Tropilaelaps Mites: Are We At Risk?

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Tropilaelaps are parasitic mites of honey bee brood. The native range of *Tropilaelaps* is tropical Asia and their usual host is the giant honey bee, *Apis dorsata*. In Asia, there are four species of *Tropilaelaps* which can parasitise a variety of bee species including *A. cerana*, *A. dorsata*, *A. florea* and *A. laboriosa*[1]. The Western honey bee, *A. mellifera*, was introduced into Asia where it became host to two species of *Tropilaelaps*: *T. clareae*[2] and *T. mercedesae*[3].

Tropilaelaps spp have been found infesting *A. mellifera* in Asia in areas where they are localised with *A. dorsata* and also in *A. mellifera* colonies in Afghanistan, South Korea, China, Kenya and New Guinea, where *A. dorsata* is not present[3]. It is troubling that these mites can spread beyond their normal range and the concern is that they may become a serious global pest of *A. mellifera*[4].

Tropilaelaps spp. are not considered to be a serious pest of their natural host, *A. dorsata*, but in *A. mellifera* colonies in Asia, they are considered to be a more destructive pest than the parasitic mite, *Varroa destructor*[3].

Tropilaelaps on honey bee brood

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Comparisons with *Varroa destructor*

Do Tropilaelaps present a similar threat to honey bees as *Varroa destructor*?

Tropilaelaps mites are similar to *V. destructor* mites in some respects. Although they look quite different, *Tropilaelaps* are smaller and more oblong in shape, their life cycles are similar. Like varroa, *Tropilaelaps* live inside the brood cells, feeding on the developing larvae.

Females enter the brood cell when the host bee is at late larval stage and feed and lay their eggs within the host cell. The eggs develop into adult mites between five and nine days later[5]. There tends to be more females than males (an average of 1:5 males: females) with females living for approximately 28 days and the males for only five days[5].

While varroa have a preference for parasitising drone brood, *Tropilaelaps* will infest worker or drone brood and may have a slight preference for the former[6].

The damage caused to honey bees through parasitisation is similar to that caused by varroa. For example, reduced bee weight, deformations and mortality. Severe infestations left untreated can, and do, kill honey bee colonies.

Winter Survival

Tropilaelaps cannot feed on adult bees as their mouthparts are not strong enough to break the thick cuticle; they need the soft developing brood to feed on and they will die within three days without access to brood. Therefore, they do not persist very well in temperate climates where the brood cycle may be broken during the winter[5, 7]. Some areas of the United Kingdom (UK) are at risk, as honey bee colonies in some areas may contain brood through the winter and the mites would be able to survive, even on a small patch of brood. If milder winters become more commonplace, there will be more areas of the UK with unbroken brood cycles throughout winter, providing ideal conditions for *Tropilaelaps*.

Concurrent Infection

Colonies can be infected with *Tropilaelaps* and varroa at the same time. *Tropilaelaps* has a shorter life cycle than varroa, so can build up more rapidly in the colony and this provides a competitive advantage to *Tropilaelaps* in some scenarios. *Tropilaelaps* is found to be more successful than *V. destructor* in honey bee colonies in Thailand, but less successful than varroa in Korea[6]. This may be explained in part by the different climates – Thailand is tropical while Korea is temperate and colonies may experience broodless periods in winter[6]. Either way, it is not good news for beekeepers or their bees.

Viral Associations

Like varroa, *Tropilaelaps* feed on the developing brood and therefore there may be some exchange of viruses between mite and host. *Tropilaelaps mercedesae* in *A. mellifera* colonies in China have been analysed for the presence of viruses. Researchers looked for KBV (Kashmir bee virus), SBV (sacbrood virus), CBPV (chronic bee paralysis virus), BQCV (black queen cell virus), ABPV (acute bee paralysis virus) and DWV (deformed wing virus)[1]. The only virus that they detected in the mites was DWV, but at quite high levels of up to 100 million copies per mite. A similar study from the same year also examined *Tropilaelaps* from *A. mellifera* in China and discovered very high levels of DWV in the mites[7] which correlated with the levels of DWV in the developing bee brood. There is some suggestion that DWV may be replicating in these mites but there is some uncertainty how and if *Tropilaelaps* will ultimately affect the virulence and prevalence of viruses such as DWV.

Monitoring for *Tropilaelaps*

Tropilaelaps may not be able to feed on adult bees, but they can hitch a ride on them, so they can be spread through the movement of adult bees. There is a risk that the mites could be introduced to the UK through importation of bees. There are strict regulations regarding the import of bees from non-EU countries and these regulations are key to preventing this mite from becoming a problem for UK beekeeping[12]. The illegal importation of bees from countries with *A. mellifera* infested with *Tropilaelaps* could have major impacts for UK beekeeping, as there is a high risk that these mites could become established in areas of England where colonies have an unbroken brood cycle[4]. Our best defense against *Tropilaelaps* is to prevent its entry into the UK.

The National Bee Unit (NBU)keeps a look out for exotic pests such as *Tropilaelaps*. A group of beekeepers in England and Wales maintain 120 sentinel apiaries, which are monitored regularly for *Tropilaelaps* and other exotic pests such as small hive beetle, on behalf of the National Bee Unit (figure 3). Twice a year, these beekeepers also send samples from the sentinel apiaries to the NBU laboratory. The sample comes in the form of a floor debris sample from the colonies. When it reaches the laboratory, the sample is submerged in pure alcohol so that the cuticle from any insect or arthropod will float to the surface while other material sinks to the bottom. This allows identification of any suspect insect specimens.

At the time of writing this article, we have had no confirmed cases of *Tropilaelaps* mites in the UK.

Control of *Tropilaelaps*

There are no *Tropilaelaps*-specific treatments in the UK, but varroa treatments will work in a similar way against *Tropilaelaps*. In Asia, *A. mellifera* colonies are treated for *Tropilaelaps* using similar chemicals as those used for treatment for varroa. Formic acid has been shown to be effective to control *Tropilaelaps*; an approved formic acid product such as MAQS® (mite away quick strips) could be used in the UK[5].

Pyrethroid products that are used to treat varroa can also be effective against *Tropilaelaps*. Bayvarol® (0.06 per cent flumethrin) has been used successfully in Thailand against *T. mercedesae* in honey bees with 100 per cent effectiveness after four weeks of use[8]. The strips must be in contact with the bee cluster to be effective and can be used any time except when bees are storing honey. Apistan®, which contains 10.3 per cent tau-fluvalinate, is also effective against *Tropilaelaps*, with mites dying within six weeks of application[8].

These products are highly effective when applied correctly, but improper use may lead to resistance in mites. As yet, there is no reported resistance of *Tropilaelaps* to these products but widespread resistance of varroa to the products Apistan® and Bayvarol® has been reported[9].

Varroa can survive on adult bees in the absence of brood for many weeks[10, 11], but *Tropilaelaps* mites can only survive for two to five days[13]. UK winters can be sufficiently cold to lead to a broodless period of more than one week, especially further north. Where the winters are not cold enough to break the brood cycle, the beekeeper can stimulate broodless periods to eradicate *Tropilaelaps* from a colony using husbandry methods such as artificial swarms or queen caging in the summer.

Vigilance

Be on the lookout for *Tropilaelaps* mites. They are slightly smaller than varroa but move more quickly and will be quite obvious on uncapped brood. If you think you have seen anything unusual, please contact your local bee inspector or the National Bee Unit at nbu@apha.gsi.gov.uk □

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