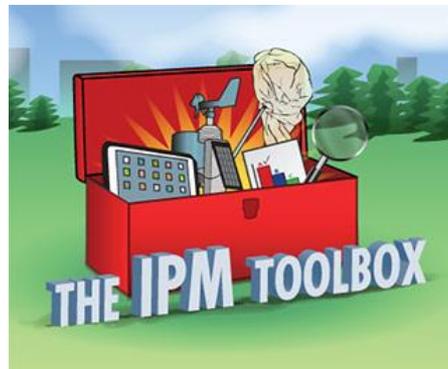




Varroa Mite IPM Program for New England Honey Beekeepers



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



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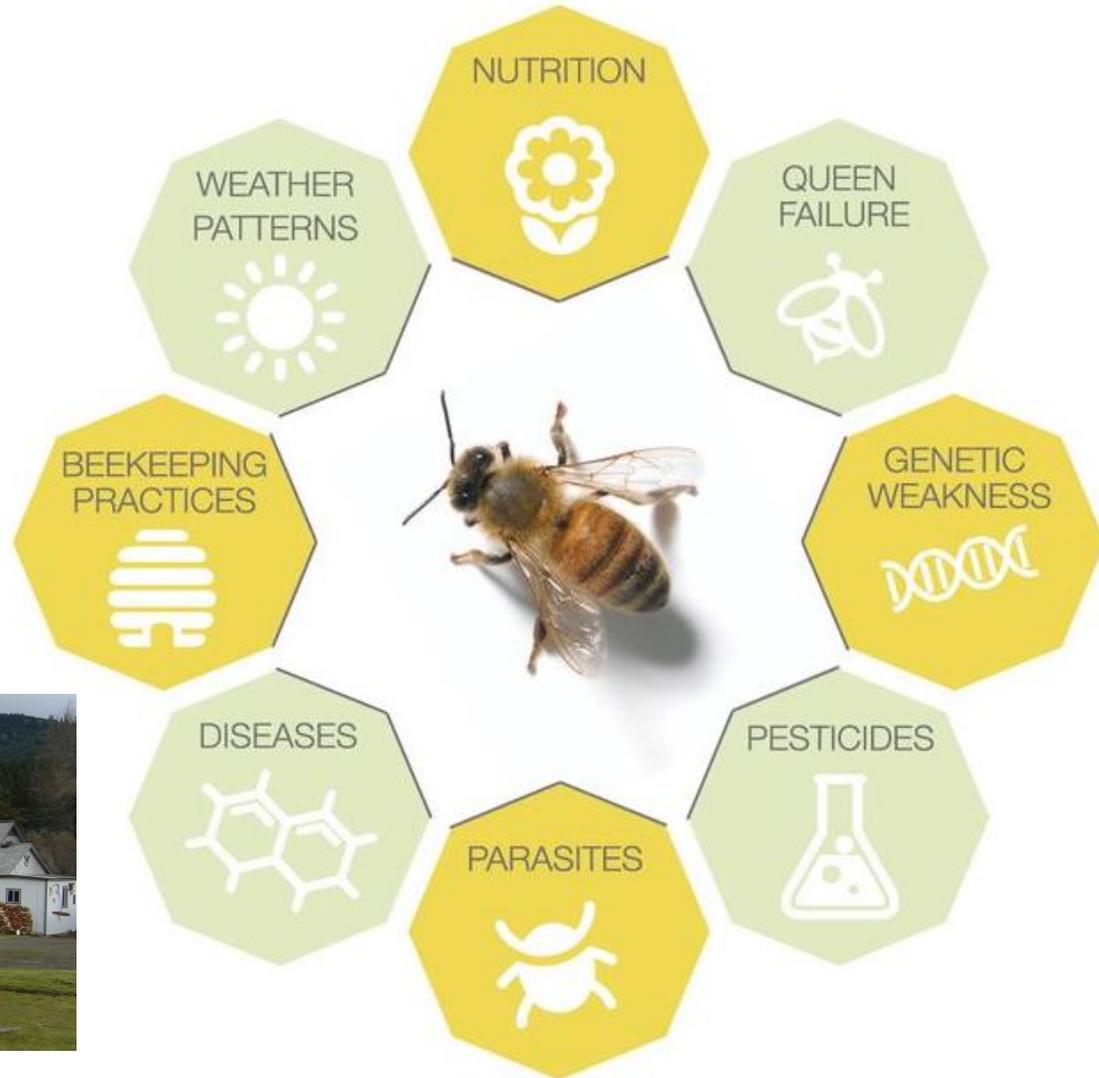
2017–2018 U.S. Annual Loss = 34%–40%
[USDA Acceptable Level of Loss = 18%]

