

VARROA TREATMENT IN DENMARK

- an outline of the National Strategy

By Henrik Hansen & Camilla J. Brødsgaard Danmarks Jordbrugs-Forskning, Projektgruppe Biavl

The varroa mite, together with attacks of virus are the cause of varroa disease. The Danish strategy for combating the virus is built on a need based strategy without the use of pesticides. Treatment is based on a combination of technical beekeeping and physical methods. Furthermore, organic acids which occur naturally in honey are used and do not give problems of residues. Experience has shown that an effective treatment can be carried out using this strategy, and it can be combined with an economically viable honey production. At the same time beekeeping products can be kept free from problematic traces of pesticides. If an effective treatment against the varroa mite is not carried out the colonies will die due to virus attacks.

VIRUS

In recent years in Denmark, and throughout the rest of Europe, there have been great problems with secondary virus infections in connection with Varroa attack. These attacks have led to the deaths of many bee colonies. At the present moment we have diagnosed the following conditions in Denmark: Acute Paralysis Virus (APV), Deformed Wing Virus (DWV) and Sack Brood Virus (SBV). In Sweden Unclear Wing Virus (CWV) (Nordström, 1997) and in England Slow Paralysis Virus (SPV) (Ball, 1997) have been found in connection with varroa attacks.

In Denmark problems with DWV and APV have been registered. These virus attacks cannot be treated. However outbreaks can be prevented by treating for varroa in good time.

The varroa mite can spread APV to brood and adult bees. The sting of the adult bee can be the cause of the virus outbreak. An outbreak will result in brood being badly cared for, and for the adult bees the loss of their orientation abilities. Thus spreading of the virus to other bee colonies occurs, when infected bees beg their way into new hives. Outbreaks of APV can be expected in Denmark at the moment with the presence of 2,000 - 5,000 mites in a colony and will result in the death of the colony.

Outbreaks of DWV can be expected far earlier than that of APV. When the symptoms of DWV are recognised, treatment for the varroa mite should be carried out at once.

NEED BASED TREATMENT

In order to treat the varroa mite effectively it is necessary to carry out a monitoring of the mite population in the colony.

Monitoring is carried out by laying an insert at the bottom of the hive, and counting the numbers that fall down. Of course hive types which have a specially designed bottom for mite counting can also be used.

It has been shown under Danish conditions that there is a linear connection between the natural mite death as counted on a plastic insert and the amount of varroa mite in the colony and brood. Recent studies have shown the following connection between the number of mites in a colony with a minimum of a half frame of sealed brood and the average number of mites which fall down on the plastic insert per day, in the course of a week.

Total number of mites in a colony = 120 X average number of mites per day.

One can calculate at the same time that the amount of mites in a colony with brood will double monthly, and that between 50 and 90% of them will die in winter.

In areas with inadequate treatment of varroa mite a huge invasion can take place from colonies on the verge of collapse. It is, therefore, necessary to monitor several times through a season. The times are dependent on how effectively ones neighbouring apiaries have treated their colonies. The first monitoring should take place at the end of May, and should also take place at the end of June, July and August. If it is not possible to carry out these four monitorings then, as a minimum, monitoring should be carried out at the end of June and the end of August. As far as possible monitoring should be carried out on all colonies in the apiary.

An average colony with an outbreak of APV will probably die when there are about 5,000 mites present. In order to save the colony treatment ought to be carried out much earlier, when there is a maximum of 1,000 mites present. If, on average, 2 mites per day fall onto the insert in the course of a week's count at the end of May, then treatment should be carried out at the latest at the end of July. It is necessary to treat all the colonies in an apiary. If a lactic acid treatment is carried out in the end of October, then the numbers of fallen mites can be counted afterwards. Seen out from the expected 90% effect of treatment, the amount of surviving mites in the colony can be estimated. Colonies should be wintered with a maximum of 50 - 70 mites.

TECHNICAL BEEKEEPING AND PHYSICAL METHODS

Technical beekeeping and physical methods have the great advantage that one avoids traces of chemicals in honey or wax.

