

HONEY BEE  
DISEASES AND  
PESTS



# Parasitic Diseases

VARROOSIS



# Introduction

- It is the most important pest of honey bee.
- They suck hemolymph from larvae, pupa and adults of honey bees.
- The disease was first described in *Apis cerena* in Java Island.
- In addition to its direct effect, varroa mites play role as vector in many diseases (especially virus).
- The losses caused by varroa are very large and these mites are the most fought disease in the apiary.
- Today, varroasis is at the head of honey bee disease in the world with the most money left (3.5 billion dollars annually).
- It has been estimated that this disease entered from Bulgaria to Turkey in 1976.
- The disease has spread all over the country until 1982, and caused the loss of 600,000 colonies, as well as 7000-7500 tons of product loss.



# Epidemiology and Distribution

- There are 4 important species.
  - *Varroa jacobsoni*
  - *Varroa destructor*
  - *Varroa underwoodi*
  - *Varroa rindereri*
- *V. destructor* is the most prevalent species around the world, while the others are local.
- It has been found that there are about 20 strains according to mt-DNA, but the Korean strain has been found to be widespread all over the world.
- This parasite is not found in some island countries like New Zealand, Australia, and Hawaii due to the strict quarantine measures applied.
- Due to the hygienic and aggressive features of *Apis mellifera scutellata* (killer bee), a special honey bee of Tropical Africa, there is no varroa in the area where this bee species live.



# Morphology

- They are mesostigmatic mites (acarina).
- The adult and female mites constitute 96% of all varroa in the hive.
- Females are deep reddish brown and 1.1-1.2 mm long, while males are 0.8-0.9 mm long and the pale coffee or yellowish color.
- They can be seen with the naked eye.
- Their dorsal covered with a hard chitin layer is an oval structure.
- Although the mouth structure of the female varroa is the biting-sucking structure, the mouth of male varroa is not suitable for feeding, but it is a structure that carries sperm to females.
- For this reason, the males die shortly after they mate in the closed larvae cell.



# Biology

- Egg-larvae-protonymph-deutonymph-adult
- Females live 2-3 months in spring-summer, while 5-8 months in autumn-winter.
- Larva has 3 pairs leg, while adults and nymph have 4 pairs leg.
- It has hairy structure. All of these hairs are called as "ketom", which enable them to stay on the bee.



# Life cycle and Reproduction

- The effects of varroa on larvae and pupa are quite high.
- Adult females are fed with the hemolymph of the larvae in the 5-5.5 days old cell before leaving the eggs.
- They leave the first egg 2-3 days after the cells are closed.
- A female varroa lays 2-6 eggs with a 30-hour interval and the male mite emerges from the first egg and females beginning from the second egg.
- While 3 female varroas develop in a worker cell, 5 females can develop in a drone cell (low temperature and high nutrients).



- *V. jacobsoni* develops within 6-8 days, while *V. destructor* within 5-6 days.
- As the females mate in the closed cell, the males die after mating.
- Some female varroas attach to adult bees and disturb the feeding of larvae.
- The earlier the colony production starts and the sooner it ends, the faster the reproduction rate of varroa increases.
- Varroa can be spread by means of the natural swarming, rapine (plunder), winds and confusion of drones.



# Transmission routes

1. Uncontrolled migratory beekeeping
2. Transfer of young workers to healthy colonies from infested colonies.
3. Passing infested drones to other hives (Confusion).
4. Changing of frame and honeycomb between hives.
5. Uncontrolled colony uniting.
6. Rapine (looting, plundering)
7. Uncontrolled swarming
8. Contaminated equipment use
9. Unconscious struggle and unconscious chemical use



# Pathogenicity

- Varroa mites in the cell affect negatively the development of hypopharyngeal glands, which secrete royal jelly, of bee larvae and pupa.
- Also, the protein loss occurs in the bees.
- The presence of 2 or fewer varroa on the pupa results in a 27% decrease in the protein content of the hemolymph, while the presence of 3 or more results a 50% decrease.
- While non-return rate is 20% in the adaptation flights of bees in uncontaminated colonies with varroa, this ratio can eventually reach up to 36% in the contaminated colonies.



- A female varroa consumes 0.2 microliter of bee hemolymph throughout his life.
- If the number of varroa in the cell is 2 or less, the life force of the bee is reduced.
- If this number is 3 or more, these can be seen in adult bees;
  - shortening of life span,
  - wing loss,
  - abdominal shortening,
  - deformation of wings and legs,
  - weight loss,
  - reduction in sperma,
  - reduction in flight activity,
  - reluctance to rearing immatures.



• They play vector role in the transmission of many viral agents.

- Deformed wing virus

- Acute bee paralysis virus

- Slow bee paralysis virus



# Clinical manifestations

- The sealed drone and worker bee cells that are infested with varroa can be pierced as in the foul brood.
- Deformed workers (wingless, leg deformation) can be seen, and in this case the appearance of adult bee deformation indicates that varroa exists for at least 3 seasons.
- The health workers throw out the deformed bee larvae and pupae.
- White pupae have pale, dark red spots on them.
- Spotted immature bees and other diseases (such as chalkbrood disease, foulbrood diseases, noseiosis etc.) begin to appear.
- The colony gradually weakens and becomes vulnerable to plunder.
- Sudden colony collapse can be seen especially in the autumn and winter seasons.



# Diagnosis

- Varroa mites can be seen with the naked eye in the drawers of the full pollen drawer hives.
- It may be a sign that the colony collapse occurs in a short time.
- The presence and number of the varroa can be determined by the shaking test with approximately 200-300 bees.
- Or, approximately 300 bees are mixed with powdered sugar. There is no bee loss in this method.
- When bee production period, the drone cells are opened with a pen and the larva is examined.
- In differential diagnosis, the varroa can be misdiagnosed macroscopically with *Braula coeca* and *Tropilaelaps clarea*.