Honey Bee Health Issues

CCD



Pollination Transport



Disease/pest	Causative agent	Symptoms
Adult Parasites		
Varroa mites	The parasitic mite, <i>Varroa destructor</i>	Presence of adult mites, deformed wings
Tracheal mites	The parasitic mite, <i>Acarapis woodi</i>	K-wings, morbidity
Nosema	The fungal <i>Nosema apis</i>	Diarrhea, distended abdomens
Brood Pathogens		
American foulbrood (AFB)	The bacterium <i>Paenibacillus larvae</i>	Distorted larvae, ropy scale
European foulbrood (EFB)	The bacterium <i>Melissococcus plutonius</i>	Distorted larvae, foul smelling brood, non-ropy remains, no scale
Chalkbrood	The fungus <i>Ascosphaera apis</i>	White or black mummies in cells or on bottom board
Sacbrood	A viral infection	Brown larvae in the curled "canoe" shape
Pests		
Wax moths	Larvae of <i>Galleria mellonella</i>	Silk cocoons and/or tunnels
Small hive beetle (SHB)	Larvae of <i>Aethina tumida</i>	Wet combs, maggot-like larvae

+ 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%

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

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



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)

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



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VARROA MITES



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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

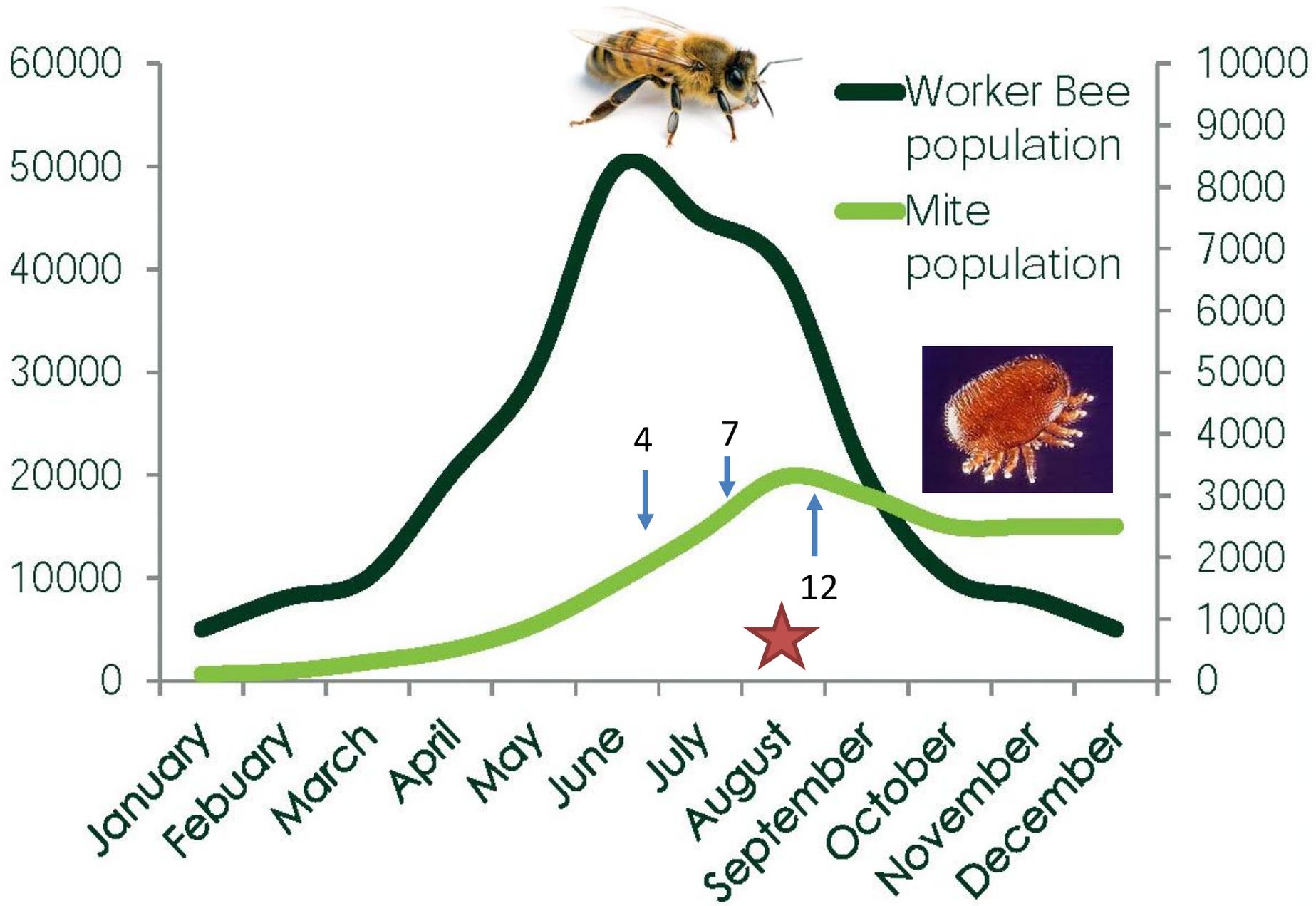


The hairs on the top and bottom of the mite's body enable it to cling to the honey bee.
© Bayer Bee Care Center, Bayer AG | Source: Brochure << The Varroa mite >>

