Alternative Varroa control

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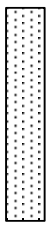
The bee parasite Varroa destructor *is almost world wide spread and to control this mite pyrethroids have up to now mainly been used. However, the future use of these products is questionable due to formation of resistant mites as in Europe or in North America. The remaining conventional varroacides (Perizin, Apitol, Folbex) are only efficient in broodless colonies and repeated applications of these products cause increasing residues in wax and to a lesser extent also in honey. Alternative Varroa control leads the way out of this dead-end. The active substances used here are either organic acids, such as formic and oxalic acid or components of essential oils, e.g. thymol. They are widespread in nature and some of them also occur naturally in honey. No residue problems should arise when colonies are treated with organic acids. During treatment with components of essential oils, however, residues accumulate in the wax and subsequently evaporate to a great part. The residues in honey are small and not important from a toxicological point of view. The application of these alternative active substances is only successful, however, if they are used in a treatment strategy. In this article such treatment concept will be presented, witch has been developed and successful tested in extensive investigation under Central Europe conditions the last years.*

VARROA CONTROL STRATEGY

Monitoring the Varroa population is an important measure, in that an increase of the Varroa population is recognised early and the necessary control measures can be introduced in time. The mite population is significantly reduced in August and September by one or two long-term treatments with formic acid or a treatment with thymol over about 6 weeks after the honey harvest. As soon as the colonies are brood-less, they are treated additionally with oxalic acid in November. When this concept is carried out consistently, further treatments before the end of the honey harvest of the following year are not necessary.



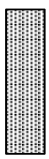
April

May

June

July

Monitoring the naturel mite fall



August

September

One ore two long term treatment with formic acid
or
one thymol treatment over about six weeks

October

November

One oxalic acid treatment in brood free colonies

Alternative Varroa control is only successful if used as a strategy. Monitoring the degree of infestation and reducing the Varroa population in August and September with formic acid or thymol and in November with oxalic acid are the corner stones of this strategy

INFORMATION ON THE DIFFERENT MEASUREMENTS

Monitoring the mite population

By means of mesh-protected inserts, rapid increases of infestation through re-invasion or insufficient treatment success can be recognised early and necessary control measures taken in time.

When resistant mites increase, there is a danger that the damage threshold will be exceeded sometime and colonies will collapse. This in turn can lead to massive reinvasions of neighbouring apiaries. It is therefore necessary to monitor mite fall from time to time between spring and the end of July. If mite fall is higher that 30 per day, control measures must be initiated, irrespective of time. With a weekly treatment using formic acid, dying of colonies can be avoided.

With the help of mesh-protected inserts a rapid increase in the mite population, due to reinvasions or insufficient treatments can be recognised and the necessary control measures can be introduced in time.

Time	Mites per day more than	Measures
End May	3	A long-term treatment with formic acid should be carried out immediately after the spring harvest.
End July	10	Two long-term treatments with formic acid are necessary.
Beginning September	1	A second long-term treatment is necessary.
Whole bee season	30	Damage threshold reached. Colony collapse imminent. Treatment without delay is imperative.

Reduction of the Varroa population in spring

If mite fall at the end of May exceeds 3 Varroa per day, treatment cannot wait until August. In the next gap between honey flows, a long-term treatment of one week, or two short term treatments with formic acid should be carried out, without super. Such treatments often cause larger formic acid residues in a subsequent honey harvest. These treatments are therefore to be used in emergencies only.

The Varroa population can be reduced by about half by cutting out drone brood twice or three times or by about a third by forming a nucleus. It is an advantage to integrate such measures into routine beekeeping procedures.

Long-term treatment with formic acid

Various types of dosing equipment for long-term treatment are available on the market. Since *V. jacobsoni* control is completed later on with an oxalic acid treatment, it is not essential to achieve the highest possible treatment success with formic acid. Thereby the risk of queen losses is lessened considerably. Application of the various dispensers must be in accordance with instructions.

Depending on the degree of infestation, one or two long-term treatments with formic acid are necessary. For this purpose different formic acid dispenser are available on the market.

One or two treatments with formic acid?

