

Research article

The ectoparasitic mite *Tropilaelaps mercedesae* (Acari, Laelapidae) as a vector of honeybee viruses

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Abstract. The ectoparasitic mites *Varroa destructor* and *Tropilaelaps mercedesae* share life history traits and both infect honeybee colonies, *Apis mellifera*. Since *V. destructor* is a biological vector of several honeybee viruses, we here test whether *T. mercedesae* can also be infected and enable virus replication. In Kunming (China), workers and *T. mercedesae* mites were sampled from three *A. mellifera* colonies, where workers were exhibiting clinical symptoms of deformed wing virus (DWV). We analysed a pooled bee sample (15 workers) and 29 mites for the presence of Deformed wing virus (DWV), Black queen cell virus (BQCV), Sacbrood virus (SBV), Kashmir bee virus (KBV), Acute bee paralysis virus (ABPV), and Chronic bee paralysis virus (CBPV). Virus positive samples were analysed with a qPCR. Only DWV +RNA was found but with a high titre of up to 10⁸ equivalent virus copies per mite and 10⁶ per bee. Moreover, in all DWV positive mites (N= 12) and in the bee sample virus –RNA was also detected using RT-PCR and tagged RT-PCR, strongly suggesting virus replication. Our data show for the first time that *T. mercedesae* may be a biological vector of DWV, which would open a novel route of virus spread in *A. mellifera*.

Keywords: *Apis mellifera*, honeybees, *Tropilaelaps mercedesae*, vector, viruses.

Introduction

Mites of the genus *Tropilaelaps* (Acari: Laelapidae) are ectoparasites of honeybees *Apis* native to Asia (Delfinado and Baker, 1961; Laigo and Morse, 1968). The primary host of one of the better known species *Tropilaelaps clareae* is *Apis dorsata* (Laigo and Morse, 1968) but *Tropilaelaps* mites were able to switch to the western honeybee, *Apis mellifera* (Delfinado and Baker, 1961; Anderson and Morgan, 2007). *Tropilaelaps clareae* was first discovered on *A. mellifera* in the Philippines (Delfinado and Baker, 1961). *Tropilaelaps* species seem to be prevalent in Asia and are able to infect a wide spectrum of honeybee species ranging from *Apis mellifera*, *A. cerana*, *A. dorsata*, *A. florae* and *A. laboriosa* (Bailey and Ball, 1991; Schmid-Hempel, 1998). However, these mites appear to be particularly pathogenic in *A. mellifera* (Burgett et al., 1983; de Jong et al., 1982; Laigo and Morse, 1969). Similar to *Varroa destructor* Anderson and Trueman (Acari: Varroaidae), *Tropilaelaps* mites are infecting brood and suck haemolymph. Up to four female mites can invade the same brood cell (Burgett and Akranakul, 1985; de Jong et al., 1982).

Given that both mite genera are sucking haemolymph, it seems likely that they obtain pathogens from their hosts and may act e.g. as vectors of viruses, because mites switch between different host individuals (Delfinado-Baker and Aggarwal, 1987; Sammataro et al., 2000). Indeed, several honeybee viruses have been found in *V. destructor* like Deformed wing virus (DWV), Black queen cell virus (BQCV), Sacbrood virus (SBV), Kashmir bee virus (KBV), Acute bee paralysis virus (ABPV) and Chronic bee paralysis virus (CBPV; Chen and Siede, 2007). Moreover, DWV is replicating in *V. destructor* (Yue and

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