Attention! Since 2013, only formic acid approved by
Swissmedic can be used to fill formic acid dispensers.

The "FAM Liebefeld" Formic Acid Dispenser for Varroa Control

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The appearance of Varroa mites resistant to Apistan and Bayvarol meant that beekeepers needed to find an alternative Varroa control. Treatments with formic acid are predominant. Originally, 5 – 6 short-term treatments were recommended. Now, long-term treatments prevail for which various suitable dispensers are marketed. These treatments have the advantage of being better for the bees as the concentration of formic acid vapour is lower and entails less work (1 – 2 annual treatments only). The Swiss Bee Research Centre has developed a formic acid dispenser for long-term treatment and tested it under laboratory conditions as well as in apiaries using approximately 600 colonies. It is sold by Andermatt Biocontrol AG , CH - 6146 Grossdietwil (www.biocontrol.ch) and is available from equipment dealers in other countries. In this article, we describe Varroa control by means of the Liebefeld dispenser.

Construction of the "FAM Liebefeld" Formic Acid Dispenser

The dispenser measures 25 x 25 cm with a height of 16 mm. It consists of three parts: a bottom containing the viscose sponge and a cover with a rotatable disc. The holes of the cover are opened more or less by rotating the disc allowing 7 different widths of opening adjusted by means of a scale. The dispenser is made of polystyrene and can be used for several years. If it is stuck together with propolis, it can be easily cleaned by scratching or by using alcohol. The sponge can be used several times if stored slightly moist in between the treatments.

Application of the "FAM Liebefeld" Formic Acid Dispenser

The dispenser is filled as described in the next paragraph. The evaporation surface is set according to season, type of hive and the expected daily maximum temperature in the shade (see table). The dispenser is placed **directly over the brood chamber with the openings facing downwards**. The four elevated edges prevent the evaporation holes from being covered.

A space beneath the crown board is necessary where the dispenser can be placed. In Swiss type hives, this space can be created by using an empty super. In order to avoid the loss of formic acid vapours, a single-piece crown board should be used. In other types of hive like Dadant for example, a feeder turned upside-down or a crown board with a plinth of about 2 cm (1 inch) can be used. An insulation layer underneath the roof of free standing hives is an additional advantage. For the time being, treatment from below cannot be recommended because the required tests have not yet been completed.

The dispenser should be installed during the **cool morning hours**. Throughout the treatment period the entrance of the hive has to be kept open at least 15 cm (5/8 inch) and all open bottoms have to be shut by means of a bottom board. Before starting the treatment in August, it is recommended that the colonies be fed once. Feeding can be finished after the treatment. In August the treatment lasts 7 days. In September, however, it is advised that the dispenser is left in place for at least 14 days.

Table: Adjustment of dispenser:

Maximum temperature *	Adjustment of dispenser openings	
	Swiss hive	**Dadant hive**
1. Treatment (August) Period: 7 days		
15 - 20°C	**3**	**4**
20 - 25°C	**2**	**3**
25 -30° C	**1** during 1st and 2nd day, **3** from 3rd day	**2** during 1st and 2nd day, **4** from 3rd day
2. Treatment (after Sept. 20th) Period: 14 days		
10 - 15°C	**5**	**5**
15 - 20°C	**4**	**4**
20 - 25°C	**3**	**3**

***** expected maximum temperature in the shade according to weather forecast

Under conditions not described in this table or with different types of hives it is recommended to gain experience (e.g. one-storey Zander or Langstroth hives are equivalent to Swisstype hives, whereas two-storey DNM (German Normal Measure) hives correspond approximately to Dadant hives). Up to now, there is no experience with double brood chamber Zander and Langstroth hives.

Filling the Dispenser

It must be ensured that there is no formic acid residue from the previous treatment, before soaking the sponge inside the dispenser with formic acid. Therefore, the sponge should be dried gently in the shade after each treatment and stored slightly moist in a plastic bag. This prevents its drying out and getting cracked.

The dispenser is opened for filling by separating the bottom from the cover. For the first and the second treatment **130 ml 70 % formic acid** are poured on the sponge. Always keep the filled dispenser in a **horizontal** position. Laboratory trials have shown that optimum evaporation using this dispenser is achieved with 70 % formic acid. 70 % formic acid is sold at bee equipment dealers, Andermatt Biocontrol AG or chemist's shops. The cheaper "technical" quality is sufficient. The dilution can be home made. For 1 litre 70% formic acid 0,8 litre 85 % acid is poured into a jar filled with 0,2 litre water. (Caution: Wear protective glasses and rubber gloves! Water must be within reach!)

