The Varroa Bee Mite[1]

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Varroa jacobsoni is potentially the most serious pest ever to threaten world beekeeping. Reports from other areas where the mite has been introduced show that great losses of colonies have occurred. The same has been true in the United States.

It is important to ensure that *Varroa* is not confused with the honey bee tracheal mite (*Acarapis woodi*). There has been and continues to be a great deal of controversy about the latter mite which lives in the breathing tubes of bees. The tracheal mite is difficult to find and the damage it inflicts on colonies is a matter of great debate. The *Varroa* mite should also not be confused with the bee louse, *Braula coeca*, which has six legs that extend from the body (Figure 1).

The *Varroa* mite, by contrast, is an external parasite of the honey bee. It is visible to the naked eye (Figure 2), reddish brown with a characteristic oval shape and has eight legs tucked under a shell (Figure 3).

Some generalizations concerning the *Varroa* mite which have been true in other infested areas of the world are:

1. Russian and European experiences reveal an infestation is usually fatal to colonies of European bees (*Apis mellifera*) within three to seven years.

2. Low levels of infestation are extremely difficult to detect.

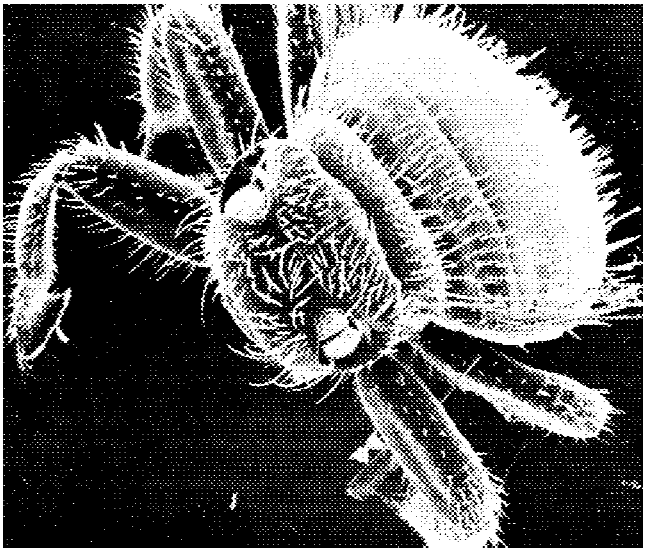

Figure 1. Bee louse. (SEM photo by H. L. Cromroy and W. C. Carpenter.)

3. It is a 7-10 year process to get chemicals registered, a process often costing millions of dollars.

4. Many of the 140 or so chemicals used worldwide for Varroa mite control are toxic to bees and beekeepers and their use risks contamination of honey and wax.

5. The *Varroa* mite develops resistance to chemicals in a short time. This is especially true when the chemicals are not used properly and/or dosage rates have not been adequately investigated.

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1. This document was published November, 1992 as ENY-127, and supercedes Hints for the Hive No. 127, Florida Cooperative Extension Service. For more information, contact your county Cooperative Extension Service office.

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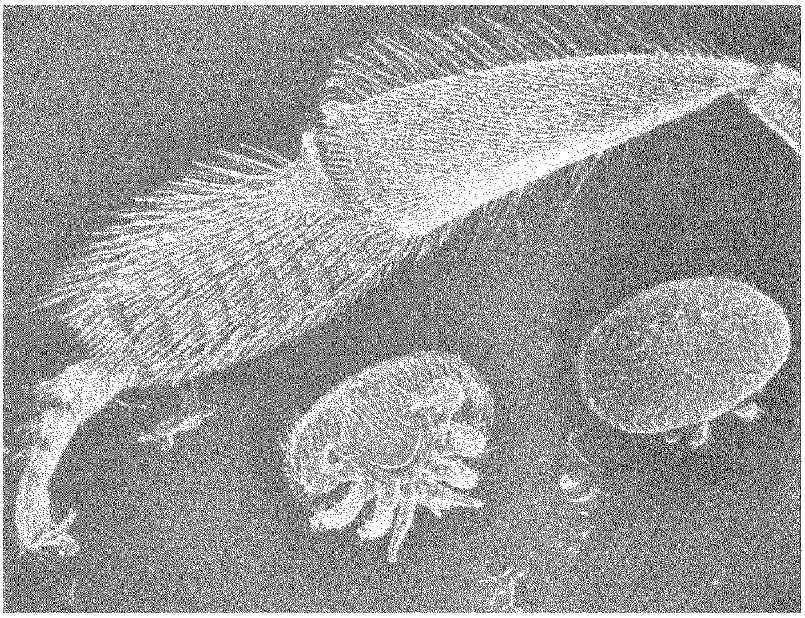

