An advanced formic acid evaporator

Short communication about preliminary results
by Bruno Becker, Nassenheide, Germany.

Introduction

Efforts to breed varroa-resistant honeybees are desirable and correct. Decades however may pass before beekeepers can use, and rely on, such resistant strains. Reports from Italy and neighbouring countries indicate that pyrethroids are losing their efficacy against varroa mites. This will give cause for concern to those beekeepers who had dismissed reservations about chemical residues in bee products. Resistant mites are not necessarily the result of bee movements. They develop sooner or later on their own. For that reason particularly, and in response to considerations of ecology and economy, interest in the use of formic acid, and its importance, will grow.

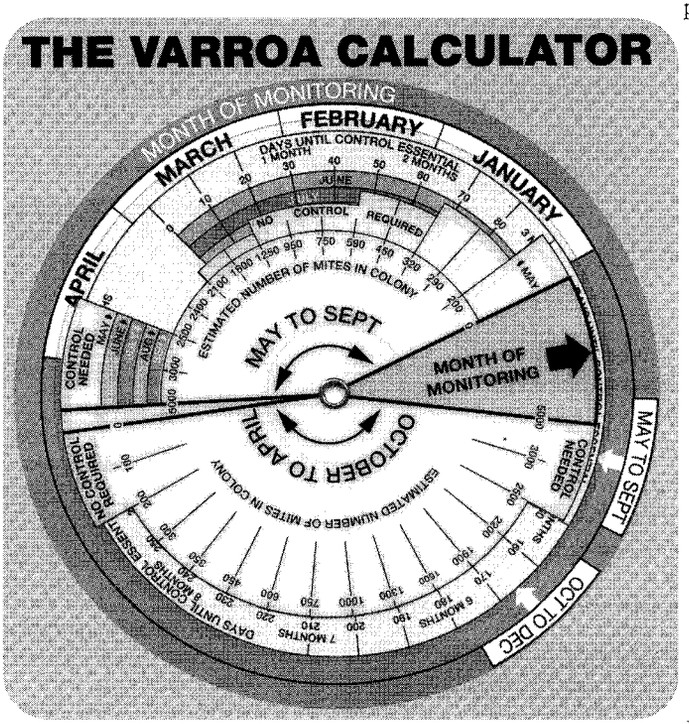
Material and Methods

A more detailed description of a formic acid device, the Nassenheider Evaporator, is given below. The prototype Fig. 1 received little attention 8 years ago when first published (BECKER 1990). This may have been due to the unification of East and West Germany that was taking place at the time; possibly beekeepers were more interested in other topics than a new evaporator!

The device (Fig. 2) has now been in commercial production since 1995. It has to be fixed in a frame and placed within the brood chamber. The wick is always submerged to the same depth in the formic acid, regardless of the depth of formic acid. This allows the evaporation of sufficient formic acid to cause extensive damage to the mites without harming the bees, despite variable environmental conditions such as external temperatures and air circulation. The concentration of formic acid vapour increases very slowly when first installed. Irritation of the bees, and consequent aggression, are avoided. Bees, like other animals, seem unaware of slow changes or movements - this is also apparently the case with strange odours.

The wick of the evaporator must not be too close to the brood cells; this might damage the brood, which after all cannot move away from the vapour. Therefore the evaporator should be placed behind the first brood-free comb. To find the right place requires more working time than alternative treatments which are placed above or below the brood, but many beekeepers accept this because the results are better, and there is less danger to the queen.

The advanced evaporator (first described by BECKER 1997) takes less time to use. The combination of a vertical and horizontal wick does not eliminate, but significantly reduces environmental influences, ie the evaporator does not have to be placed next to the brood nest, but in an empty brood chamber or super above the brood nest (Fig.3). In some hives, there may be enough space between the inner and outer covers for the evaporator. In side-opening hives, which are often used in German-speaking countries, the best location is between the window and the last comb (Fig. 4). Installing it, and checking the level of the formic acid need only take a few seconds. This will be appreciated by commercial beekeepers who until now have considered the procedure too laborious.



A useful gadget for calculations, designed by Steve Martin for NBU

Results and Discussion

It is important to stress that the advanced evaporator works not only during autumn, but also for some weeks later, which is a considerable advantage.

- It avoids problems due to a late honey flow, or unavoidable absence from the bees, such as holidays.
- The danger of overdosing is reduced since the more susceptible house bees are not present.
- Subsequent reinfection is greatly reduced, since bees have largely ceased flying by then.

Research at the Freie Universität, Berlin with the Nassenheider (RADEMACHER et. al. 1994) showed that treating in September generally gave better results than July and August. Preliminary observations with the advanced evaporator seem to confirm this result, even with treatment extending into October (Table 1, referring to the Berlin area with its climatic conditions). (For those beekeepers already using the original evaporator, an upgrading part is available.)

To discover how many mites will seriously damage a colony, and how many mites are actually present, is difficult (LIEBIG 1983, RADEMACHER 1985 and 1990).I believe it is not essential to know this number accurately. Nevertheless mite check is impor-

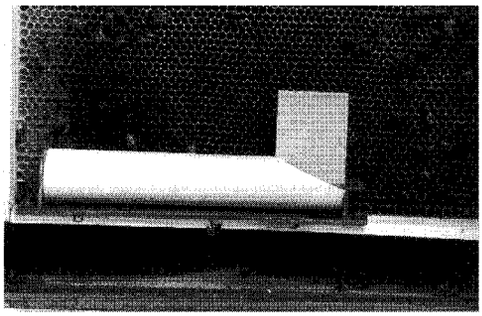


Fig. 1 The prototype as tested at the Freie Universität, Berlin.