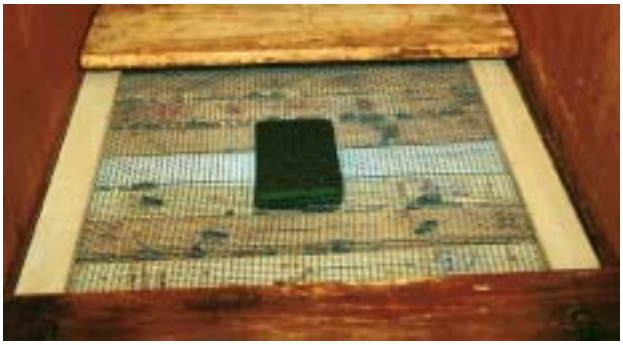
If natural mite fall is above 10 mites per day at the beginning of August, two long-term treatments are needed; the first should be done immediately after the honey harvest. The second treatment is from mid-September. For a mite fall of less than 10 per day one treatment is sufficient. This can be postponed until the end of August.

The necessity of a second formic acid application can also be checked by means of the natural mite fall during the third week after the end of the first treatment. If mite fall is above one Varroa per day, a second application should be carried out.

Effectiveness of one treatment can be expected to lie between 60 and 80%. Over two applications, the effectiveness increases to 90-95%. Formic acid is effective in capped brood cells and kills Acarapis mites in the trachea.

Treatment with components of essential oils

Instead of formic acid, treatments with thymol can be carried out. The market offers several products where the effective principle thymol is applied or incorporated into different carrier substances. For evaporating thymol, these products are placed on the top bars over several weeks.



Instead of formic acid, thymol can also be used as an active ingredient. Different products are on the market.

The application is carried out according to manufacturer's instructions. After the honey harvest is completed, as much food as possible should be given. As with formic acid, treatment has to start as early as possible when natural mite fall exceeds 10 mites per day. With products where the first tablet is replaced by a second after 3 weeks, feed should be given before application of the second tablet.

It is estimated that effectiveness under optimum conditions is between 90 and 97%. Monitoring treatment success is not necessary because of the subsequent application of oxalic acid in November.

Oxalic acid in broodless colonies

The treatment with oxalic acid in broodless colonies in November aims at the reduction of the remaining varroa population to a necessary minimum of less than 50 mites per colony. If there is no re-invasion in spring, no further control measures are necessary until August of the following year. This objective will be only attained if there is no brood in the colonies at the time of the treatment. Oxalic acid does not influence the mites in the sealed brood.

Spraying oxalic acid

A solution is prepared by dissolving 30 g oxalic acid dihydrate per 1 litre of water. 3 to 4 ml of this solution is sprayed onto each comb side with bees with the help of an atomizer. This method is convenient for treating of colonies in one-storey hives.

This method has the advantage, that colonies with remains of brood can be identified, so that they can be treated later, when they are broodless.

Trickling oxalic acid

For this treatment a solution of 35 g oxalic acid dihydrate per liter sugar water 1+1 (by weight) is used. 5 ml of this solution per occupied bee way is trickled onto the bees. Depending on colony size 30 to 50 ml per colony are needed. We advise beekeepers not to treat colonies more than once during the same winter.

Trickling of oxalic acid needs only little work.

Evaporation of oxalic acid

This application is carried out with the help of an evaporation device in broodless colonies. Evaporate 1 g in Swiss hives and in one-storey hives and 2 g in Dadant hives and in two story hives. During the evaporation which takes 3 minutes, and also during the following 10 minutes, the hive entrance should be kept closed with foam. The evaporator needs a 12 V battery.

During the evaporation treatment the hives should not be opened. Treatments can be applied by temperatures above 2 °C.

All three oxalic acid treatment methods have an efficiency of more than 95 % if carried out in broodless colonies. Bees will tolerate well any of these three treatment methods if only one application per winter is applied.

PROTECTIVE MEASURES

When applying organic acids and essential oils use always protective acid-proof gloves. Additionally, when manipulating with formic and oxalic acid goggles should be carried and a pale of water should be at hand. When spraying and evaporating oxalic acid a respirator mask FFP2SL resp. FFP3 or similar should be carried. All products used for alternative varroa control are available at Swiss specialized traders. The preparation of oxalic acid should be carried out only by specialized personnel.

According to the Institute of Labour and Social Medicine Hygiene at the Unversity of Tübingen, Germany, if the above mentioned protective measures are applied when using oxalic acid, there is no danger for the user.

CONCLUDING REMARKS

This control concept provides a means for the beekeeper to keep Varroa below the damage threshold in Central European regions. With relatively low labour costs, it will remain possible to produce high-quality bee products successfully in the future.

Translation and editing: Ro. Rayner and Ron Crocker

Updated by 2003

LITERATUR

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