Figure 2. Adult female, ventral and dorsal views, comparing size with hind leg of worker honey bee. (SEM photo by H. L. Cromroy and W. C. Carpenter.)

Based on the above information, several things are apparent. The *Varroa* mite is a serious pest leading to death of European bees in most cases. Mite populations are difficult to detect in incipient stages, and may take years to build up to levels where colony death is imminent.

LIFE CYCLE OF VARROA

Numerous studies have pieced together the life cycle of the *Varroa* mite (Figure 4), but it has yet to be cultured artificially and many aspects of its complicated biology are unknown. The adult female leaves the brood cell and attaches to an adult worker or drone where she begins to feed by cutting a hole in the intersegmental membrane of the bee's hard outer skeleton. Little is known about the length of time required for this phase. Next, the well-fed female drops off the adult into a brood cell and hides in the brood food (jelly).

Normally, once the brood food is consumed by the host, the female then begins to feed on the larvae itself by piercing its delicate skin. She then lays a number of eggs of both sexes which hatch into six-legged larvae. After 48 hours, these become eight-legged protonymphs which, after feeding on the bee larva, molt into a deutonymph. Three days later, the last molt to an adult occurs. Approximately twenty-four hours later the mites mate inside the capped honey bee brood cell. The males die after copulation in the brood cell and the female mites emerge to begin the cycle again.

The female mite does not lay its eggs all at once, but at prescribed intervals (See Figure 4). This means that the longer the brood cycle, the more time there is for subsequent mites to develop. It is thought that drones are preferentially parasitized because their developmental cycle is longer (24 days) than that of the worker (21 days). It is also believed that bees with shorter developmental times [*Apis mellifera scutella*, the African honey bee, and the Asian bee, *Apis cerana (Indica)*] are more resistant to *Varroa* because mite populations do not develop as quickly as in the European races.

CONTROL STRATEGIES

Control of the *Varroa* mite must be accomplished using several strategies in concert with each other, similar to integrated pest management techniques commonly used in much of agriculture. Dr. W. Ritter of the German Federal Republic in "*Varroa* Disease of the Honeybee *Apis mellifera*," *Bee World*, Vol. 62,