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.
6. Mating begins within cell.
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)





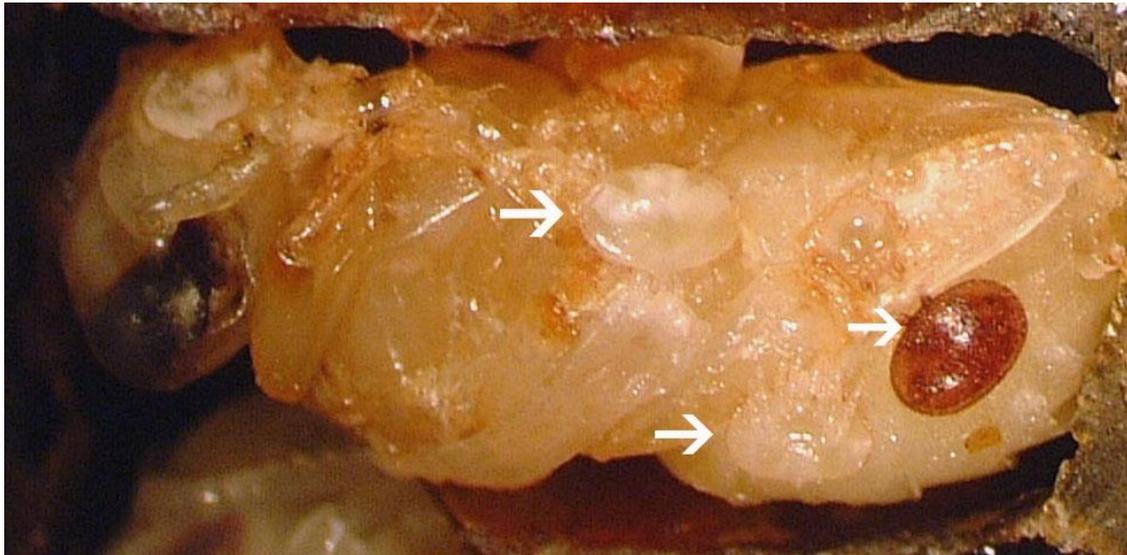




Varroa mites - Inspection

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?



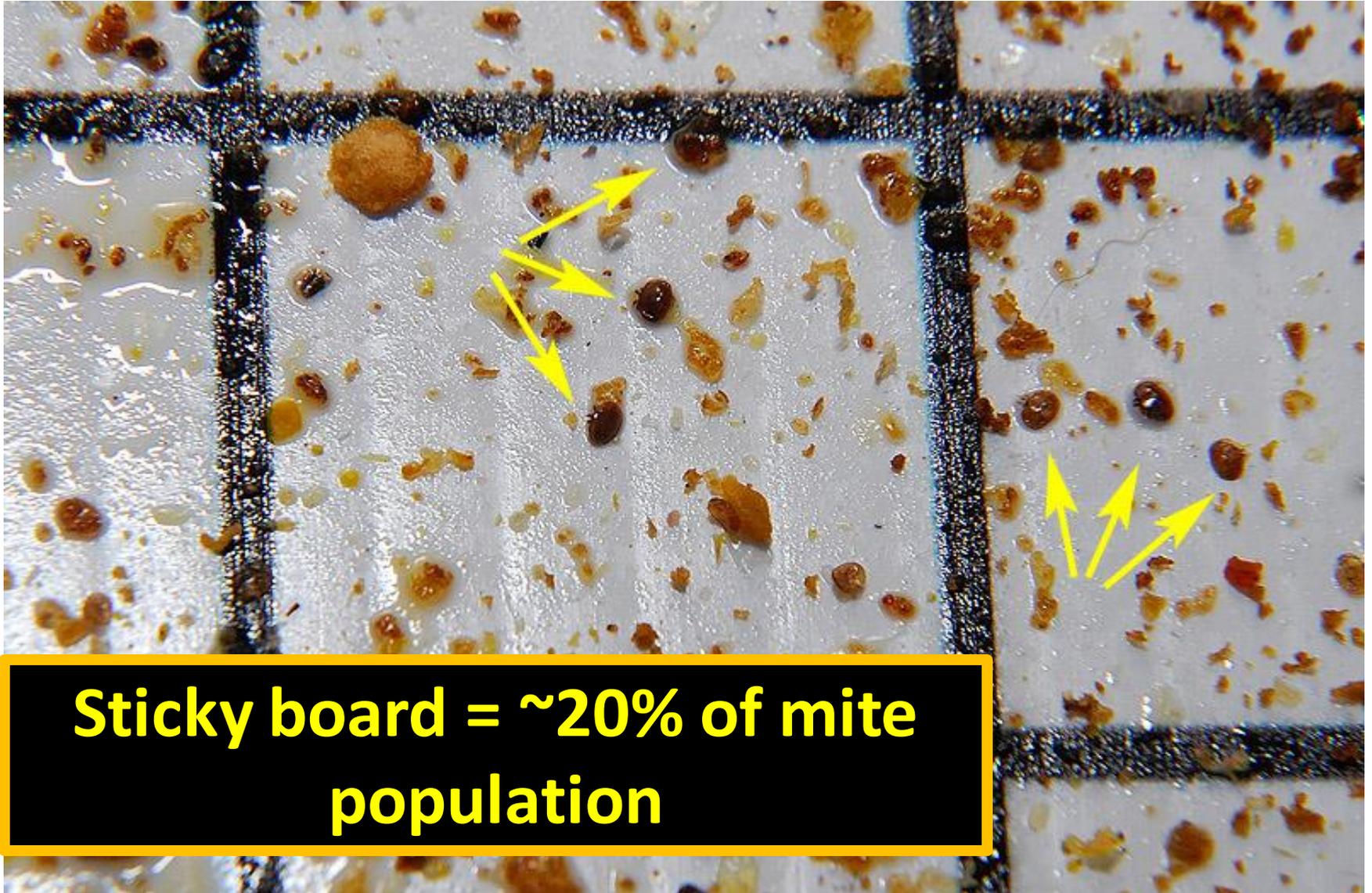
14 mites total!