Control of Success Rate

An efficiency of about 96% can be expected after two treatments with the "FAM Liebefeld" dispenser. Under unfavourable conditions, the success rate may deteriorate. Treatment efficiency monitoring is therefore always necessary. The procedure is described below:

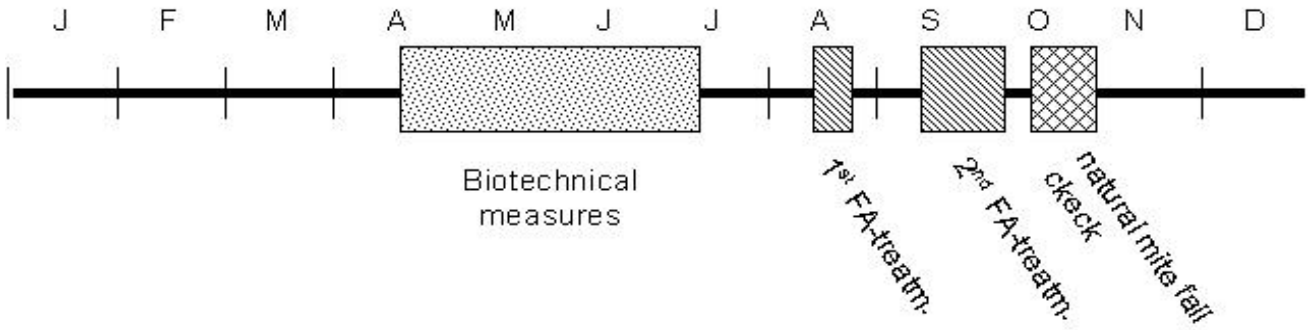
The natural mite fall is determined by means of a Varroa screen and tray during one week in October, but not before two weeks after the end of the treatment.

The mite count is interpreted according to the following table:

Daily natural mite fall in October	Measures required
● below 0.2 Varroa / day	No additional measures required
● 0.2 - 1 Varroa / day	Biotechnological measures in the following year
● above 1 Varroa / day	Additional treatment required, e.g. with oxalic acid in broodless colonies. In this case no biotechnological measures in the following year.

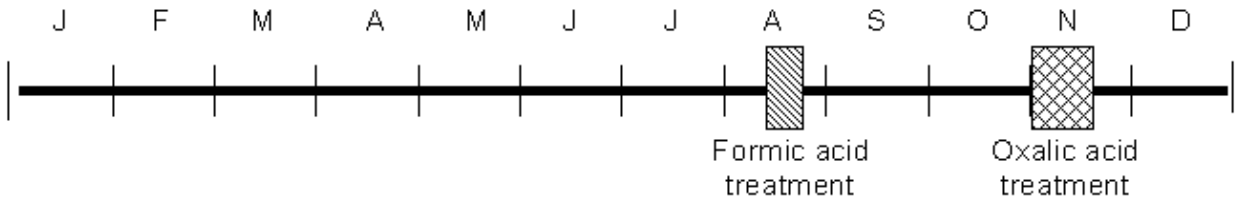
Two Varroa control concepts with the "FAM Liebefeld" formic acid dispenser

① Our own experience, as well as the ones abroad have shown that Varroa control with formic acid treatments alone is not sufficient. Additional biotechnological measures in spring such as forming nuclei or removing the drone brood are recommended after autumn treatments.



Here, the formic acid dispenser „FAM Liebefeld“ is used during one week in August and two weeks at the end of September. Beekeepers have to monitor the natural mite fall in October until sufficient experience has been gained.

② A combined Varroa control with the "FAM Liebefeld" dispenser in August and an oxalic acid treatment of broodless colonies in the end of autumn has proved very efficient. In a trial with 46 colonies we obtained a success rate of 82 % with the formic acid treatment and 98% with oxalic acid - this resulted in a total success rate above 99%. Due to the more successful treatment compared to the one with two formic acid treatments in August and September, this procedure requires no biotechnological measures in the following year (removal of drone brood, formation of nuclei). The procedure for oxalic acid treatment has been published in "Schweiz. Bienenzeitung", March 1996 and also in other bee journals.



Advantages of the „FAM Liebefeld" Formic Acid Dispenser

- Simple adjustment of evaporation surface according to type of hive, season and temperature.
- Multiple use
- Simple filling.
- No leakage of the sponge soaked with acid from horizontal dispenser. Risk of accidents while manipulating dispenser is reduced.
- Simple placement in hive without moving combs.
- No residue problems in honey if treatment is carried out after the harvest.
- Resistant mites are improbable during short and medium term periods.
- Also affects tracheal mites.

Precaution

Formic acid is a strong caustic. It has to be manipulated with great care: Protective glasses and intact rubber gloves (PVC) must be worn. Used sponges must be handled with rubber gloves only. Any splashes on the skin must be washed off immediately and rinsed thoroughly. For safety reasons, it is essential that tap water or a bucket of water is at hand at all times. If the solution gets into the eyes, they must be rinsed thoroughly with water and a physician consulted immediately. When preparing an acid solution, the acid is poured into the water, not vice versa!

Acknowledgement

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After Charrière J. D., Imdorf A., Fluri P (1998) "Anpassung der Gebrauchsanleitung für den Ameisensäure-Dispenser FAM-Liebefeld". Schweiz. Bienenztg. 121 (7) 437-438.

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