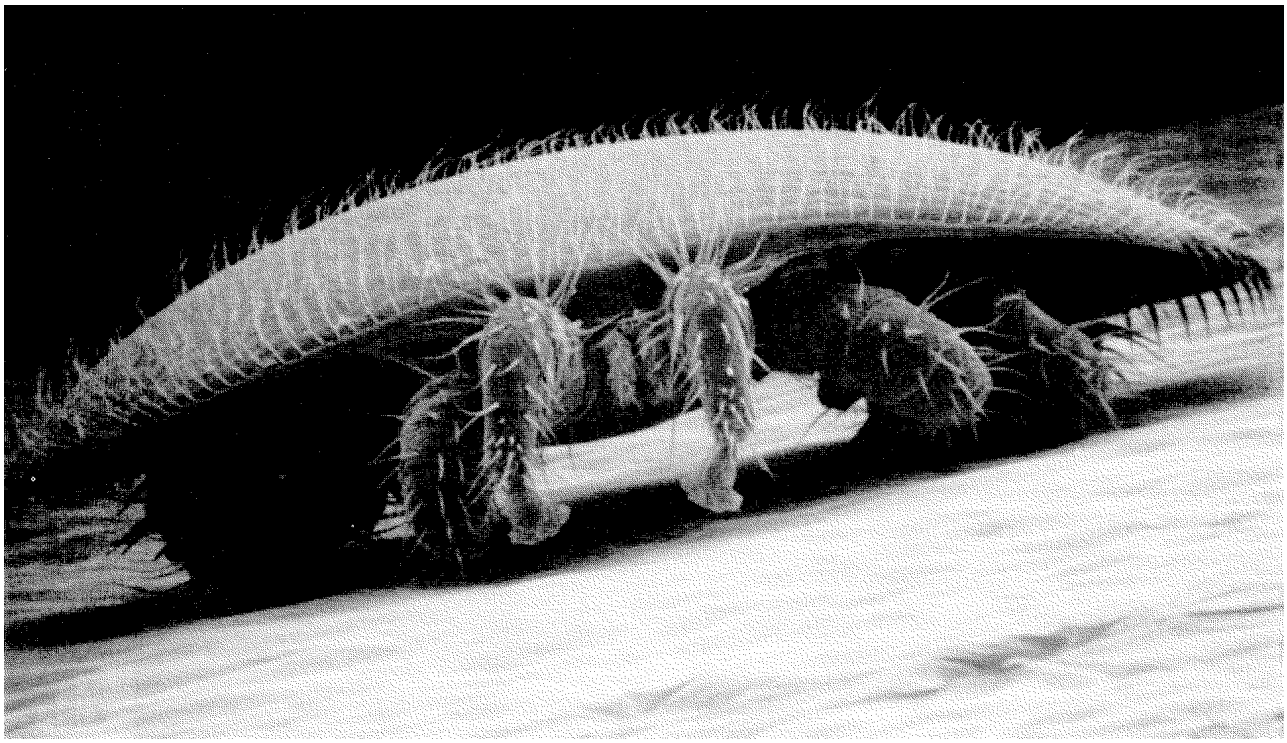

Figure 3. Adult female, showing curvature of body and legs covered by the shell. (SEM photo by H. L. Cromroy and W. C. Carpenter

No. 4, 1981, pp. 141-153) suggests a combination of the following:

1. Develop and use more effective treatment methods.

2. Control importation of all species of honey bees.

3. Diagnose infestations in the latent stage (before damage is seen).

4. Isolate infested colonies and those in the immediate area.

5. Control and coordinate treatment of infested colonies.

According to Dr. Ritter, the aim in the German Federal Republic has been to isolate the source of infestation and eradicate the mite in specific localities. However, where it has been spread over a wide area, infestation can at best only be reduced, particularly where there are feral colonies.

He also states that unsuitable highly toxic substances are coming into use and their improper application can contaminate honey. Frequent underdosing can also result in resistant strains of mites, already observed in Japan with phenothiazine. Frequent use of chemicals can also make beekeeping unprofitable, says Dr. Ritter, and a biological control should be a first priority in research for a long-range answer to *Varroa* control.

CHEMICAL CONTROL

Using chemicals to reduce mite populations can in no way be compared to experiences by beekeepers with Terramycin® to control American foulbrood. Therefore, beekeepers are urged not to use chemicals for mite control unless they are registered. Not only is the practice of using unregistered pesticides illegal, but it can also create undesirable effects. Among these are chemically-resistant mites, contaminated wax and honey, and susceptible lines of bees which are more prone to parasitization.

