Tropilaelapidosis on *Apis mellifera*

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Definition

Tropilaelapidosis is due to a haemophagous ectoparasitic mite *Tropilaelaps clareae*. After a short phoretic period on the adult bee, it enters the brood cell just before capping, where it reproduces. It causes a rapid decline of colonies of *Apis mellifera*.

General epidemiology

The mite was first described on *A. mellifera* in the Philippines by Delfinado and Baker (1961). Later, it was described on the other species of the genus *Apis* (Table 1).

Table 1. Distribution of *Tropilaelaps clareae* on its known *Apis* hosts (after Aggarwal, 1988)

Host	*A. dorsata*	*A. mellifera*	*A. cerana*	*A. florea*
Stage and cast†	Ad, drB, wB	Ad, drB, wB	Ad, drB	Ad
Infested countries	India Philippines Nepal Burma	India Philippines Burma Malaya Vietnam Thailand China Taiwan Pakistan Afghanistan	India Burma Malaya Java Pakistan Papua N.G.	India

†Ad = adult bees; drB = drone brood; wB = worker brood.

In India, the mite was responsible for the loss of 50% of the brood in *A. mellifera* colonies, introduced six years earlier (Atwal and Goyal, 1971). The same situation was observed in the Philippines (Laigo and Morse, 1968). In other countries, where *A. mellifera* is native, *T. clareae* is considered a serious pest, making control treatments necessary.

Etiology

Classification, anatomy, biology, reproduction

The genus *Tropilaelaps* belongs to the Laelapidae family. It includes two species: *T. clareae* and *T. koenigerum*. The latter has only been described on *Apis dorsata* in Sri Lanka.

Description

For the external anatomy, see Fig. 1 of the Chapter on "Generalities on the mites present on honeybees".

Tropilaelaps clareae is primarily a parasite of the bee brood; it is probably only phoretic on adult bees. Only the immature stages and adult females are haemophagous. The parasite reproduces on both drone and worker brood, although the drone brood is preferentially infested (ratio 3:1). The parasitism level can reach a maximum of 90% in the drone brood and in the worker brood (Burgett *et al.,* 1983).

Typically 1 to 4 mated females enter a brood cell when it is approximately two thirds sealed (Burgett *et al.*, 1983; Ritter and Schneider-Ritter, 1986). The latter authors distinguish five stages in the growth of the body size of female mites, correlated with the feeding behaviour, before egg-laying commences. The first egg is laid 50 hours after the cell has been capped and the majority of the eggs are laid before 110 hours. A female can produce up to six eggs (Feng, 1990). According to Kitprasert (1984), the mean duration of the mite progeny stages are: 1.05 days for the egg, 1.85 days for the larva, 2.11 days for the protonymph and 3.75 days for the deutonymph. Using these developmental times the first young adult mite appears about 18 days after the honeybee egg is laid, which is not in exact agreement with the maturation time of 16 days given by Woyke (1987).

Males and females are produced in about the same proportion. When the bee emerges, by removing the cell capping, the adult female mites are released and start to move freely on the comb surface. The remaining few nymphal stages and the males in the cells do not survive after the bee has emerged. The adult female mites do not stay on the adult bees for longer than 1.4 days (Kitprasert, 1984). Comparing the data of this author to that of Woyke (1987) we can assume that more than 50% of the females are able to produce two viable offspring.

It was reported that in Thailand approximately 27% of the females entering brood cells did not reproduce and 2% of them give birth only to males (Ritter and Schneider-Ritter, 1986). In Afghanistan, Woyke (1987) found that only 18% of female mites were non-reproducing. Approximately 64% of the females produce one descendant and 33% produce two descendants (Ritter and Schneider-Ritter, 1986).

In colonies where *Varroa jacobsoni* is also present the ratio *V. jacobsoni* to *T. clareae* is 1:25, probably because only *T. clareae* produces viable progeny when it is in competition with *V. jacobsoni* (Burgett *et al.*, 1983).

Spread and transmission

The adult female mite is the only stage responsible for the establishment and spread of infestation. A proportion of the adult female population remains in the colony where the mites can move with great agility, freely on the combs. Others are phoretic on the adult bee, often taking up a position between the thorax and the abdomen. According to De Jong *et al.* (1982), they feed on the haemolymph of the adult bee, which is contrary to the assertion of Ritter and Schneider-Ritter (1986). The survival of the mite on worker bees maintained in an incubator at 35°C and 60% RH is a maximum of three days (Rinderer *et al.*, 1994; Kitprasert, 1984). Without food, mite survival is two days (Aggarwal, 1988; Koeniger and Muzaffar, 1988). The survival time does not seem to be closely correlated with the presence of adult bees, which is an argument in favour of mere phoresy. The main means of spread of the mites between colonies are robbing, drifting and absconding.

Pathogenesis

No information is available at the present time.

Clinical diagnosis

According to Rinderer *et al.* (1994), if the population of *T. clareae* is allowed to develop unchecked the mite can rapidly cause the death of the colony. When the colony collapses, severely infested bee larvae and pupae are often seen at the hive entrance. Newly emerged adult bees often have vestigial or deformed wings or legs. The abdomen can also be malformed. The brood combs display an irregular pattern with dead or malformed immature bees. Pupae in infested cells often have darkly coloured spots, mainly on their extremities. At this stage, infestation in brood cells could be recognized by the adult bees (Ritter and Schneider-Ritter, 1986). Queenless colonies have more severe infestations than queenright colonies (De Jong *et al.*, 1982).

Differential diagnosis consists of distinguishing *T. clareae* from *T. koenigerum* although the latter has not been found on *A. mellifera*.

Treatment, prophylaxis

A biological method, consisting of caging the queen for 9 days and removing the sealed brood at the same time, is sufficient to eliminate the mite (Tangkanasing *et al.*, 1988). Garg *et al.* (1984) used 85% formic acid as acaricide. By means of a wick of gauze of a defined length inserted through a cork, 5 ml of formic acid is left to evaporate inside the colony for 14 days. The use of an absorbent plate impregnated with formic acid (Illertissen Milben Platten®), is also effective and more successful than in the treatment of varroosis. Cymiazol (Apitol®) is also very effective (Ritter and Schneider-Ritter, 1986).

Concerning prophylaxis, we have to keep in mind that others tropical mites (*Euvarroa wongsirii*, *Varroa underwoodi*) are good candidates to adapt to *A. mellifera* (Akratanakul and Burgett, 1976; Aggarwal and Kapil, 1988; Delfinado-Baker and Aggarwal, 1987; Morin and Otis, 1993).

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