Honey Bees & Parasitic Mites
A Historical Review with Some Current Control Suggestions

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You had to have been there - Before the mites

Midwestern Apiary - 1944
Tracheal Mites

- Old pest - Isle of Wight (Identified 1921)
- Lives in breathing tubes (trachea)
- Restriction of all honey bee imports - 1922
- South America - possibly by African Bees
  1970's
- Early 1980s was in Mexico
- Texas, 1984
- Devastating losses at first, not so much now
- Possibly due to Varroa control procedures

Too small to see
Tracheal mite life cycle

Not much concern now
Varroa mites made tracheal mites look tame. Maybe we have become too relaxed.
For tracheal mite control:

1. Menthol crystals
2. Chemical acaricides
3. Oil or grease patties

   1 lb. vegetable shortening (such as Crisco®)
   2 lbs. granulated sugar
   or
   1 lb. vegetable oil
   3 lbs. granulated (or powdered) sugar

From: https://agdev.anr.udel.edu/maarec/wp-content/uploads/2010/03/TRACHEAL_PDF

Varroa destructor

To this point, simply the biggest thing that has ever happened to beekeeping
As with tracheal mites, effects were different in different countries.

Different species involved (*V. jacobsoni* vs. *V. destructor*)

No specific control procedures were available

It was a bleak time

A national US map showed new finds as they occurred

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**1987- Confusion (and disbelief) at first....**

Keep in mind, *Killer Bees* were all the rage at this same time
During the early days

- October 20, 1987, APHIS approved (Sec 18) plywood strips soaked in Mavrik or Spur for DETECTION of Varroa

- On December 30, 1987, Sec 18 special exemption approved plywood strips soaked in Mavrik or Spur as TREATMENT

- March 21, 1988, use of Mavrik and Spur was WITHDRAWN and was replaced by Apistan, available still today.

- This was the dawn of our chemical frenzy to find a control agent for *V. destructor*.

- Use of these materials today is off-label and illegal. If needed, far better control materials exist now.

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**Varroa Lifecycle**

![Varroa Lifecycle Diagram](Image)

- **8 days old**: Female mite, attracted to the brood pheromones, invades larva before it is capped. Mite will invade drone brood first.
- **10 days**: Female foundress mite hides in the bee brood food until cell is capped over.
- **12 days**: When bee larva has spun its cocoon, the foundress mite feeds on its blood and begins to lay eggs.
- **18 days**: Mite lays up to five eggs, which damage developing bee by feeding on it, allowing pathogens to enter. Mating occurs inside the cell.
- **21 days**: Daughter mites exit as bee emerges; mites disperse to nurse bees and invade new larva. Male mite usually dies in the cell.

Photo credit: Sammataro and Yoder
But the biggest issue? _Pathogenic RNA Viruses_ (Probably)

- Mite feeding causes mechanical damage
- Reduced lifespan
- Learning ability reduced
- Vectored RNA viruses the real issue
- 18 viruses have been identified
- Much blame for CCD by viruses

Hope for bee virus control

- RNAi Silencing Technology
  - Old defense mechanism
  - No effects on bees
  - Safe & natural
  - Bio-degradable no residues

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11800 SW 77th Avenue
Miami, Florida 33156

Phone: +1 305 233 6564
Fax: +1 305 233 7749
E-mail: info@beeologics.com

Monitoring Varroa Mite Populations

- Watch for symptoms of Varroa
  - Deformed wings
  - Crawling bees
  - Pupae at hive front
  - Mites on workers or drones

Sampling Techniques

- Ether roll
- Sugar shake
- Colony/brood examination
- Sticky board
- Debris examination
- Screen bottom
Treatment Thresholds
(In the Mid-West)

- Average-sized colony
- Treat at 3000-4000 mites/colony
- 15-40 mites/ether roll
- 50+ on sticky sheet/24 hrs with no treatment

Current Chemical Controls
Some sources I used

- Thymovar® [info@Propolis-Etc.ca](mailto:info@Propolis-Etc.ca) (Canada)
You should...

- Respect pesticides - regardless of synthetic or organic
- Read/follow labels - exactly
- Use only registered & tested materials
- Dispose chemical residue properly

Some Chemical Controls

<table>
<thead>
<tr>
<th>Product Trade Name*</th>
<th>Active Ingredient</th>
<th>Chemical Class</th>
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</thead>
<tbody>
<tr>
<td>Apiguard</td>
<td>Thymol</td>
<td>Essential oil</td>
</tr>
<tr>
<td>Apilife VAR</td>
<td>Thymol, eucalyptol, menthol, camphor</td>
<td>Essential oil</td>
</tr>
<tr>
<td>Apistan**</td>
<td>Fluvalinate</td>
<td>Synthetic pyrethroid</td>
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<tr>
<td>Amitraz, Miticur, Api-warol (tablets)</td>
<td>Formamidine</td>
<td>Formetanate, methanimidamide</td>
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<tr>
<td>Apitox</td>
<td>Cymiazole</td>
<td>Iminophenyl thiazolidone derivative</td>
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<td>Apivar**</td>
<td>Amitraz</td>
<td>Amadine</td>
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<tr>
<td>Bayvaro**</td>
<td>Flumethrin</td>
<td>Synthetic pyrethroid</td>
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<tr>
<td>Check-Mite**</td>
<td>Penrin, coumarins</td>
<td>Organophosphate</td>
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<tr>
<td>Folbex</td>
<td>Brompropylate</td>
<td>Chlorinated hydrocarbon</td>
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<tr>
<td>Sucroide</td>
<td>Sucrose octanoate</td>
<td>Sugar esters</td>
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<tr>
<td>Hivestan</td>
<td>Fenpyroximate</td>
<td>Pyrazole (alkaloid)</td>
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<tr>
<td>Generic [e.g., MiteAway**]</td>
<td>Formic acid</td>
<td>Organic acid</td>
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<tr>
<td>Generic (Lactic acid)</td>
<td>Lactic acid</td>
<td>Organic acid</td>
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<tr>
<td>Generic (Oxalic acid)</td>
<td>Oxalic acid</td>
<td>Organic acid</td>
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<tr>
<td>Thymovar</td>
<td>Thymol</td>
<td>Essential oil</td>
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**No longer effective in some areas.
Chemical Resistance

