

Different Reaction of *Apis dorsata* and *Apis mellifera* to Brood Infestation by Parasitic Mites

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Introduction

One of the resistance mechanism of honey bees against parasitic mites is the ability to detect the mites in sealed brood cells and to open and to remove the infested brood.

According to Laigo and Morse (1969) no brood killed by *T. clareae* was found in lightly infested *A. dorsata* nests. However much dead brood was present in more heavily infested nests. Woyke (1984) reported that sealed brood cells infested by *T. clareae* were left in comb area where bees had already emerged. Burgett *et al.* (1990) suggest, that no dead brood is found in *A. dorsata* combs, because infested brood is removed by the bees. However, Koeniger *et al.* (1993) found again a number of sealed brood cells infested by *T. clareae*, in each empty comb left by absconded *A. dorsata* colony.

Concerning *A. mellifera*, Woyke (1984) found that brood infested by *T. clareae* is scattered, brood cells are opened, and pupae partly eaten up. Ritter and Schneider – Ritter (1988) reported that a large number of cells opened by the bees were found in colonies heavily infested by *T. clareae*. However, only a few cells, that have been infested with *V. jacobsoni* were opened by bees. Boecking *et al.* (1992) reported also that more cells were opened after they were infested artificially or naturally by *T. clareae*, than by *V. jacobsoni*. Nobody suggested the reason for the higher opening rate of brood cells infested by *T. clareae*, than by *V. jacobsoni*.

The purpose of this investigation was to determine infestation of brood by mites in *A. dorsata* and *A. mellifera* colonies and to suggest on this basis, the stimuli for the hygienic behaviour towards *T. clareae* and *V. jacobsoni*.

Material and methods

Investigation on *A. dorsata* were conducted in the Central Bee Research Institute in Poona, India 1974, and in Pedu Lake, Malaysia 1995. Fresh brood combs were examined.

Investigations on *A. mellifera ligustica* were conducted in Institute of Apiculture in Beijing, China, 1993. Contents of brood cells of both *Apis* species was examined with the aid of stereomicroscope. *A. mellifera* sealed comb cells containing brood either shortly after capping (pre-pupae and young pupae) or shortly before emerging of adult worker bees were opened. Numbers of cells infested by *V. jacobsoni* and *T. clareae* were recorded.

Results

Apis dorsata

Brood cells in four combs of *A. dorsata* collected in Pedu Lakes were infested in 0, 0.4, 2.0 and 2.4 %, the average infestation rate was 1.2 %. The infestation was very low, although the colonies past on the tree the season and were ready to migrate. In the heaviest infested comb (2.4 %), cells containing order pupae with dark eyes were examined. Together 23 *T. clareae* mites were found in 250 cells. Among them, 7 were old females, 6 males, 7 young females, and 2 deutonymphs. Only in one cell, 2 old females were found. The above results indicate, that the reproduction rate of the old female to total offspring was 1:2.2, and to young females 1: 1.7.

Comb heavily infested by *T. clareae* was collected in India. The comb was taken from *A. dorsata* colony in full activity. The comb was 50 x 50 cm, it was full of honey in the upper part, and brood was present below. Workers emerged already from the central upper part of brood area, and unsealed brood was present there. However, within 735 cells of that area 24.2 % of scattered sealed cells, were left. Those cells had dark cappings. Inside, dead pupae infested by *T. clareae* were found. Some pupae were soft and the others were dry. Within 861 cells in the sealed brood area, 28.2 % had dark cappings, and contained dead pupae infested by *T. clareae*. Only 1.4 % cells within that area was open. This shows, that *A. dorsata* workers mostly did not open cells with infested dead pupae within bee sealing period.

Apis mellifera

In Beijing area, *V. jacobsoni* survive the winter and *T. clareae* does not. Bee colonies with *T. clareae* were infested recently.

In colony A, 400 cells with young and 400 with old sealed brood, were investigated. *V. jacobsoni* infested 19.3 and 17.0 % of cells respectively. *T. clareae* infested 4.0 and 3.8 % of cells respectively. No significant difference was found between infestation of young old sealed brood by both mite species.

In colony B, 800 cells with young and 1000 cells with old sealed brood were investigated. Fig. 1. shows, that *V. jacobsoni* infested 13.5 and 11.4 % of cells respectively. However, *T. clareae* infested as much as 4.9 % of cells with young sealed brood and as little as 0.7 % of cells with bees ready to emerge. Thus, young sealed brood was infested by *T. clareae* 7 times more, than the old one. This indicated, that worker bees of that colony were able to detect the presence of *T. clareae* mites in sealed brood cells and to remove them. Out of infested cells 85.7 % were cleared up.

Observations revealed, that *V. jacobsoni* occupies and deposits excrements in deeper part of brood cells. However, *T. clareae* occupies upper part of cells, and deposits excrements around and on inner surface of cappings. Bees scratch wax from cappings of older sealed brood, exposing the cocoon through which the excrements are visible. I am able to detect the presence of *T. clareae* mites in cells with older sealed brood, without opening the sealings.

Discussion

The known mechanisms by which *A. dorsata* regulates *T. clareae* are grooming and migration. The above results suggest, that *A. dorsata*, posses also a third mechanism, by not opening infested cells. If the cells were opened, the reproduction cycle could be interrupted. However, *T. clareae* females could enter another brood cell. If cells with dead brood remain sealed, the parasite must die. To which extend *A. dorsata* workers open lightly infested alive brood must still be determined.

Contrary, worker bees of some *A. mellifera* colonies open much more brood infested by *T. clareae* than by *V. jacobsoni*. I suggest, that the presence of *T. clareae* mites and its feces on brood sealing, enables to the workers of some bee colonies to detect the mites and to remove them.

Literature

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Legend to: J Woyke

Different reaction of *A. dorsata* and *A. mellifera* to brood infestation by parasitic mites

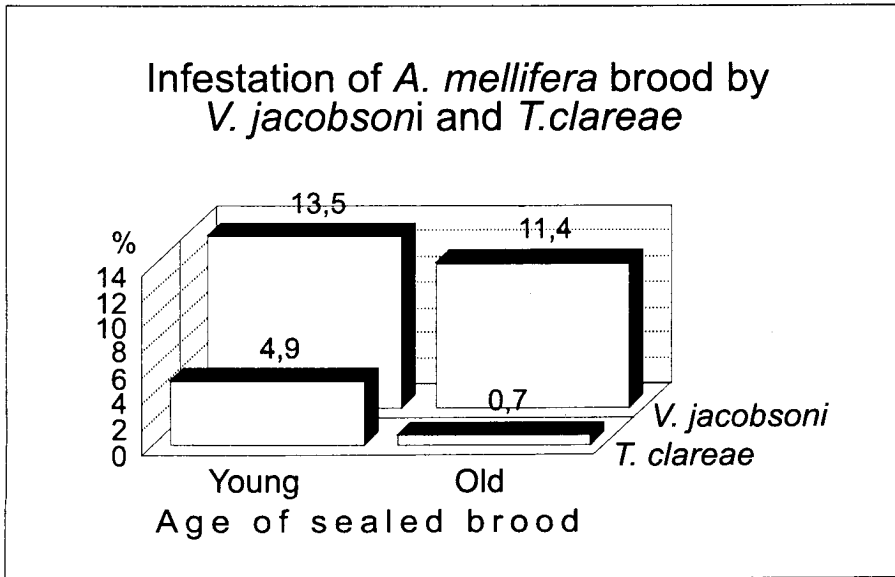


Fig.1. Infestation of old and young *A. mellifera* sealed brood by *V. jacobsoni* and *T. clareae* in bee colony No B.