

## PEST AND DISEASE CONTROL

# HOW TO IDENTIFY VARROA SENSITIVE HYGIENE

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This is a third in a series of articles about varroa sensitive hygiene (VSH), a behavioural trait of honey bees proven to assist VSH bee colonies to reduce levels of varroa (*Varroa destructor*).

**VARROA**

**COUNT**

**SENSITIVE**

**OBSERVE**

**HYGIENE**

**TEST**

VSH is the ability of honey bees to detect, uncap and remove mite-infested brood. Mites that are hygienically removed by bees may be killed or have their reproduction cycles interrupted, which leads to high infertility in the mite population. This in turn reduces the mite population.

## The mite population growth threshold

The goal is to keep the mite population in the bee colony below the mite population growth (MPG) threshold. The MPG is the daily growth rate of the mite population within a honey bee colony and is on average about 1.021 of mature mites per day (Martin, 1998). This average was determined by calculating the mite population growth in relation to the bee brood, adult bee development and mite development.

It is not entirely understood how the uncapping by the adult honey bees interrupts the reproductive cycles of the mite populations. In some cases, the mother mite absconds to a new cell once disturbed. In other cases, the original cell is recapped with the mother still in place; this too can lead to poor reproductive output of the mites.

Selection for VSH is based on measuring either the frequency of non-reproductive mites or the direct rate of hygiene activity against infested brood. Both influence MPG, but both are difficult for beekeepers to measure. Still, there are a variety of simplified techniques beekeepers can apply as an initial screening of their colonies to indicate if there is potentially any mite resistance, perhaps caused by VSH activities, within their colonies.

## Counting phoretic varroa mites

Periodic sampling for mites on adult bees is a useful indicator. The mites being carried around by the adult bees are called 'phoretic' mites. Regular monitoring of the phoretic mite numbers can be graphed against the mite population growth chart.

If the numbers remain below the predicted threshold, this could be an indication that the bee colony is influencing the growth of the mite population. For example, at day one, it is estimated that one mite, after 90 days on average, reproduces to be 6.61 mites. If at day one there were five mites counted, then after 90 days there will be 30.35 mites.

Alcohol wash or sugar shake assays are reliable measurements for phoretic mites. Regular counts will help paint a picture of what is happening within the hive.

Superseding, swarming, splitting of hives and varroa re-invasion will all have an influence on the mite counts; therefore, a potential VSH positive hive must be left untreated and monitored for at least four months.

Colonies that show they can maintain zero to low mite levels, strong bee numbers, good brood health and good uncapping behaviour, while having maintained the same queen, can be considered for further VSH trait testing in a laboratory.

## Observing brood indicators

It is also important to look at the brood to see if there are any visibly chewed pupae or uncapped white-, pink- and purple-eyed pupae. These are the pupal stages at which VSH bees detect the mites and remove infected pupae. The large uncappings are more than half the diameter of the cell. Normal hygienic bees also uncap and remove infected brood, but do not specifically target as many varroa mites like varroa sensitive hygienic bees.

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In addition, due to the uncapping capabilities of VSH colonies, some high-VSH colonies tend to have a spotty brood pattern and may be overlooked for any VSH breeding potential.

The importance of these preliminary indicators of VSH potential in a colony is to provide a tool for beekeepers to conduct a first-level screening for candidate sources for the VSH trait in their apiaries. Further testing by VSH queen breeders to demonstrate that the VSH trait is actively present involves more complex procedures using test hives and microscopic examination of the VSH activity. These methods are in development overseas and in New Zealand.

### References and further reading

www.beesmartbreeding.co.nz (Author's website)

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