Removal of Drone Brood

The varroa mite prefers to propagate in cells with drone brood. With the removal and destruction of sealed drone brood one has a good supplement to other methods. This method ought, therefore, to be part of treatment in general.

Creation of Nuclei

It is very important that one continues to maintain the desired number of productive colonies. This can partly be secured by creating nuclei each year. These should be established in July. Since honey is not to be harvested from them in the first year,

they can be treated with lactic acid.

Heat Treatment

Heat treating of sealed brood provides an effective treatment against the varroa mite. This treatment can be carried out in a thermostatically controlled box. In Germany a number of products have been developed specifically for this treatment, e.g. "Apitherm". In order to obtain the best results (close to 100% morality of mites) and to create the least damage to brood, frames should be treated for three to four hours at 44°C, depending on the apparatus in use.

Treatment should be carried out two or more times over the period in which brood are present. If one chooses to treat twice, then the first at the end of May and the second at the end of July would be appropriate.

Queen Caging

Queen caging is an effective technical beekeeping operation. The effectiveness of this can be enhanced if a pair of sealed brood frames are removed simultaneously at the beginning of summer. Queen caging can be used in colonies not intended for setting out on heather.

The Queen can be caged in a cassette on a frame for less than four weeks from the middle of June. The frame is then used as a bait for varroa mites and should be changed every eight to nine days. The removed frames should be destroyed. If one wishes to save the brood in the frames, then they can be treated with lactic acid or using heat treatment.

CHEMICAL PRODUCTS USED IN TREATMENT

Pharmacological products used in treating varroa mite are classified as veterinary medicines. At present there are no recognised veterinary medicines for the treatment of Varroa in Denmark.

There is a so-called "positive list" of products on the EU Commission for use in the treatment of animals (honey bees included) destined for human consumption. Lactic and formic acids are on this positive list. It is therefore legal to use these acids in the treatment of varroa mites. Oxalic acids, on the other hand, is not on this list, and cannot be legally used in this treatment.

FORMIC ACID

Formic acid is used in the autumn after the last honey is harvested. It is most effective when used while there is brood in the colony shortly after the honey is harvested. This means that treatment is often carried out at the end of July or at the beginning of August. If the bees are to be moved to heather, then treatment should be carried out shortly after the end of this honey flow.

Formic acid treatment can be carried out using a dishcloth, or a thin fibre board, to which is added 60% lactic acid. Kråmer boards, which are thick wood fibre boards, can also be used, to which formic acid in an 85% solution is added. The fibre boards are placed in perforated plastic bags. There are several formic acid evaporators available, all of which are used beside the hive wall.

Honey has a natural formic acid content. After formic acid treatment there will be a slightly higher content of formic acid in the remaining honey. However, the content still lies within the acceptable natural occurrence. Very little formic acid has been found in wax after treatment.

LACTIC ACID

The varroa mite is very sensitive towards lactic acid treatment. In order to avoid traces of lactic acid in the honey, a dead-line of eight weeks prior to the honey harvest should be observed for treatment. The lactic acid does not penetrate the sealed cell. In order to achieve the best results from this treatment, it should be carried out when there is no brood present in the colony, i.e. early spring or late autumn. The early treatment is carried out if one has a feeling that after the autumn treatment, there are too many mites present in the colony. A water spray is used in carrying out this treatment, spraying each side of every frame in the colony. The effectiveness of the treatment is very high.

Keeping within the dead-line then the lactic acid content is within the natural boundaries.

1 Brødsgaard, C.J. & Brødsgaard, H. F.1998. Monitoring Method as a Basis for Need-based Control of Varroa Mites (Varroa destructor - former Varroa jacobsoni) Infesting Honey Bee (Apis mellifera) Colonies. ATLA 26, 413-419

2 Fries, I., Aarhus, A., Hansen, H. & Korpela, S. 1991. Development of early infestations by the mite Varroa destructor (former Varroa jacobsoni) in honey-bee (Apis mellifera) colonies in cold climate. Experimental & Applied Acarology 11, 215-214.