EENY-037

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Varroa Mite, *Varroa destructor (=jacobsoni)* Anderson & Trueman (Arachnida: Acari: Varroidae)[1]

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Introduction

The varroa mite, *Varroa destructor* Anderson & Trueman, an ectoparasite of honey bees, was first described as *Varroa jacobsoni* by Oudemans (l904) from Java on *Apis cerana*. However, Anderson and Trueman (2000), after studying mtDNA Co-I gene sequences and morphological characters of many populations of *V. jacobsoni* from around the world split it into two species. *Varroa jacobsoni* s.s. infests *Apis cerana* F. in the Malaysia-Indonesia region. *Varroa destructor* Anderson & Trueman, 2000 infests its natural host *A. cerana* on mainland Asia and also *A. mellifera* L. worldwide (Zhang 2000).

In 1951, the varroa mite was found in Singapore. In 1962-63, varroa was found on *Apis m. mellifera* in Hong Kong and the Philippines (Delfinado 1963) and spread rapidly from there. Adaption to a new host (*Apis m. mellifera*), the importation of queen bees from infested areas, and the movement of infested colonies of bees for pollination led to the rapid spread of this mite. Following the find of a single varroa mite in Maryland in 1979, the Division of Plant Industry and H.L. Cromroy, University of Florida, made an inspection of Florida bees in 1984. The varroa mite was not found at that time, but in 1987 the varroa mite was detected in Wisconsin and Florida. Several thousand colonies of migratory bees are moved in and out of Florida each year. It is not known where or when varroa mite was introduced into the continental U.S.A. In Florida, the varroa mite has been found on flower feeding-insects Bombus pennsylvanicus (Hymenoptera: Apidae) and *Palpada vinetorum* (Diptera: Syrphidae). It has also been found on *Phanae us vindex* (Coleoptera: Scarabaeidae) (Kevan et al. 1990). Although the varroa mite can not reproduce on other insects, it is a means of spreading the mite short distances.

Distribution

Varroa mite is now cosmopolitan, being found in Indonesia (Oudemans 1904), Singapore (Gunther 1951), and USSR (Breguetova 1953); it was found on *Apis m. mellifera* in Hong Kong (Delfinado 1963) and Philippines (Delfinado 1963). It quickly spread to the Peoples Republic of China (Ian Tzien-He 1965),

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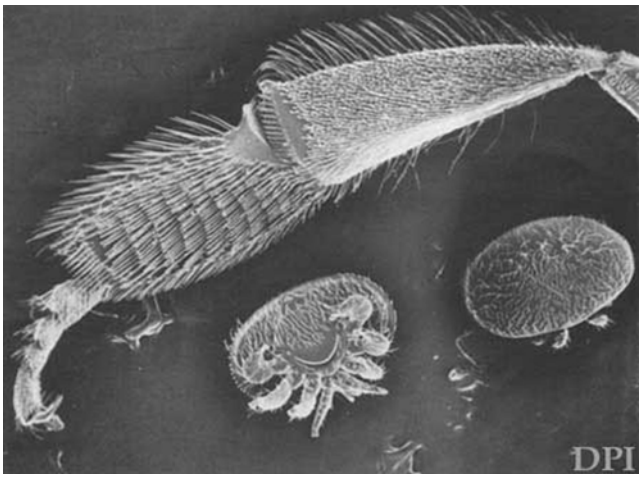

Figure 1. European honey bee with a varroa mite, *Varroa destructor* Anderson & Trueman, on its back. Credits: Scott Bauer, USDA

India (Phadke et al. 1966), North Korea (Tian Zai Zai Soun 1967), Cambodia (Ehara 1968), Japan (Ehara 1968), Vietnam (Stephen 1968), Thialand (Laigo and Morse 1969), Czechoslovakia (Samsinak and Haragsim 1972), Bulgaria (Velitchkov and Natchev 1973), South Korea (Delfinado and Baker 1974), Paraguay (Orosi-Pal 1975), Taiwan (Akratanakul and Burgett 1975), Argentina (Montiel and Piola 1976), Poland (Koivulehto 1976) Romania (Orosi-Pal 1975), Urguay (Grobov 1976), Germany (Ruttner 1977), Bangladesh (Marin 1978), Brazil (Alves et al. 1975) Myanmar (Marin 1978), Hungary (Buza 1978), Tunisia (Hicheri 1978), Greece (Santas 1979), Iran (Crane 979), Libya (Crane 1979), Turkey (Crane 1979), Yugoslavia (Santas 1979), Lebanon (Popa 1980), and likely other countries. Again, the mite was first detected in the USA in 1987 and has spread to most of North America. A full description of varroa's introduction, spread and economic impact has recently been published (Sanford 2001).

Description

Adult female mites are brown to dark brown, shaped like a crab, measuring 1.00-1.77 mm long and 1.50-1.99 mm wide. Their curved bodies fit into abdominal folds of the adult bee and are held there by the shape and arrangement of ventral setae. This protects them from the bee's normal cleaning habits. Adult males are yellowish with lightly tanned legs and spherical body shape measuring 0.75-0.98 mm long and 0.70-0.88 wide. The male chelicerae are modified for transferring sperm. The protonymph and deutonymph stages were described by Delfinado-Baker (1984).