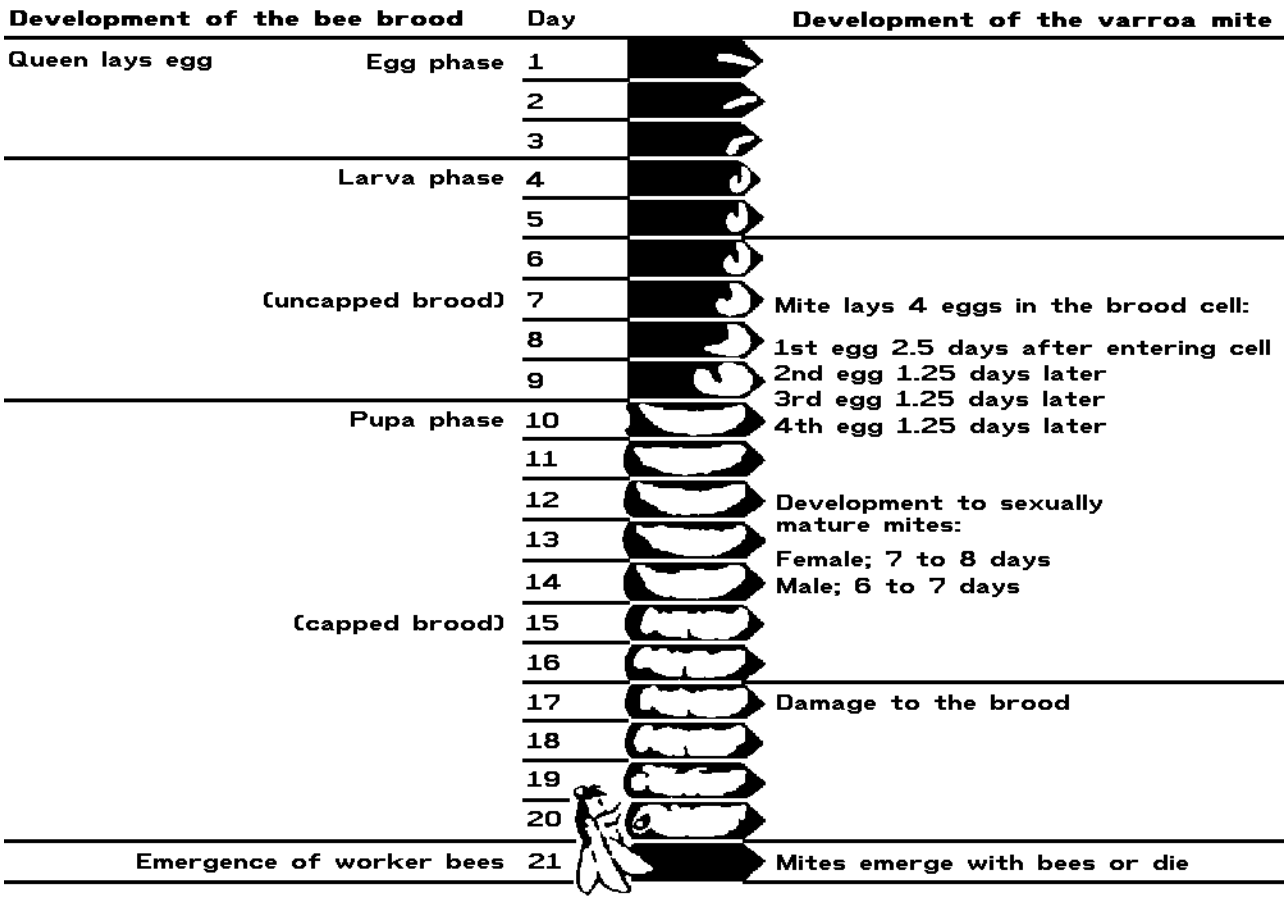

Figure 4. Life Cycle of *Varroa* Bee Mite.

Again, it is emphasized that USE of any unregistered chemicals by beekeepers is potentially HARMFUL to the beekeeping industry. It should be remembered that chemical control can only be considered a short range objective--more long-range research will be required to find suitable biological control and/or resistant strains of bees.

