the needs of honey beekeepers managing Varroa mites.

Thank you for taking the time to complete the survey and provide information on mite management.

Happy Beekeeping!

Survey Link: bit.ly/2Q5EImV

United States Department of Agriculture
National Institute of Food and Agriculture
What Is Varroa Mite IPM?
Meet The Varroa Mite...

The Varroa Mite, *Varroa destructor*, is an external parasite that attacks adult and immature stages (brood) of honey bees. These mites weaken bees and can transmit viruses during the feeding process. Common signs of mite damage include:

1) open or damaged pupal cells;
2) holes in pupal cappings;
3) emerging adult bees with deformed or missing wings; and
4) visible mites on bees/brood.

Unmonitored and untreated infestations of Varroa mites can result in colony death. Colonies should be routinely monitored so informed management decisions can be made about population levels, treatment methods and efficacy. To obtain the best results, incorporate a range of the chemical and cultural Integrated Pest Management (IPM) methods listed in this brochure.

10 Steps To Doing An Alcohol Mite Wash

**Materials Needed:**
- dishpan
- ½ cup measuring device
- ½ cup 70% rubbing alcohol
- mite wash jar

**Directions:**

1. Inspect honey bee colony to remove a single frame that contains open brood and adult bees. Make sure the queen is not on the frame.
2. Shake worker bees from this frame into the dishpan.
3. Quickly scoop ½ cup of worker bees (~300 bees) from the dishpan and put into provided mite wash jar filled half-way with 70% alcohol.
4. Shake leftover live bees from the dishpan back into the hive.
5. Put the solid and mesh lids on jar and tightly seal.
6. Shake jar vigorously for 1-2 minutes to dislodge mites from submerged bees. Let jar sit for a few minutes to let mites dislodge.
7. Remove solid lid from jar, leaving mesh lid and tightly seal.
8. Pour the mixture of dead bees, mites and alcohol through the mesh lid over the empty dishpan to remove the mites and alcohol. Vigorously shake jar contents while pouring to ensure mites are dislodged.
9. Sift through the liquid debris to count the total mites. If the total number of mites ranges from 3-9, consider treatment options.
10. Discard bees. Alcohol can be re-used if mites are removed. Wash all re-usable materials after use.
## Integrated Pest Management (IPM) Options for Varroa Mites

<table>
<thead>
<tr>
<th>NAME</th>
<th>ACTIVE INGREDIENT [CHEMICAL CLASS]</th>
<th>MODE OF ACTION</th>
<th>APPLICATION MATERIAL</th>
<th>APPLICATION SEASON &amp; TEMPERATURE GUIDELINES</th>
<th>TREATMENT DURATION</th>
<th>KEEP HONEY SUPER ON?</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apivar®</td>
<td>amitraz [amidine]</td>
<td>contact</td>
<td>plastic strip</td>
<td>Spring, Fall</td>
<td>42-56 days</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Apistan®</td>
<td>tau-fluvalinate [pyrethroid]</td>
<td>contact</td>
<td>plastic strip</td>
<td>Spring, Fall [&gt;50°F]</td>
<td>42-56 days</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>CheckMite+®</td>
<td>coumaphos [organophosphate]</td>
<td>contact</td>
<td>plastic strip</td>
<td>Spring, Summer, Fall</td>
<td>42-45 days</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Apiguard®</td>
<td>thymol</td>
<td>fumigant</td>
<td>gel or gel tray</td>
<td>Spring, Fall [60°F to 105°F]</td>
<td>28-42 days</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Api Life Var®</td>
<td>thymol, menthol, eucalyptus oil</td>
<td>fumigant</td>
<td>tablet</td>
<td>Spring, Summer, Fall [64°F to 95°F]</td>
<td>26-32 days</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Mite-Away Quick Strips® (MAQS)</td>
<td>formic acid</td>
<td>fumigant</td>
<td>gel strip</td>
<td>Spring, Summer, Fall [50°F to 85°F]</td>
<td>7 days or 21 days</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Formic Pro®</td>
<td>formic acid</td>
<td>fumigant</td>
<td>gel strip</td>
<td>Spring, Summer, Fall [50°F to 85°F]</td>
<td>14 days or 20 days</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Oxalic Acid</td>
<td>oxalic acid dihydrate</td>
<td>contact, fumigant</td>
<td>vapor or liquid</td>
<td>Spring, Fall</td>
<td>varies by application type</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>HopGuard®II</td>
<td>potassium salt of hops beta acids</td>
<td>contact</td>
<td>cardboard strip</td>
<td>Spring, Summer, Fall</td>
<td>30 days</td>
<td>yes</td>
<td></td>
</tr>
</tbody>
</table>

