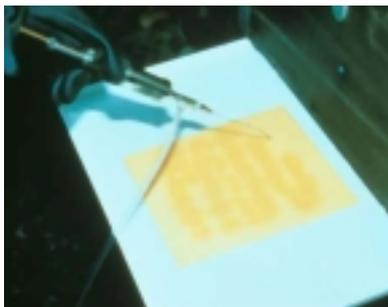


Combination of formic acid short term treatment and apicultural measures

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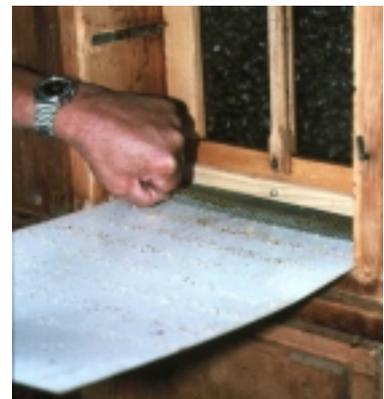


The experience with this method has shown, that short term treatment alone often does not reduce the varroa population sufficiently, and the varroa increase in the following year, combined with small reinvasions, may reach a dangerous level until the following treatment. It is therefore necessary to reduce the increase of the varroa population in spring by 2 to 3 removals of drone brood or by forming a nucleus. In order to keep the amount of work involved within reasonable limits, these biotechnological measures have to be combined with other beekeeping activities.



During the short term treatment small amounts of formic acid evaporate relatively uncontrolled within 6 to 10 hours. At the beginning of the treatment the formic acid concentration in the hive air increases rapidly. Six hours later most of it has already evaporated. The time and the dosage of the treatment depend a lot on the temperature and on the hive system. When applied from above, 60% formic acid is used, whereas 85% is necessary from below. The treatment in two blocks of two to three applications within a week in August after the honey harvest and in the end of

September has proved efficient. The treatment efficiency obtained under these circumstances is approximately 95%. This result is possible, because formic acid also kills a part of the mites in the brood. The efficiency may be controlled two weeks after the last treatment by measuring the natural mite fall, using a bottom board with a metal lattice covering the entire hive bottom. It is sufficient to count the mites once a week. If the natural mite fall is above one varroa per day, another treatment with oxalic or lactic acid must follow. Six years' experience with this method has shown, that follow-up treatments are necessary only after reinvasions in October.



If formic acid is applied after the honey harvest in late summer, there will be no residue problems. In order to avoid bee and queen losses, the indications concerning temperature and application must be followed. In August it is an advantage to feed at the time of the treatment.

Application guidelines for short term treatment with formic acid (FA)

Active substance	Formic acid - short term treatment															
Application	Passive evaporation from support material															
Period of treatment	1st block of treatment → beginning of August 2nd block of treatment → end of September (Duration of block of treatment app. 1 week)															
Number of treatments	2-3 treatments per block															
Day temperature	12-20 °C → treatment during the day 20-25 °C → treatment in the evening or morning more than 25 °C → treatment early in the morning															
Concentration	Treatment from the top → 60 % FA Treatment from the bottom → 85 % FA															
Doses	<table> <thead> <tr> <th></th> <th>1 story ml</th> <th>2 story ml</th> </tr> </thead> <tbody> <tr> <td>Swiss hive from the top</td> <td>20-30</td> <td></td> </tr> <tr> <td>Dadant hive top or bottom</td> <td>30</td> <td></td> </tr> <tr> <td>Langstroth top or bottom</td> <td>20-30</td> <td>40-50</td> </tr> <tr> <td>German standard top or bottom</td> <td>20</td> <td>40</td> </tr> </tbody> </table>		1 story ml	2 story ml	Swiss hive from the top	20-30		Dadant hive top or bottom	30		Langstroth top or bottom	20-30	40-50	German standard top or bottom	20	40
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Support material or solution	Viscose sponge Soft fibre cardboard Soft fibre Pavatex plate (wood fibre)															
Surface of evaporation	Approximately 15 x 20 cm															
Control of treatment efficiency	Measuring of the natural mite fall Beginning → 14 days after last treatment Duration → 2 weeks Insufficient efficiency if more than 1 Varroa falls per day → an additional treatment with oxalic acid is necessary															
Security measures by the application	Protective glasses and rubber gloves															