

Bees Biting Mites

by ERIK OSTERLUND

Sweden

honeybee@elgon.se

It has been documented that some worker bees capture varroa mites on their bodies or on the bodies of other bees with their mandibles, shake them and bite them, causing damage to the parasite (Thakur et al., 1997 Rosenkranz et al., 1997; Fries et al., 1994). In Brazil the traits mentioned for explaining the tolerance of their bee to the varroa mite are low fertility of female mites, efficient grooming behavior, shorter post-capping period and efficient hygienic behavior (Goncalves, 2001). Sven Olof Ohlsson in Finland has documented through video filming how some of his colonies easily detected and reacted on mites close to them and tried to remove them. They also denied young bees with mites on them entrance to the hive. He has noted that the type of bees that reacted in this way have no problems with the mite, in spite of the fact that he has used no miticide whatsoever in these colonies. Varroa mites were detected as present in his bee colonies in 1999. Another stock of his bees has significant problems with high mite loads, which he has treated with Apistan.

Sven Olof Ohlsson lives in Osterbotten, an area in which there are a few beekeepers. His beekeeper friend and Ohlsson don't like treating with drugs in bee colonies. So, his friend used formic acid (FA) in his colonies in autumn 2000. (Well, that's actually a drug, too, in the concentration used.) Ohlsson didn't use anything. Out of 130 colonies his friend had 70 colonies left in spring 2001. Ohlsson had almost all of his 100 colonies surviving. His friend probably used a little too much of the acid?

Breeding and small cell size

As a means of fighting the mite Ohlsson and his friend have concentrated on using selection and breeding their bees as a tool for dealing with the mite. They also bring their bees down in cell size as a way of helping the bees to fight the mite. Going directly from their large cell sizes, which are normally today, about 5.5 mm, to the desired 4.9 mm, mostly is not an easy task. Therefore, they have

bought 5.1 mm wax from Sweden (the old size, of 5 cells to the inch). Ninety percent of all bees can handle this foundation without problems drawing them completely and correctly. When their bees are all entirely on 5.1, they will be given 4.9-foundation. They began their 5.1-insertion in 2001 and will have completed it next year for all combs in the brood boxes.

What should they do in 2001, more than inserting 5.1mm wax? Ohlsson's friend didn't treat with any drug. Ohlsson used Apistan reluctantly in the fall of 2001, but only in 15 of his 120 colonies - in those that had very high mite levels. Those 15 were all of another stock (here called stock B) than his main stock (Elgon) (Osterlund, 2001).

Defense against mites and clean bottom boards

Ohlsson put quite a lot of time into studying his bees closely and thinking of a lot of possibilities and solutions for his bees. We once discussed over the phone the possibility that there could be differences between bee colonies, concerning their hostility to drifting bees with mites going into other hives than their own - a defense against reinfestation with mites. During studies of his bees, he observed that his Elgon bees cleaned their bottom boards thoroughly. Some colonies seemed to be constantly occupied with carrying out debris.

Testing colonies with mites on newly hatched bees

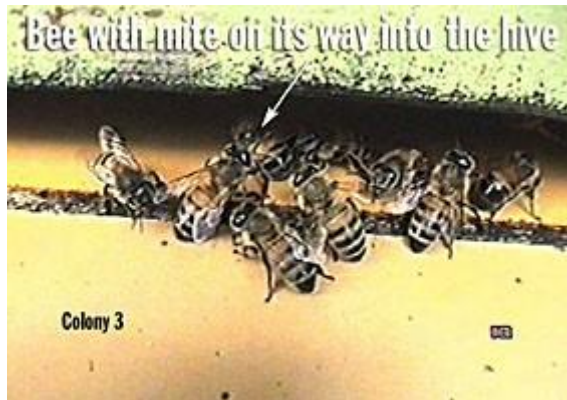
In late August 2001 he found some colonies of stock B with huge amounts of mites, especially in the hatching brood. In one of these colonies every hatching young bee had 1-3 mites. To be noted is that at this time of the year the amount of brood has diminished a lot, so that now the increased population of varroa mites has fewer brood cells to use for their reproduction. That's, of course, one of the reasons why you may find brood full of mites this time of the year. Ohlsson then got the idea to test his bottom board-cleaning colonies.