- Common procedure - even in humans
- Select at least two chemicals and rotate use
- Do not increase beyond label instructions
  - May kill or sicken bees
  - Wax & honey contamination
  - > Resistance could develop faster

Effects on Drones

- Varroa prefers drones
- Fewer flights
- Shorter duration
- Reduced sperm counts
- Reduced fertility
- > Queen replacement
Drone trapping seems to work
(If done regularly)

- Drone brood (approximately) 10x more attractive than worker brood
- Natural nest is ≈ 17% drone comb
- At 5% drone, 50-60 ♂ drone cells = 1000 ♀ cells

http://scientificbeekeeping.com/fighting-varroa-biotechnical-tactics-iii/

Our conundrum...

Drones for queens?
or
Drones for Varroa?
Producing Sacrificial Drones

Trap-Cropping in the Bee Colony

Drones and mites
The Mite Zapper®

Some comments about the Zapper Frame

- Requires some minor bee box modification
- Non-invasive procedure
- Should either be used or removed
- No chemical resistance issues
- Just under $100 to begin, about $50 from then on
- Used every 21-25 days during drone-rearing season

www.cyberbee.net/gallery
The Oliver Trap Frame

http://scientificbeekeeping.com/fighting-varroa-biotechnical-tactics/

Suggested Annual Integrated Control for UK beekeepers

Figure 5.2: Examples of integrated control methods used throughout the year by UK and EU beekeepers (See Table 4 for information about authorisation for use of varroacides in Member States)

<table>
<thead>
<tr>
<th>Control</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
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<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
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<tbody>
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<td>Open mesh floor</td>
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<td>Drone brood removal</td>
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<td>Queen comb trapping</td>
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<td>Fumic acid/MAQS</td>
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<tr>
<td>Apiguard/Apilife VAR/Thymovar</td>
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<tr>
<td>Aplistan/Bayvarol/Apivar</td>
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<tr>
<td>Lactic/Oxalic Acid</td>
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Artificial swarm procedure for swarm and mite control (and possibly...queen replacement)

1. Move parent colony to one side of the original site, at least 4 metres away.

2. Place a second hive containing newly drawn combs and the queen lanolin on the original site to house the artificial swarm. Foragers will return to this hive creating the artificial swarm.

3. After 9 days remove all but one queen cell from the parent colony. The cell can be protected in a queen cell nursery cage which prevents the virgin queen from leaving the hive to mate, but allows worker bees access to care for her.

4. After 3 weeks all brood in the parent colony will have hatched. Transfer two bait combs of unsealed brood from the artificial swarm to the parent colony, and when they are capped, remove and destroy them. At this stage, cull the virgin and introduce a new queen to the parent colony.

5. The old queen in the swarm can later be removed and the two colonies reunited.

Many beekeepers are doing *nothing* to control Varroa

- Only general managerial procedures are used
- Bee colonies are kept healthy and populous
- Queens are frequently replaced
- Screened bottom boards may/may not be used
- Regardless, a percentage will fail
- This is a desirable, but uncertain procedure
So chemically - what to do?

- Restrict drone brood (if not producing queens)
- Select control materials or procedures with which you are comfortable
- If possible, use “softer” chemicals whenever possible

  - For instance - Apilife VAR or HopGuard (not intended to be a selective recommendation)
  - Occasionally, traditional chemical use may be necessary - such as Apistan or Check-Mite+ (not intended to be a selective recommendation)

Some take-home recommendations and suggestions

- Spotty brood, twisted wings, declining population - August - too late to help
- Maybe keeping colonies somewhat crowded will help with grooming and mite fall
- All mites need not be killed for treatment to be effective (generally about 50%)
- Virus infection is causing the damage more than Varroa feeding (apparently)
- Varroa causes many bee problems - but not all of them (don’t fixate)
  - Queen quality issues (genetics and/or mating success)
  - Nutritional issues (mono-cropping and herbicidal sprays)
  - Other bee diseases and pests (AFB, Chalkbrood, Small Hive Beetle)
  - Pesticides
  - Management errors
So, what do you “feel”? 

- Uncertain
- Somewhat uninformed
- Overloaded
- Responsible
- Resigned

Photo: J. Hurst

Thank You

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