



Varroa Monitoring and Biomechanical Treatment



Background

My project investigates the possibilities of avoiding chemical treatments - if not completely then at least only when need be. Identifying when there is a need for treatment is not trivial. Aspects include the local environment, beekeeping practices and the bee families. Monitoring the infestation level is essential for assessing the Varroa population and making decision when to treat or not to treat.



Comparing Varroa Monitoring Techniques

- ❖ **Alcohol wash** of 300 bees. Reflects the size of the Varroa population relative to the adult bee population, i.e. the **mite index**
- ❖ **Natural mite drop** on sticky board under an open mesh floor: The mite drops are counted over a period of 5–7 days and the average **daily mite drop** is calculated. The daily mite drop reflects the total size of the Varroa population

Varroa Monitoring

I have sampled my 3 bee hives each month, year-round, for almost three years. The 3 hives are located in my garden under almost similar conditions.

Although not reflecting the same aspects of the Varroa population, both techniques seem equally effective at estimating the infestation level.

The values display considerable variations among the 3 hives but also that there seems to be a common seasonal pattern

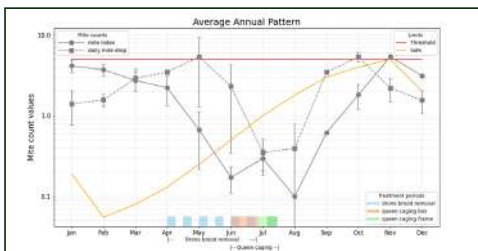


Varroa Annual Pattern

I have calculated the annual pattern by averaging the monthly data from the three hives over the available time period.

The annual trend shows a distinct reduction in Varroa infestation levels from April/May to July/August. This coincides with the period during which biomechanical methods were applied to reduce mite levels.

If no treatment is applied at all, the mite counts should lay below the constructed yellow line, which represents an approximate doubling of the infestation level from February to a peak in November and remain below the critical threshold of 5 mites in daily natural drop or a 5% infestation index (the red line).



Biomechanical Methods

- ❖ **Drone brood removal**
In the season, approx. April to middle of July, I have removed capped drone brood regularly from a drone frame.
- ❖ **Brood breaks**
I have caged the queen 25 days from 1st of June to 25th of June. This causes all brood to emerge from the cells and all the Varroa mites are free on the bees.
- ❖ **Worker brood removal**
The queen is caged on a foundation frame for 9 days to fill it with brood. This first frame is then placed in the hive and replaced with a second frame, where the queen again is confined for 9 days. After this, the brood on the first frame will be sealed and the Varroa mites trapped, and the frame is removed. After an additional 9 days, the second frame is also removed with sealed brood and trapped mites.



Conclusions

The amount of data in my investigation is quite sparse, but based on my monthly Varroa mite counts over 2½ years, I dare to make the following conclusions:

The infestation level is estimated equally well using natural mite drop and alcohol wash. The mite drop method is non-intrusive and suitable during colder periods, whereas the alcohol wash provides a more immediate result. The mite drop method typically counts mites over a period of 5–7 days.

The biomechanical methods I have used are able to keep the Varroa infestation below a critical threshold of 5 mites per day or a 5% mite index. **Medical/chemical treatments are no longer needed.**

The Varroa population increases from January through April until drone brood removal starts to show its effect. After the biomechanical treatments end in July, the mite population rises again, peaking around October 1st. I don't observe any significant drop in the infestation level during the winter.

To estimate and monitor the Varroa infestation level, suitable sampling dates are May 1st, August 1st, and October 1st.

Next Steps?

A natural next step would be to select and breed queens that maintain a low daily mite drop, in order to obtain bees that require less, or even no, treatment against Varroa mites.



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Treatment of honey bee colonies against varroa mites faces several problems. Pesticides affects the wax and may, over time, cause resistance in the mites. Organic acids have traditionally been used in Denmark as plan-based rather than need-based and are not without harm to the honeybees. Both of these treatments must consider the honey harvest periods, meaning they cannot be used from approx. March to August in which period the varroa population is rapidly increasing. My project investigates the possibilities of avoiding chemical treatments - if not completely then at least only when need be. Identifying when there is a need for treatment is not trivial. Aspects include the local environment, beekeeping practices and the bee families. Monitoring is essential for assessing the varroa population and I have compared two different methods for estimating the varroa population: Alcohol wash of approx. 300 bees provides the varroa index, i.e., number of varroa mites per 100 bees. This reflects the size of the varroa population relative to the bee population. Sampling the natural varroa mite fall on sticky boards over a 7-day period. This provides the daily varroa mite fall, which is proportional to the size of the varroa population. I have sampled my bee colonies each month, year-round, for almost three years. The two monitoring methods, although not reflecting the same aspects of the varroa population, seem equally effective at estimating the infestation level. I have experimented with biomechanical techniques, including queen caging and brood removal, to see if these techniques keep the varroa population below thresholds, and this seems the case. The winter period in Denmark seem not to induce a significant drop in the varroa population. The fastest increase in varroa population seem to take place in August to September. Hence, sampling the varroa level over this period may prove helpful in detecting bee families better at maintaining a low varroa level than others. The effort required for monitoring varroa level and adapting biomechanical methods are rather high. While this may be manageable for hobbyist beekeepers as myself, it may be prohibitive for large professional beekeepers.