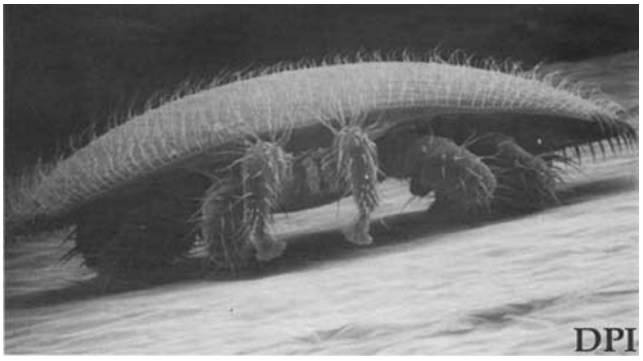

Figure 2. Adult female varroa mites, *Varroa destructor* Anderson & Trueman, ventral and dorsal views (lower right) with honey bee leg (upper left) for scale. Credits: Division of Plant Industry

Figure 3. Adult female of varroa mite, *Varroa destructor* Anderson & Trueman, anterior view, showing curvature of body. Credits: Division of Plant Industry

Life Cycle

The life cycle of the varroa mite (Figure 4) is very much synchronized with that of its honey bee host; it may be that hormones or pheromones of honey bees are necessary for the mite to complete its development. The female lays eggs in bee brood cells. Developing mites feed on developing honey bee larvae. Males and females copulate in the cell. The male dies, but pregnant females emerge from the cell along with their bee host and seek another cell to repeat the cycle. It is thought the length of the postcapping period in honey bees is an important indicator of eventual infestation. The longer the postcapping time, the more time there is for more female mites to develop.

Figure 4. Dorsal view of adult varroa mite, *Varroa destructor* Anderson & Trueman. Credits: Scott Bauer, USDA

Hosts

Among the bees that serve as hosts of the varroa mite are *Apis cerana*, *A. koschevnikovi*, *A. mellifera mellifera*, *A. m. capenis*, *A. m. carnica*, *A. m. iberica*, *A. m. intermissa*, *A. m. ligustica*, *A. m. macedonica*, *A. m. meda*, *A. m. scutellata*, and *A. m. syriaca*.

Economic Importance

The varroa mite is one of the most serious pests known for Apis mellifera, principally because it is an introduced and therefore exotic organism on Apis mellifera. It feeds on the haemolymph of the developing honey bee larva, pupa, and the adult bee. Heavily infested colonies usually have large numbers of unsealed brood cells. Dead or dying newly emerged bees with malformed wings, legs, abdomens, and thoraxes may be present at the entrance of affected colonies. If left unchecked, mites can cause loss of most affected colonies. It is reported in Europe that weak colonies are subject to being

