

Varroa Mites

Diagnose the disease first then diagnose the problem with the Honey Bee.

Where can You find Varroa Mites?

The Greeks were the first to find and name the Mite. It is believed that mites have been here for over 400 million years. Acarologists suggest that there are over 50,000 named species of mites.

They live where there are animals and plants. They can be found in soil, water (fresh and salt), in and on plants, arthropods, vertebrates and invertebrates. They are also found in polar climates as well as the desert.

The Honey Bee Hive is a perfect place to live. Year around food, warmth, and a place to raise young.

There are over 30 different Honey Bee Mites. There are three main suborders of the mites. They are Astigmata (mostly detritus feeders), Prostigmata (Mainly pollen feeders), and Mesostigmata (feeding on hive products such as bee bread and Honey Bees). There are also three obligate parasitic mites, Varroa mite (*Varroa* spp), tracheal mite (*Acarapis woodi*), and *Tropilaelaps* spp.

1. Diseases carried by varroa mites:
 - a. Deformed wing virus
 - b. Acute bee paralysis virus
 - c. Chronic bee paralysis virus
 - d. Slow bee paralysis virus
 - e. Black queen cell virus
 - f. Kashmir bee virus
 - g. Cloudy wing virus
 - h. Sacbrood virus

2. New virus found on the varroa mite
 - a. Kakugo virus
 - b. Invertebrate iridescent virus
 - c. Nosema Cerane – new
 - d. Nosema Apis – old

Honey Bee mites

- There are over 50,000 named species of mites
- They are found in cold temperature, hot temperatures, up to 33 feet deep in the ground. Mites are ticks.
- There are 30 mite species associated with honey bees.
 - Predatory
 - Incidental
 - Facultative
 - Obligatory
 - Phoretic

- Three major suborders
 - Astigmata – mostly dead organic material feeders
 - Prostigmata – mainly pollen from plants feeders
 - Mesostigma – feeding on bee bread and honey bees
 - Obligate
 - Varroa mites
 - Tracheal mites
 - TROPILAEELAPS spp. – not yet reported in the US

- Varroa Mite was first found in 1904.

- Life Cycle of the Varroa Mite
 - Female Varroa mite starts with the 5th instar before capping.
 - Preferred drone larva
 - 70 hours in cell female lays a male egg
 - The female lays egg every 30 hours
 - Up to five female eggs are laid, the average is three.
 - Because of the longer time a drone needs to grow, the varroa can lay up to six eggs. That is a reason drone cells are preferred.
 - The honey bee larvae release a pheromone that the varroa mite can determine the correct time to enter the cell.
 - The varroa mites feed on the Hemolymph of the honey bees.
 - Once the male varroa mite's mates with its sister it dies and remains in the cell.
 - The mother varroa and her daughters will then emerge with the new Honey Bee.
 - They will find new 5th instar pupa and repeat the process
 - The varroa mite's saliva suppresses the wound – healing capabilities of the Honey Bee.

- New threat TROPILAEELAPS.
 - Brought into the US from Australia.
 - All imported Honey Bees have been banned.
 - The mite can only live 3 to 4 days on the back of a Honey Bee before it dies.
 - Lives longer in the cell
 - Can't handle the cold weather.
 - It also carries the deformed wing virus.

- 18 different viruses found in the varroa mites that can be transferred to the Honey Bee.
 - Kashmir (KBV)
 - Sacbrood (SBV)
 - Israeli Acute Paralysis (IAPV)

- Much of the CCD is related to varroa mites and the related viruses.
- The correct time to check for mites is before it becomes a problem.
 - Twice a year, spring and fall.
 - If mite count is,
 - 25 IPM average daily mite count
 - Nothing needs to be done.
 - 26 IPM average daily mite count
 - Then something should be done.
- How to sample for Varroa Mites
 - 300 Honey Bees are needed
 - They are to be brood area. These bees will have the most mites.
 - Using a two-inch diameter jar
 - 2/3 inch = 100 Honey Bees
 - 1/3 of a cup = 238 to 300 Honey Bees
- Ether/Alcohol/Soapy Water/Sugar Roll
 - Place the Honey Bees in the jar.
 - Place one of the liquids/Powdered Sugar in the jar with the Honey Bees.
 - Spray a two second to three second burst of ether into the jar. Cover and close until all the bees are dead. Ether is HIGHLY flammable.
 - Pour 70% alcohol into the jar until the Honey Bees are covered. Seal the jar and wait until the Honey Bees are dead.
 - Pour soap water into the jar. Make sure the liquid covers the Honey Bees. Cover and wait until the Honey Bees are dead.
 - Two tablespoons of Powder Sugar and wait about two minutes
 - Dump the contents of the jar onto a paper towel supported by a plate.
 - Slowly separate the Honey Bees looking for the varroa mites.
 - Count the Varroa Mites.
 - How many Varroa Mites per hundred Honey Bees.
 - Increase the count by one hundred Varroa Mites.
 - This will give you an idea how many mites are in brood and how bad/good the count is.

Life cycle of Varroa Mites

Age of Honey Bee	Varroa Mite Activity
Eight Days Old	Female mite, attracted to the brood pheromones, invades larva before it is capped. Mite will invade drone brood first.
Ten Days Old	Female mite hides beneath the bee brood food until cell is capped over.
Twelve Days Old	When larva has spun its cocoon, the foundress mite feeds on the brood and begins to lay eggs.
Eighteen Days Old	Mite lays up to five eggs, which damage developing bee by feeding on it, allowing pathogens to enter. Mating occurs inside the cell.
Twenty-One Days Old	Daughter mites exit as bee emerges, mites disperse to nurse bees and invade new larvae. Male mite usually dies in the cell.

Colony Density of Varroa Mites

Number of Varroa Mites per 300 Honey Bees	Colony infestation	Number of Mites per eight samples of 300 Honey Bees	Apiary Infestation
1	1%	8	1%
2	1%	16	1%
3	2%	24	2%
4	3%	32	3%
5	3%	40	3%
6	4%	48	4%
7	5%	56	5%
8	5%	64	5%
9	6%	72	6%
10	7%	80	7%
11	7%	88	7%
12	8%	96	8%
13	9%	104	9%
14	9%	112	9%
15	10%	120	10%
16	11%	128	11%
17	11%	136	11%
18	12%	144	12%

- A non-destructive method for counting Varroa Mites in a hive. This method uses the Integrated Pest Management Method (IPM).
 - Screened bottom board with a metal insert is required.
 - Remove the metal insert, clean and spray with PAM.
 - Install the metal insert into the screened bottom board as designed.
 - After seven or fourteen days remove the metal insert.
 - Count the number of live and dead Varroa Mites.
 - Divide the number of Varroa Mites found by the number of days the metal insert was left in the screened bottom board.
 - This will give you an average.
 - Using the IPM limits:
 - 0 to 25 average Varroa Mites per day
 - The hive will handle the Varroa Mites
 - Greater than 26 average Varroa Mites per day
 - The beekeeper should help the hive by removing the Varroa Mites.

Honey bee selection procedure:

- Hygienic behavior
 - Varroa mite population and growth rate.
 - Growth rate
 - $X = e^{rd}$
 - X = number by which the population has grown
 - e = natural logarithm
 - r = average growth rate per day
 - d = number of days during the testing for mites