



**Note 2.02**  
(Previously Note # 3A)

## **TRACHEAL MITES**

### **INTRODUCTION**

The tracheal mite (*Acarapis woodi*) was first detected in North Carolina in 1984 and initially it caused a great loss in managed and feral (wild) honey bee colonies. In recent years, the pest has become less of a problem as our bees have developed some resistance or at least tolerance to the mite pest. However, beekeepers should still be aware of this pest which has periodically caused massive bee deaths in some areas of the state in recent years.

### **ECONOMIC IMPORTANCE**

In North Carolina, severe losses have been encountered causing entire apiaries to die. Infested colonies are most likely to succumb during the stressful overwintering period, regardless of honey stores. Losses in recent years have been reduced but the mite can still be a problem. In addition to the economic losses incurred by beekeepers from reduced honey production and pollination fees, vegetable and fruit growers often rely on rented hives for crop pollination. A shortage of hives could adversely impact grower production or cause pollination rental fees to increase.

### **MITE BIOLOGY**

The tracheal mite is a parasite of the adult honey bee and does not affect the immature stages of the bees except to the degree that the mite can kill most or all of the adult bees resulting in the loss of the entire colony. This parasite gets its name (tracheal mite) from the fact that it spends its entire life cycle (except for transferring to a new bee host) in the tracheal or breathing tubes of the honey bee.

This is an obligate pest of the honey bee and it can not live away from its host for more than a day or two and it does not appear to have any other hosts. The tracheal mite is a microscopic mite (even in the adult stage) and for all practical purposes it can not be readily seen with the naked eye.

Upon entering the tracheal tubes of the honey bee via the bee's spiracles, the adult female mite will begin to lay eggs in the tracheal tubes of its host. The female will spend the rest of its life cycle inside of the bee's tracheal tubes where the entire developmental cycle of the mite occurs (see Figure #1). The initial (mother) female mite will lay eggs that will produce both male and female mites that will feed on the body fluids of the host bee from the inside of the tracheal tubes. Under some conditions, mite numbers may grow to levels that result in the death of the infected bees and eventually the entire colony of bees.

The mites spread from bee to bee by the transfer of mated female mites to new bee hosts. The mated female will exit the tracheal system of an infested bee and then transfer "jump" onto a new bee host and enter that bee's tracheal system via the spiracles of the new host. Young bees, usually less than nine days old, are the preferred hosts of the transferring mites; but even bees over 30 days old are acceptable hosts if young bees are not available. The development of a mite population in the bee colony is cyclical with the heaviest infestations (mite per bee and mite per colony) being found in the winter or non-productive months.

## **DETECTION**

Because of the microscopic size of the mite and its life cycle there are no reliable field indicators for the presence of the pest. The pest may go undetected for one to five years and then result in the death of the entire colony, which normally occurs in the late winter or early spring when mite numbers are highest and bee numbers are lowest. A severely infested colony may result in the presence of crawling bees on a warm winter or early spring day or walking bees with unhooked or "K" wings. However, this terminal indicator is soon followed by the death of the entire colony.

Laboratory procedures are available for the detection of the mite but these require the dissection and microscopic examination of the adult bees. Beekeepers who are concerned about tracheal mites or are suspicious that they may have tracheal mite infections should contact their local bee inspector, County Cooperative Extension Office, or the Extension Apiculturist at NCSU.

## **CONTROL**

### **CHEMICAL CONTROL:**

At the present time there are two products labeled for the control of tracheal mites in the U.S. They are menthol sold under the trade name of Mite-A-Thol<sup>®</sup> and formic acid which is sold under the trade name of Apicure<sup>®</sup>.

Both menthol and formic acid are naturally occurring products in honey but they should only be used in the labeled forms which are Mite-A-Thol and Apicure. Mite-A-Thol is a crystal form of menthol and Apicure is a formic acid preparation in a gel base. The misuse of either product can result in bee death and affect the flavor and saleability of the honey.

Of the two products, Apicure is the product of choice because it controls both tracheal mites and varroa mites, the more serious mite pest in N.C. (see Beekeeping Note 2.03, Varroa Mites). In addition, Apicure is less dependent upon ambient temperature for its effectiveness than is Mite-A-Thol. The best time to use Apicure for tracheal and varroa mite control is in the late summer or early fall. Both Apicure and Mite-A-Thol are most effective when honey bee brood is at a minimum and a treatment prior to winter conditions will be most effective in keeping mite levels from becoming a serious problem. Apicure becomes ineffective at temperatures below 45 degrees F.

Mite-A-Thol (menthol) is just as effective in controlling tracheal mites as is Apicure but it does not control varroa mites and it is ineffective at temperatures of less than 60 degrees F. The most effective time to use this product for tracheal mite control is prior to winter conditions when bee brood levels are at a low level so late summer or early fall treatments are best.

#### NON-CHEMICAL CONTROL:

In addition to the use of the two chemical controls, there are two other options that beekeepers should consider in tracheal mite control. These include the use of resistant stocks of bees and the use of vegetable shortening patties. Be advised that the beekeeper may still have to use chemical controls for the tracheal mites, but the use of these procedures may reduce the number of chemical treatments that are needed.

Resistant bee stocks, such as the Buckfast bees, have shown to be effective in reducing the impact of tracheal mites on honey bees. There are several strains of bees that show promise in this area, but the beekeeper should realize that the bees are really only tolerant and not really resistant to the mite pests. Any bee stock should be considered for characteristics other than just mite resistance in making a decision as to which bee to use.

The second non-chemical control of tracheal mites for beekeepers to consider is the use of vegetable shortening patties. The use of these vegetable shortening and sugar patties seems to interfere with the transfer (spread) of mated tracheal mites from their old bee host to a new bee host. The patties are most effective when used in the fall to early spring period. Patty preparations are available from most of the major bee suppliers.

The use of resistant (tolerant) bee stocks and the vegetable shortening patties have shown to be effective in reducing the impact of tracheal mites on honey bees, but chemical controls may be necessary even with the use of these products.

## SPECIAL NOTES ON TRACHEAL MITES

1. This honey bee pest is not as serious a problem to N.C. beekeepers as it was in the 1980's and early 1990's; however, it can still be a problem and result in colony loss.
2. There are no obvious field symptoms that the beekeeper can use to diagnose the presence of this pest in the apiary. The presence of crawling adult bees or walking adult bees with unhooked "K" wings in the late winter or early spring is an indication of a severe tracheal mite infestation, but this is a terminal symptom and the bee colony will probably die within a few days.
3. Tracheal mites only affect the adult bees and have no affect on the brood. Good management practices that keep adult bee populations strong will help the bee colony to "outgrow" this pest problem.
4. There are effective chemical controls for the tracheal mites including Apicure (formic acid in a gel formulation) and Mite-A-Thol ( menthol in a crystal form).
5. If you are in a region of the state that is undergoing problems with tracheal mites or think your bees may be infested, then contact one of the following for assistance: local NCDA bee inspector, county Cooperative Extension Office, or the extension Apiculturist at NCSU.
6. For updated information on registered pesticides for use against tracheal mites and other honey bee pests, visit the N. C. Agricultural Chemicals Manual online at: <http://ipmwww.ncsu.edu/agchem/chpt.5/501.PDF>  
To view this PDF file, you must have Acrobat Reader on your computer. Additional information can be found at the NCSU Apicultural website: <http://entomology.ncsu.edu/apiculture>

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