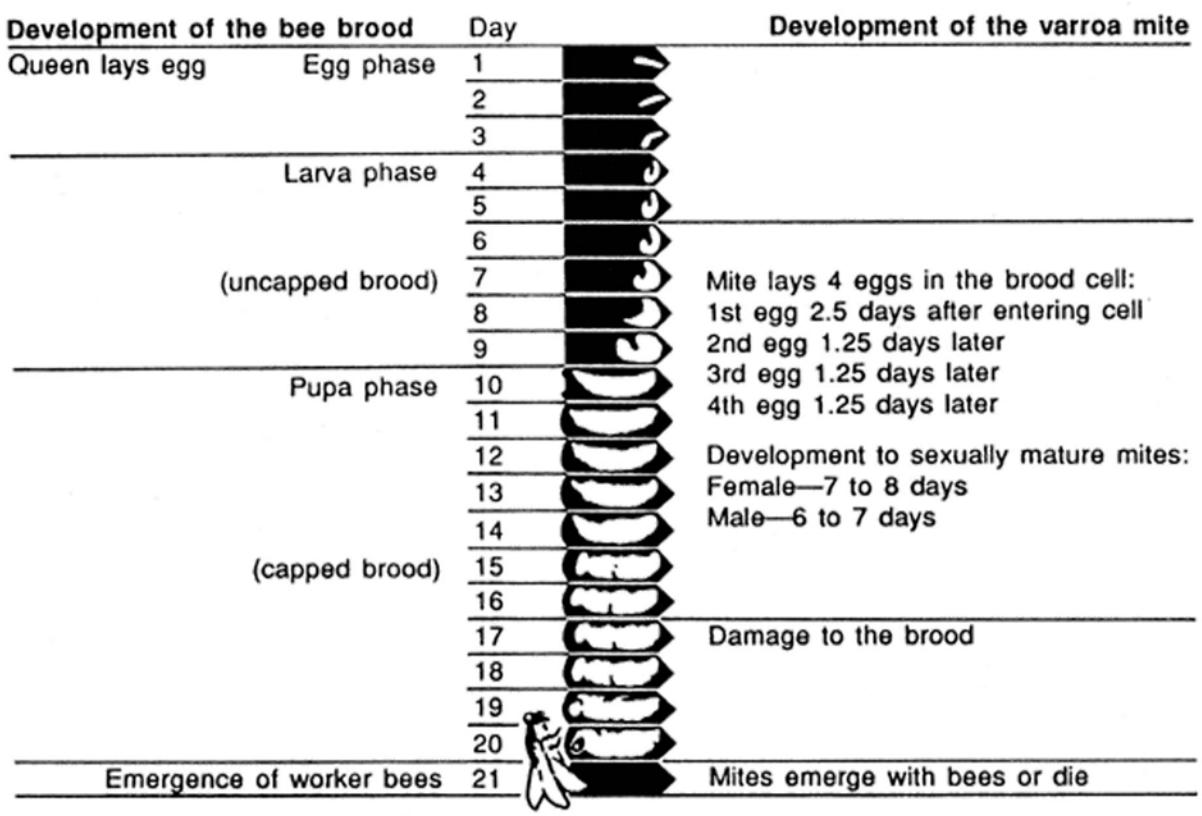

Figure 5. Life cycle Varroa mites, *Varroa destructor* Anderson & Trueman. Credits: Scott Bauer, USDA

Figure 6. A family of varroa mites, *Varroa destructor* Anderson & Trueman, found in the bottom of a honey bee brood cell. Credits: Scott Bauer, USDA

Figure 7. A young worker bee emerges from a brood cell with a varroa mite, *Varroa destructor* Anderson & Trueman, on its back. Credits: Stephen Ausmus, USDA

robbed by stronger colonies of may die within three to four years from the lack of worker bees to manage the brood and gather nectar. In Florida, infested colonies have died within seven months, probably due to the ideal weather conditions for mite development. Because varroa mites usually cause the death of a colony of Apis mellifera, it has been suggested that the development of this particular host/parasite relationship is still incomplete. The original host, Apis cerana, supports populations of mites without collapsing and Apis m. scutellata (the African or Africanized honey bee) seems to have some resistance or tolerance to varroa mite (Ritter 1981).

Figure 8. Visible as a dark, oval shap, an adult female varroa mite, *Varroa destructor* Anderson & Trueman, feeds on the midsection of a developing worker bee. Credits: Scott Bauer, USDA

Survey and Detection

Ether Roll: The most widely used technique involves shaking 300 to 500 bees (1/4 to 1/3 pint) from the center frame of the brood nest into a pint jar. Spray automotive ether starting fluid for about two seconds onto bees. Close jar and shake vigorously for 10 to 15 seconds, then roll slowly. Mites can be seen stuck to the jar's interior.

Sugar Shake: Rather than starting fluid, which kills the bees, one can use powdered sugar as a substitute. For details, see various sites on the World Wide Web (http://www.nhb.org/articles/sugshke.html).

Sticky Paper: Place a sheet of white paper coated with cooking oil (i.e., Pam®) on the hive bottom and cover with #8 mesh screen. Check the "sticky board" daily for mites and replace when debris becomes excessive. To accelerate mite drop, place two Apistan® or CheckMite+® strips in the brood nest as directed by the label. Sticky boards are commercially available for this purpose.

Shake and Wash: Shake 1/4 to 1/2 pint of bees from the brood nest into a jar. Cover with 75% isopropyl alcohol and place on shaker for 15 to 30 minutes. Pour contents into a coarse sieve and vertically agitate in alcohol for 60 seconds. Strain alcohol wash through fine mesh cloth to recover mites. Replace bees in pint jar and preserve with alcohol. Count bees in white enamel pan and recover

Figure 9. Parasitic varroa mites, *Varroa destructor* Anderson & Trueman, attached to a sticky board removed from the bottom of a beehive. Credits: Peggy Greb, USDA

additional mites not recovered by first wash (ca. 1 to 3%).

Management

The Environmental Protection Agency originally approved Apistan® strips for varroa control. These are plastic strips impregnated with fluvalinate as the active ingredient. For unexposed mites, this treatment is generally 99.8% effective, and if the colony is not exposed to heavy reinfestation, treatment should be effective for 12 months. Experience has shown, however, that resistance by mites has probably occurred and is occuring in many areas. This was first seen in Europe (Italy and France), but now has been confirmed in parts of the United States. Because of this, it is important for beekeepers to monitor whether this or any treatment works. More recently Section 18 labels have been approved for CheckMite+®, a plastic strip treatment based on coumaphos, a highly effective, but more dangerous organophosphate.

Resistance has been seen for both of the above treatments and beekeepers are continually in search of alternatives. Anyone contemplating chemical treatment for varroa should first determine a colony's infestation level and then be sure to monitor effectiveness of the treatment. Several different strategies for using materials consistent with the principles of Integrated Pest Management are found on the World Wide Web (http://www.orsba.org/download/janfeb2001.PDF).

Remember to follow label directions on all chemicals used for varroa mite control. For the latest information in Florida, contact a local bee inspector or the Division of Plant Industry's Chief Apiarist at (352) 372-3505 x 114. (http://www.doacs.state.fl.us/pi/plantinsp/bees.html)

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