Update: Hive died, IAPV positive



141 mites total!

Varroa Mite Count



Sticky board = ~20% of mite population

INSTRUCTIONS

1



Shake bees from a brood frame into the large white tub. Don't forget to check for the queen. If the queen is present, select a different frame.



2

Pour or scoop bees into the measuring cup and tap it on a hard surface. Your goal is to fill the cup

4



Using your hive tool, press 2 tablespoons of powdered sugar through the screened lid, and shake/roll the jar until all bees are coated. Set the bees in the shade for 2 minutes.

5



Tip the sealed jar over the white tub, and shake vigorously up and down for at least 1 minute, allowing all mites to dislodge from the bees and fall into the large container.

7

Return the sample of bees to their colony. Don't worry, their sisters will clean them off and they'll go back to work.



8

Your mite kit measuring cup holds about 300 bees. To estimate the number of mites per 100 bees, divide the total mites found in your sample by 3.

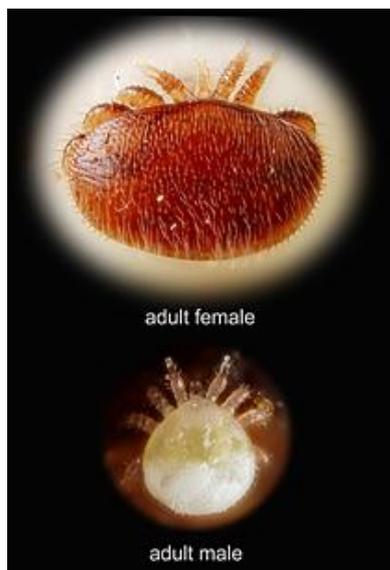
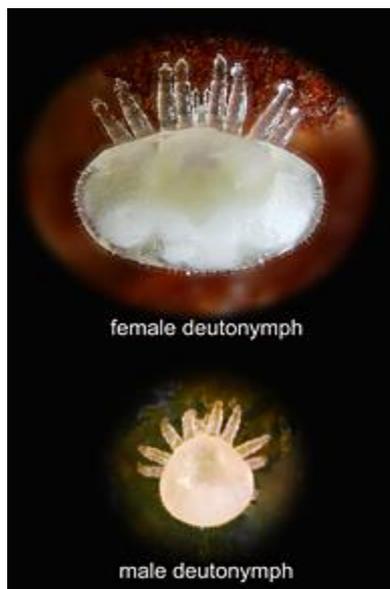


Consult your local beekeeping experts for treatment options. Treating your bees keeps them healthy and also decreases

Pour the bees into jar and shake through screened lid.

- Not as accurate during humid weather
- Issues with performing procedures
- Variation count compared to alcohol wash
- Can kill bees too!