HONEY CONTAMINATION

Although pesticide use may be impermanent, or at best, changing as more and more chemicals are used for mite control, it is a certainty that more and more honey will be screened for chemical contamination in the future. Should pesticide contamination be found, the resulting adverse publicity could severely damage the honey industry. Witness the use of aldicarb on watermelons and the *Alar*® scare on apples. If there is a tradeoff between mite control and contamination of honey, the bias must be for protecting the name and reputation of honey in the decision-making process.

CONTROL BY MANAGEMENT/ MANIPULATION

Experience has shown that *Varroa* mite control is possible by reducing the mite populations through management/manipulation. Because the mite needs access to brood to complete its life cycle, bees can be removed from brood (broodless times in cold climates

may also be taken advantage of) for a period of days by placing them in packages or empty boxes.

Adult bees removed from infested colonies can be established on foundation or broodless comb that has been stored for a few days and is free of mites. Other manipulations including the use of drone combs as *Varroa* traps and heat treatment of infested combs may be useful for small-scale beekeepers.

SAMPLING FOR MITES

Beekeepers are encouraged to regularly sample their own bee colonies for presence of *Varroa* in an effort to monitor mite population. The videotape, *Varroa Mite Detection*, VT 249 is available on request by sending a blank VHS tape to Extension Apiculturist, PO Box 110620, Bldg. 970, Gainesville, FL 32611-0620.

Adult female mites are pale to reddish brown and measure about 1.1 millimeters long by 1.5 millimeters wide. The following methods are recommended for detecting *Varroa* in a colony:

1. Examination of hive debris:

Collect debris from hive floor with brush and dustpan and examine on a sheet of white paper. At least one commercial brand of mite detection board is on the market.

2. Examination of adult bees:

a. Collect 50 to 100 bees from open BROOD COMB. Place in washing solution- gasoline, 25% ethanol or isopropyl alcohol, detergent-water mixture or hot water, and shake vigorously for 1 to 10 minutes. Recover mites by straining through fine screen mesh.

b. Collect 100 live bees from open BROOD COMB. Place in small cage with wire mesh bottom on white paper. Place in oven at 46-47 degrees C. (114-120°F.) for 10 to 15 minutes and examine white paper.

c. Put about 1.3 pint (200-300) of live bees from open BROOD COMB in a glass jar, add a one-second squirt of ether and alcohol (commercial engine starting fluids can be used), shake and roll bees around in jar. Look for mites on side of glass jar. Mites are reddish in color and uniformly shaped. It is emphasized that for all tests listed above, bees samples MUST COME from the brood nest, NOT the entrance.

3. Examination of brood cells and combs:

a. Uncap brood (drone brood is preferred by the mites, but they can also be found on worker larvae) and remove white pupae with forceps. The dark colored adult mites are easily seen against the bee larvae and/or pupae which are glistening white.

SANITATION

Although the possibility of *Varroa* being transferred from one hive to another by humans is considered slight, it cannot be totally discounted. Adult mites have also been found on other insects, but are not thought to be able to reproduce except in honey bee colonies. Mites cannot live if separated from honey bees for more than four days. Mite infested clothing stored away from contact with bee colonies that long will not contaminate other colonies.

DAMAGE AND SYMPTOMS

Bees in temperate climates with harsh winters appear to be more at risk (i.e. dying from harsh conditions--winter loss) than populations in other climatic zones. In hot climates, where brood is reared year around, mite populations reach their zenith sooner than in cooler climates. In Florida, under ideal conditions colony death can occur within 6-9 months. Most authorities agree that all European bees (*Apis mellifera*) that become infested with *Varroa* must be considered in extreme jeopardy.

It is emphasized that it may take a long time for the mite population to build to levels where extensive damage is seen. The most observed symptom of the disease is deformed larvae, pupae and adult bees, which are often thrown from the colony and can be seen near the entrance.

This information was developed by a special *Varroa* Mite Task Force, Division of Plant Industry, Florida Agriculture and Consumer Services. It is being made available electronically and in print by the Institute of Food and Agricultural Sciences, University of Florida.