*Screen Bottom Board, Drone Brood Trapping/Removal, Brood Interruption, Re-Queen/Cage Queen* are cultural, non-chemical options for management depending on management type.
Varroa Mite Alcohol Wash Jar

Beekeeper Cost (per jar): $2/measuring cup & alcohol
Apiary Inspector
Demonstrating the Varroa Mite Alcohol Wash
MiteCheck

Highest Mite Count Reported Per County

United States, counts are per 100 bees

- Change to Canada

0 - 3: Relatively low mite level, keep monitoring and managing (splitting, drone trapping, brood breaks, screened bottom boards) mite populations.

4 - 5: Intervention (use of a miticide) will greatly increase chances of colony survival.

6 - 10: Colony loss or damage likely. Intervention is critical to prevent colony loss from mite infestation.

11+: Loss of colony likely. Intervention is essential to decrease the threat of horizontal transmission (spread) of mites to neighboring colonies.

https://bip2.beinformed.org/mitecheck
Questions
FUTURE/NEXT STEPS
Future Steps:
Education and IPM Demonstrations
Fight the Mite!

May 4, 9am-3pm – Amherst, MA

UNIQUE, COMPREHENSIVE MITE WORKSHOP

• Hands-on demos of miticides, non-chemical tools, and proper safety equipment

• Create your personal Integrated Pest Management (IPM) plan.

• Participants will be challenged with a hands-on case study

• The best plan wins an apiary diagnostic kit, so bring your best management ideas!!!!

COST: $40

Registration Includes
• Lunch
• Bee-themed T-Shirt
• Mite sampling jar
• IPM brochure
• The chance to win an apiary diagnostic kit!
Preliminary Results

2016/17: 50.6% monitoring
   31% sticky board
   23% sugar shake
   11% alcohol wash

2017/18: 64.2% monitoring
   33.0% sticky board
   26.4% sugar shake
   19.3% alcohol wash

***With half to a third of beekeepers not monitoring***

2018: 39 presentations with approx. 1397 beekeepers

2019: 15 presentations with approx. 562 beekeepers (so far)

Distributed ~ 800 jars

2018/2019: 81.48% monitoring
   50.37% alcohol wash
   35.56% sticky board
   15.56% sugar shake
2018 Outreach Education:

- 60 Programs
- 162 instruction hours
- 3,896 attendees
Questions
Some Questions for You
Find a Colleague

• To post a profile about yourself and your work:
  http://neipmc.org/go/APra

• “Find a Colleague” site
  http://neipmc.org/go/colleagues
Archive of Today’s Webinar

• Today’s Webinar will be available to view **on demand** in a few business days.

http://www.neipmc.org/go/ipmtoolbox

• You can watch as often as you like.
Upcoming Toolbox Webinars

• How IPM can help keep children safe from Lyme disease at schools and in suburban communities
  – May 8, 2019 at 1:00 pm

• Industrial Hemp IPM
  – May 16, 2019 at 1:00 pm

TO REGISTER: https://www.northeastipm.org/ipm-in-action/the-ipm-toolbox/
Acknowledgements

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Thanks for Joining Us!

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