He brought with him a brood frame with hatching brood from this mite-crowded colony and put a just hatched

young bee with mite on the landing board of one of these Elgon colonies. The result was a rapid and strong reaction from the guard bees. Normally, a newly emerged bee is welcome in every colony. However, the mite-carrying young bee was not welcomed by the Elgon colony. The guard bees spotted the mite on the young bee and tried to catch it. The mite ran around on its host and the guard bees failed to catch it. After some minutes, the guard bees realized they wouldn't get the mite and instead flew away with the young bee from the hive.



Ohlsson got excited and went into the house for the video camera. He performed the test again and filmed it. (See pictures above from colony 1.) Colony 1 of the Elgon stock had a purely mated queen through insemination. He then tried this on a couple of colonies of stock B. Just a small reaction here and the young bees were welcome to enter the hive (Pictures below from colony 3 and 4).



Mites put on guard bees

Ohlsson then had a new idea. He picked up a mite with a pincett and put it on a guard bee on the landing board. When doing this on a bee in colony 1, the bee immediately started a wild dance trying to get rid of the mite, but the mite remained attached between the thorax and the abdomen. Through the dance other bees got interested in what she was doing and apparently soon understood and tried to help the bee to get rid of the mite. The bee with mite sometimes stopped still and bent over with her wing stretched out, thus making the gap between thorax and abdomen easy to see, as well as the mite. Other bees then got up on the bee and tried to dislodge the mite, but failed. And the wild dance continued and then stopped again for the same procedure. So, it went on for 19 minutes, all filmed. Then, Ohlsson got tired, tried to intervene to help the bee, but got stung in the finger and the bee flew away. ([see pictures](#))

He then put a mite on a bee in colony 2. This had a purely mated Elgon queen, naturally mated in an isolated location (which is not difficult to find in the surroundings where Ohlsson lives). This bee succeeded in getting rid of the mite quite quickly. It took the mite in its mouth for a while

and spit it out. The mite still moved, so Ohlsson directed it with the pincett closer to guard bees on the landing board. A second bee soon recognized the mite and took it, too, in its mouth for a while before spitting it out. A third bee also did this, but then Ohlsson lost track of the mite.

([see pictures](#))

When he put mites on bees of stock B, nothing special happened. In the case of one of these colonies, where nothing happened when he put a mite on a guard bee, it was an Elgon colony (see picture below from colony 5). The queen in this colony was an Elgon queen inseminated with drone semen from stock B.



Survival test on 5.1 cell size

To understand the full picture of the Elgon stock and stock B, it should be mentioned that a couple of colonies, which could be called Elgon, had quite a few mites. One of these Ohlsson managed to restock with 5.1mm foundation wax at the end of the season. He moved this colony to an apiary of its own, so it wouldn't spread mites to other colonies. Ohlsson is curious to see if this colony will survive with that load of mites with the smaller cell size, even if it wasn't down to desired 4.9-size. It could be of importance that this type of Elgon did not have a queen of an *Apis mellifera monticola* or *A.m. sahariensis* queen line, (as normally is the case with the Elgon stock), but a common stock queen had initially been crossed with Elgon drones and subsequent generations had been crossed with Elgon drones, for several generations.

Did he use any Apistan during fall 2002? Unfortunately, yes, he told me. In 15 colonies this year, too, out of 130. But, he says he will shift the remaining of stock B to his

stock of Elgon next season.

More difficult to hide?

Are smaller bees better able to handle mites? Ohlsson speculates that varroa mites have more difficulties in hiding on smaller bees. He will check that when he gets his bees on entirely 5.1mm foundation next year with tests as described here. And later, when he gets them on 4.9, he will test that size. Anyway, he said, restocking his hives with small cell size wouldn't hurt the bees. Did he get any honey this season of 2002? Oh, yes he said, about 150 lb per hive. That's pretty good in his area.

Selection tool?

These tests are, of course, too few to say anything significant about the Elgon stock or the stock B concerning their hostility against the mite, as it is described here. Also, it's not possible to establish beyond doubt that this hostility is the cause for the seemingly higher tolerance to the mite than stock B. And, of course, not all Elgons are alike. But, with selection they may well all show mite resistance.

Ohlsson, however, believes that there is a connection between the impact of the mites on his Elgon bees and their behavior against the mite. He also asks if performing tests like he has done is a good way of selecting breeder queens for tolerance against varroa mites? As it is not difficult for others to make the same kind of test, I'm sure others will follow his lead to see how their bees behave towards mites in tests described here.

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[Stinking Bees Biting Mites](#) - additional observations by Sven-Olof Ohlsson, Finland.