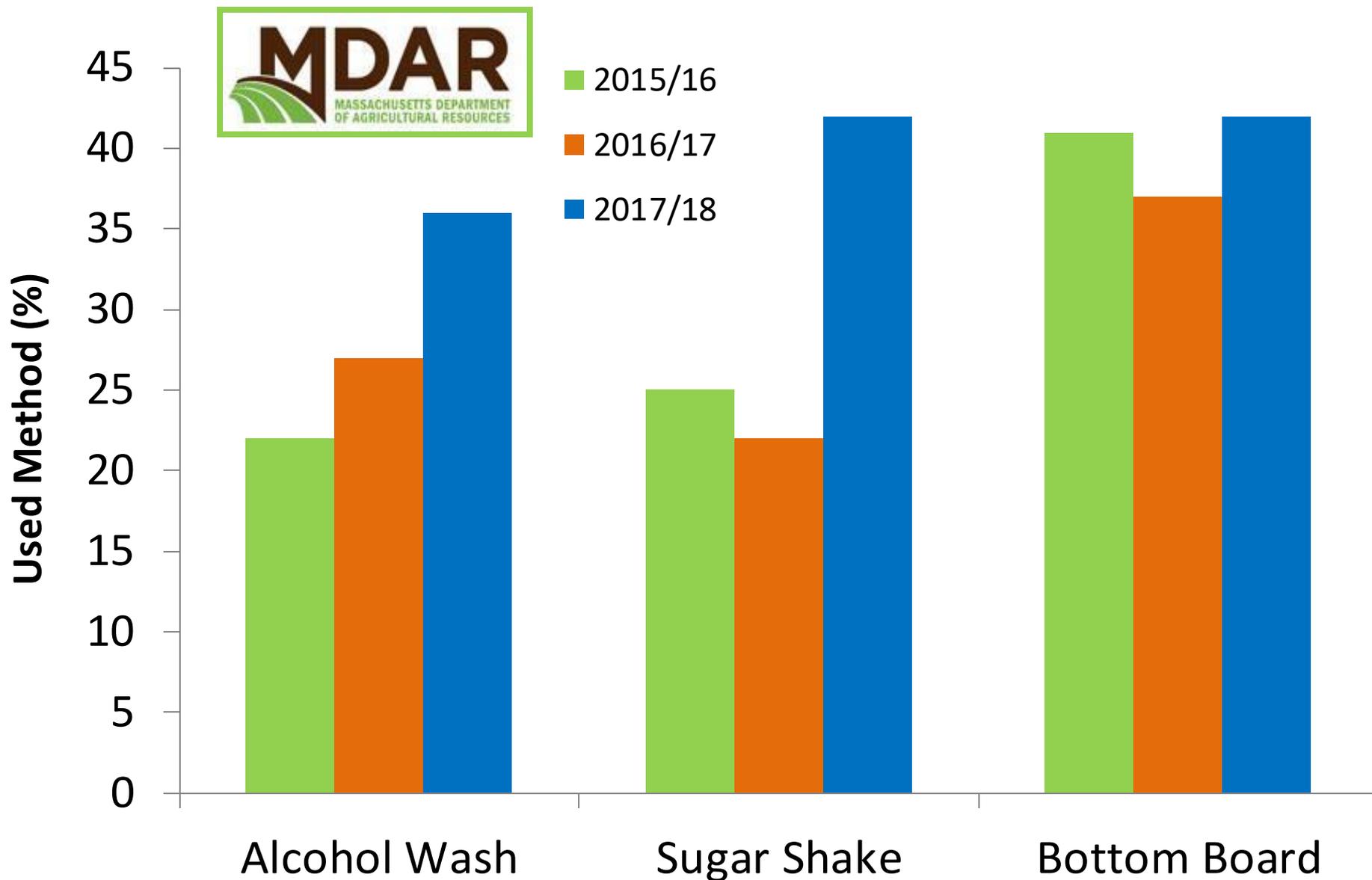
Table 2. Comparisons of the pros and cons of each varroa mite monitoring method.



Method	Pros	Cons
Powdered Sugar Roll	<ul style="list-style-type: none"> Mite levels are determined in a single visit Standard measure of 300 bees allows for colony comparisons 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Mite levels are determined in a single visit Standard measure of 300 bees allows for colony comparisons 	<ul style="list-style-type: none"> 300 bees die
<p>The MA & ME Bee Teams found the alcohol wash to be the most reliable & easiest for beekeepers to use!</p>		
Ether Roll	<ul style="list-style-type: none"> Standard measure of 300 bees allows for colony comparisons 	<ul style="list-style-type: none"> bees inside the hive can get agitated from the smell of ether Ether is highly flammable
Sticky Board	<ul style="list-style-type: none"> Can monitor mite drop during treatments No bee deaths from monitoring Can detect low levels of mites 	<ul style="list-style-type: none"> 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

MDAR Colony Loss Survey [2015–18]

Mite Survey Methods



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



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IPM PROGRAM GRANT



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What Is Missing?



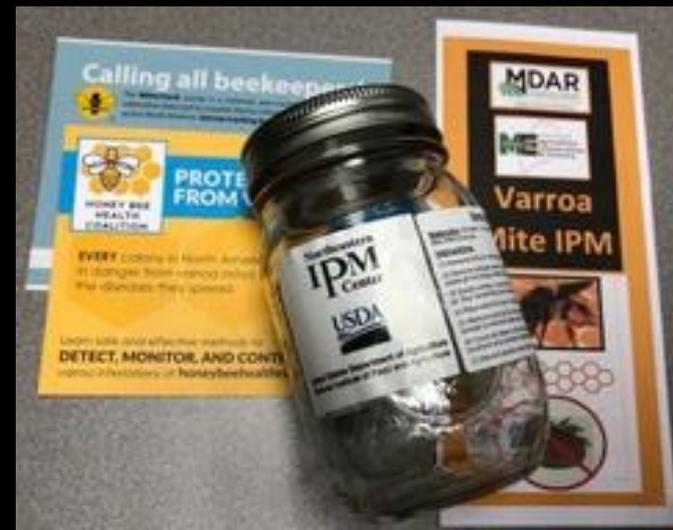
- Communication needs
 - *Community Beekeeping Approach*
- Educational gap
 - Varroa mite biology
 - Monitoring and diagnosis tools
 - Decision making toolkit – IPM knowledge
 - Label and treatment instructions
- Exceptions
 - Northeast bee season
 - Different hive types

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



Northeastern
IPM
Center



Please Participate!



