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FACTSHEET

# Tracheal Mite

Dr Douglas Somerville, Technical Specialist Honey Bees, Goulburn

Tracheal mites are a serious parasite of honey bees and are responsible for the death of bee colonies and poor performance of other colonies. They are not known to occur in Australia. This internal parasitic mite lives in the trachea or breathing tubes of the adult bee.

Tracheal mite infections are also known as acarine disease, caused by the parasitic mite *Acarapis woodi*.

There are three known mites in the genus Acarapis including *A.woodi, A.dorsalis* and *A.externus*. The two latter mites are external, they are found on the bee's thorax and are blood feeders. They are not considered a pest of honey bees as there have not been any reports of either of these mites causing visible symptoms or injury to bees, or the presence of these external mites affecting colony performance. *Acarapis externus* mites have been reported in Australia, whereas the presence of *A.woodi* have not.

## Mite biology

The life cycle of the mite occurs only in the honey bee's respiratory system, with mature female mites leaving the host to attach to the other bees. These dispersing female mites are particularly attracted to adult bees less that 3 days old. By infesting younger bees, the mites have more time to complete their life cycle before the host bee dies.

Tracheal mites will infest all castes of a honey bee colony including workers, drones and queens. The invading mites are attracted to the current of expired air coming from the first thoracic spiracle. Once inside the host bee, after 1 or 2 days the female mite lays 5 to 7 eggs over a period of 3 to 4 days. Eggs hatch in 3 to 4 days and progress through a larval stage, then a nymphal stage before finally reaching adult form. The male takes 11 to 12 days to fully develop, whereas the female takes 14 to 15 days to fully develop. The female is capable of laying almost one egg a day, each of which is about two thirds the weight of the female herself. As many as 21 offspring from each female is possible.

Only the female mites disperse, with approx 85% of the mite transfers occurring at night. Increasing temperatures result in increased number of mites transferring amongst bees. The mites cannot survive longer than a few hours in this transfer process outside of an adult bee.

## Treatments

The most favoured treatment option to control tracheal mites in many parts of the USA was to provide oil extender patties. The vegetable oil coats the young bees and protects them from mite infestation.

Alternative chemical treatments include the use of menthol and formic acid. Both have potential negative impacts on the bees and beekeeper. Menthol treatments work well during summer but are not effective during cooler periods. When used in queen mating nucleus colonies, a high loss of queens may be experienced.

Formic acid may cause skin, eye, throat and lung irritation or damage to the beekeeper. This treatment may also kill bees and cause loss of queens.

## Impact

Tracheal mites had a major impact on beekeeping in North America when they first arrived. They where first identified in the USA in 1984, they are now regarded as a minor winter problem. For many decades they have been regarded as a minor problem in Europe.

The mites spread readily between bees when the bees are in very close proximity, such as a cluster. The mites as such do not appear to cause any significant losses during warmer periods of the year, but have been implicated in contributing up to 50% loss of colonies over winter.

Mite populations reduce dramatically during summer and increase during autumn, winter and early spring. The mite populations are at their highest at the end of autumn and during winter, when bees are in a tighter cluster.

**March 2011**, www.industry.nsw.gov.au/publications for updates
Primefact 1092 first edition

Tracheal mites appear to prefer drones over workers, however workers are far more numerous and the impact of tracheal mites on a colony is usually related to the number of workers infested.

The mites feed by piercing the bee's tracheal wall and feeding on the bees hemolymph (blood), shortening the bee's life span. Large mite populations in a bee are also thought to reduce the flow of oxygen to the bee. Wherever the mite has been found in the world, initially it has caused serious losses of bees.

Tracheal mites took 5 years to spread throughout the USA. They did not cause any significant losses in the warmer states but did have a major impact in the cooler states, causing serious losses during the autumn and winter.

## Diagnosis

All stages of the mite's life cycle are extremely small. Therefore the use of a microscope is necessary to accurately identify the presence of mites. Female mites range between 143 to 174 microns, where as male mites are marginally smaller, ranging between 125-136 microns. The body of the mite is oval in shape.

Samples of live bees (30 plus) should be collected and stored in alcohol (methylated spirits). Collect older bees from the entrance on top bars, these will more likely be infested with mites.

In order to detect a 10% infestation, with 90% certainty, 20 bees must be examined. To detect a 5% level of infestation, with 90% certainty, 50 bees must be examined. To detect a 5% level of infestation, with 95% confidence, 100 bees must be examined.

Each bee needs to be examined. The head and the first pair of legs are removed with a scalpel. Under a dissecting microscope the first thoracic ring (collar) is removed with forceps to expose the tracheae. The tracheae are removed and placed on a microscopic glass slide in a drop of 85% lactic acid or glycerol, and covered with a glass cover. The tracheae are then examined with a compound microscope (40- 80x) for the presence of adult mites, nymphs or eggs.

Unfortunately no reliable visual symptoms characterise bees infested with tracheal mites.

## Management

Combining weak infested colonies with stronger colonies should not be practised. This may only reduce the fitness of the stronger colony in the long run.

Colonies with young, active laying queens appear to be able to cope with mite infestations much better than colonies with older queens.

Where mites are known to occur in an apiary, the stronger colonies coming out of the winter cluster in early spring should be considered for inclusion in a mite resistant breeding program.

Tracheal mites are believed to have evolved with honey bees (*Apis mellifera*), therefore some strains of bees appear to be highly resistant to the mite. The heritability of this resistance trait is considered to be high.

This resistance trait is thought to be primarily expressed as a self grooming behaviour, termed auto-grooming, thus removing the migrating mites.

This trait has become very wide-spread throughout North America and colony deaths attributed to tracheal mite infections are now considered rare.

## Reference

Webster TC & Delaplane KS (2001), *Mites of the Honey Bee* Dadant & Sons, Inc.



ISSN 1832-6668



PUB 11/18