2018 Varroa Mite Management Survey for New England Honey Beekeepers

This survey has been created as part of the Northeastern IPM Center "A 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/2Q5ElmV

Your email

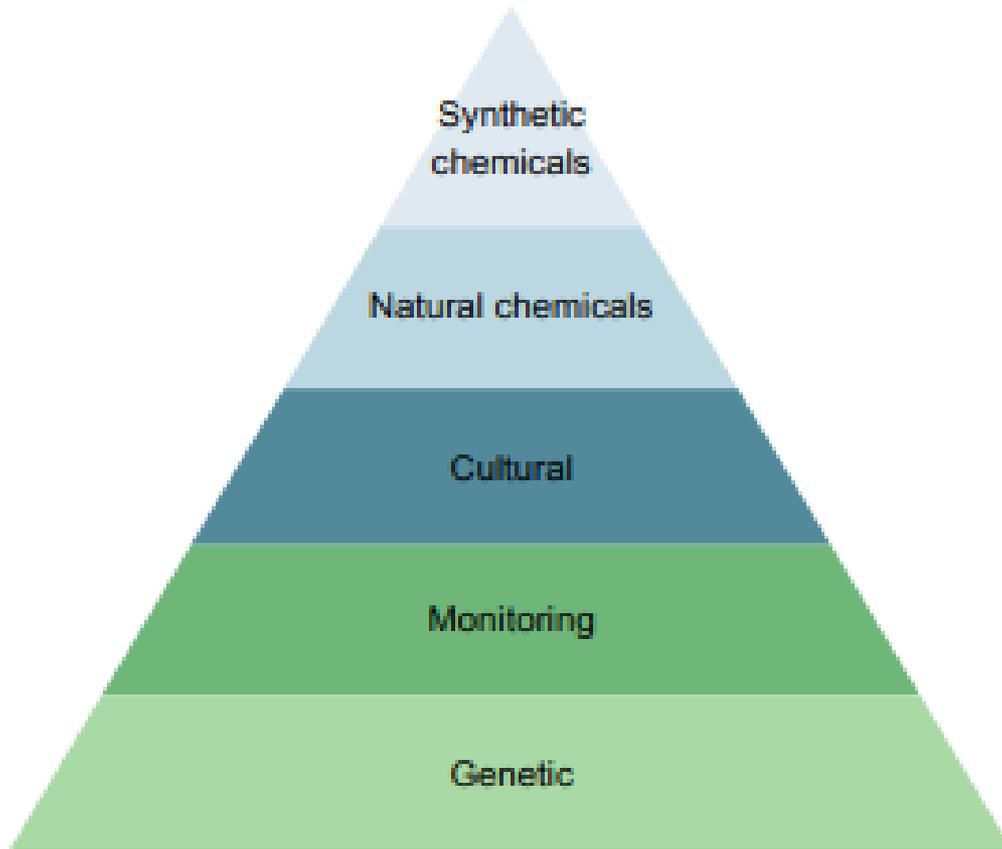


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National Institute of Food and Agriculture



What Is Varroa Mite IPM?

Pyramid of IPM Practices



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.



Varroa Mite IPM



Integrated Pest Management (IPM) Options for Varroa Mites

NAME	ACTIVE INGREDIENT [CHEMICAL CLASS]	MODE OF ACTION	APPLICATION MATERIAL	APPLICATION SEASON & TEMPERATURE GUIDELINES	TREATMENT DURATION	KEEP HONEY SUPER ON?	NOTES
Apivar®	amitraz [amidine]	contact	plastic strip	Spring, Fall	42-56 days	no	honey supers put on 14 days after strip
Apistan®	tau-fluvalinate [pyrethroid]	contact	plastic strip	Spring, Fall [$>50^{\circ}\text{F}$]	42-56 days	no	
CheckMite+®	coumaphos [organophosphate]	contact	plastic strip	Spring, Summer, Fall	42-45 days	no	
Apiguard®	thymol	fumigant	gel or gel tray	Spring, Fall [60°F to 105°F]	28-42 days	no	
Api Life Var®	thymol, menthol, eucalyptus oil	fumigant	tablet	Spring, Summer, Fall [64°F to 95°F]	26-32 days	no	
Mite-Away Quick Strips® (MAQS)	formic acid	fumigant	gel strip	Spring, Summer, Fall [50°F to 85°F]	7 days or 21 days	yes	
Formic Pro®	formic acid	fumigant	gel strip	Spring, Summer, Fall [50°F to 85°F]	14 days or 20 days	yes	
Oxalic Acid	oxalic acid dihydrate	contact, fumigant	vapor or liquid	Spring, Fall	varies by application type	no	
HopGuard®II	potassium salt of hops beta acids	contact	cardboard strip	Spring, Summer, Fall	30 days	yes	
Screen Bottom Board	cultural, non-chemical options for management		varies depending on management type	Spring, Summer, Fall, Winter	all year	yes	
Drone Brood Trapping/Removal				Spring, Summer, Fall	14-20 days	yes	
Brood Interruption				Spring, Summer	14-20 days		
Re-Queen/Cage Queen				Spring, Summer	28 days		



This publication was funded by the Northeastern IPM Center through Grant #2014-70006-22484 from the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program.



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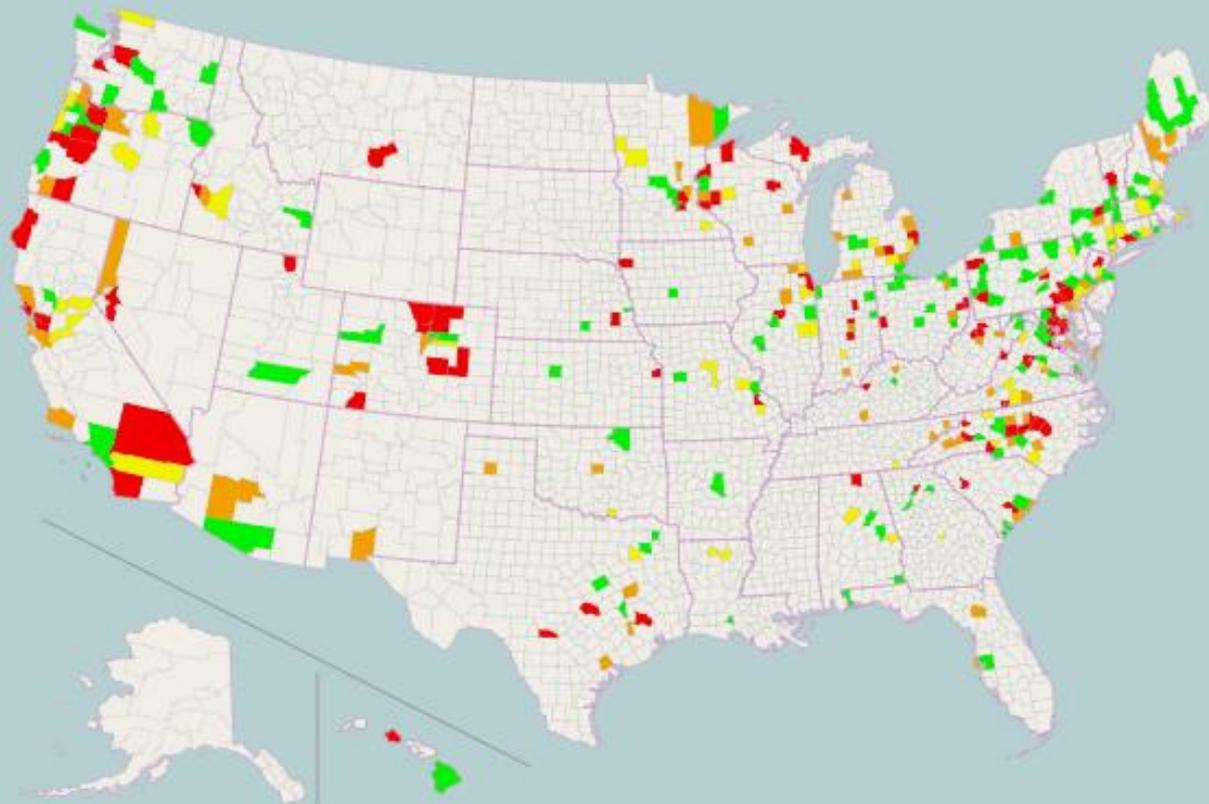


Apiary Inspector Demonstrating the Varroa Mite Alcohol Wash



Highest Mite Count Reported Per County

United States, counts are per 100 bees



Mite Counts

- 0-3
- 4-5
- 6-10
- 11+

- 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.beeinformed.org/mitecheck>

Questions



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FUTURE/NEXT STEPS



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Future Steps: Education and IPM Demonstrations



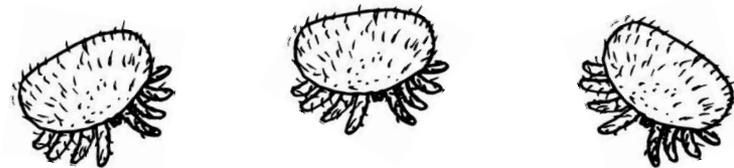


Fight the Mite!

May 4, 9am-3pm – Amherst, MA

UNIQUE, COMPREHENSIVE MITE WORKSHOP

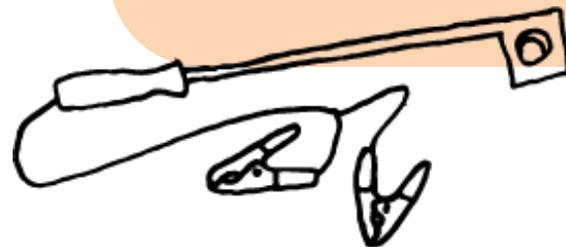
- Hands-on demos of miticides, non-chemical tools, and proper safety equipment
- Create your **personal Integrated Pest Management (IPM) plan**.
- Participants will be challenged with a **hands-on case study**
- **The best plan wins an apiary diagnostic kit**, so bring your best management ideas!!!!



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



Division of Crop and Pest Services
Apiary Program



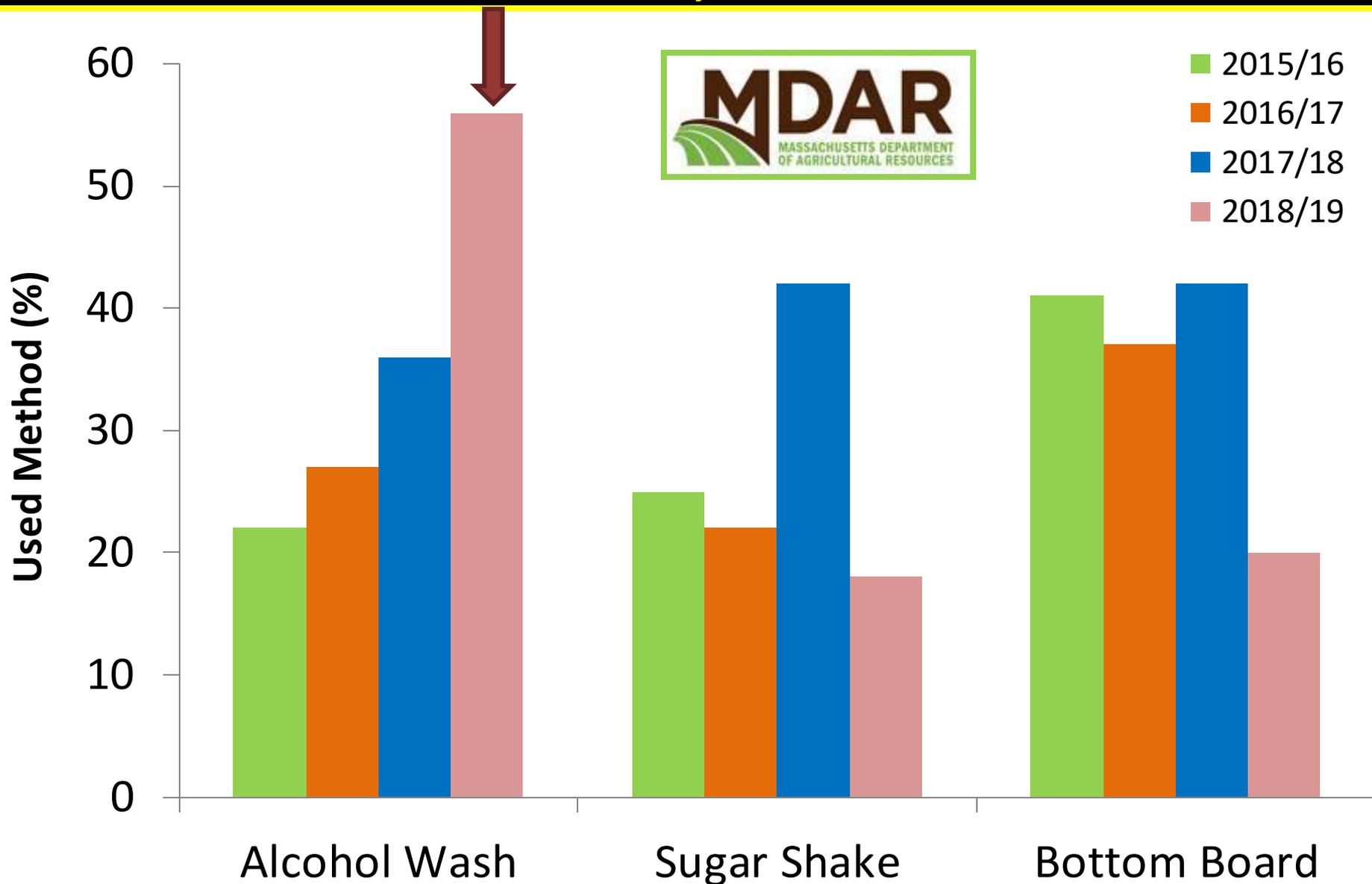
State Apiary

A collaboration between the Massachusetts Department of
Agricultural Resources-Apiary Program (MDAR) and the
University of Massachusetts-Amherst, Stockbridge School of
Agriculture (UMass).



MDAR Colony Loss Survey [2015–19]

Mite Survey Methods



Questions



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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

Northeastern IPM Center

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Thanks for Joining Us!



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