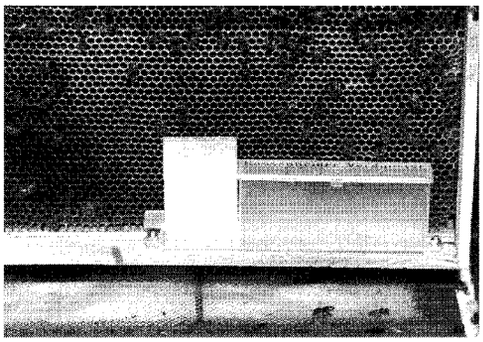


Fig. 2 The Nassenheider Evaporator as produced commercially for a number of years.

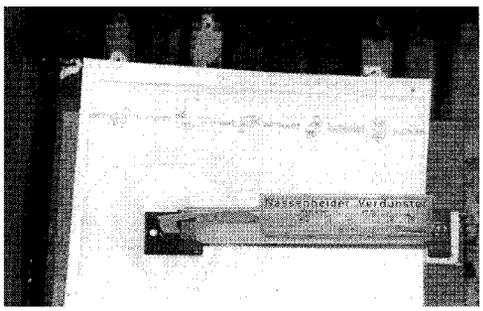


Fig. 3. The advanced evaporator in an empty brood chamber.

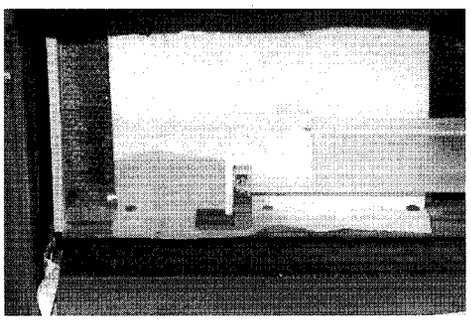


Fig. 4. The advanced evaporator in a side-opening hive.

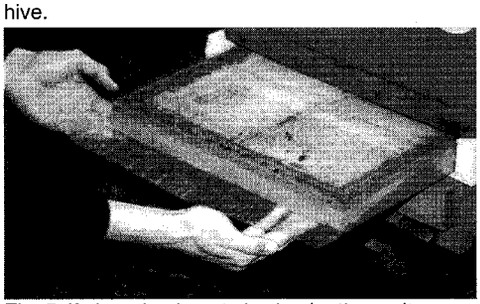


Fig. 5. If changing inserts is simple, then mite checks don't have to be time-consuming.

tant and interesting. If individual beekeepers check mite levels, we can build confidence in our ability to control Varroa. Counting mites with a sticky insert with a grid over is not time-consuming if it is kept simple (Fig. 5).

Counts of dead mites should be done after 3-5 days in summer or 10-20 days in winter. Too soon, and the results are inaccurate; after After too many days, the counting is more difficult due to wax, pollen and other particles. I don't disturb the bees in any case at temperatures below 5°C.

If I count more than 5 mites per day in June, I use a queen caging technique. For 3 consecutive 9 day periods, she is caged on a frame of brood, which is then destroyed. This eliminates nearly 90% of the mites (MAUL et. al. 1988). I believe however that if the daily mite fall in winter is less than 0.1 (Table 1, column 12) then no treatment is necessary. Preliminary results from 2 hives are not definitive, but are hopeful. Results of work in 1996 were uncertain because of robbing from a nearby apiary, which is now unused. In cases like this reinfestation is a perpetual problem.

References

BECKER, B. (1990)

Ameisensäure kontinuierlich verdunsten lassen

Garten und Kleintierzurht Ausgabe C 29(5): 10

BECKER, B. (1997)

Nassenheider Verdunster mit neuen Möglichkeiten

Deutsches Bienen Journal 5 (2): 64-65

LIEBIG, G. (1983)

Varroa-

Diagnose mittels Sommergemüll

Imkerfreund 138 (8): 307-309

MAIL, V.; KLEPSCH, A.; ASSMANN-WERTHMüLLER, U. (1988)

Das Bannwaben verfahren als Element imkerlicher

Betriebsweise bei starkem Befall mit Varroa jacobsoni

Apidologie 19 (2): 139-154

RADEMACHER, E. (1985)

Ist eine Befallsprognose aus dem patürhichen

Totenfall von Varroa jacobsoni möglich 2

Apidologie 16 (4): 395-406

RADEMACHER, E. (1990)

Die Varroatose der Honigbiene

Schelzky S Jeep; Berlin, D; 149 pp

RADEMACHER, E.; POLACZEK,B.; SCHRICKER, B. (1994)

Immer langsam voran. Eine nene Anwendungsform der Ameisensäuve am Brienenvolk

Deutsches Bienen Journal 2 (8): 438-439

Knowing the level of varroa infestation is the key to combating the parasite. Particularly in the early stages of infestation, beekeepers can be misled. Too often the numbers of mites in the hives are underestimated, until dramatic losses take place. Subsequently all colonies may be treated, whether the numbers of mites warrant treatment or not.

Two approaches to estimating populations of mites are shown here. The first is published by Dr Ritter in Germany, which relates numbers of mites dying to practical observations of brood and adult bee. The second is the Varroa Calculator based on the work of Dr Stephen Martin, partly funded by the British Beekeepers Association, produced for distribution to its members. This device will be reviewed in a coming issue.

DEGREE OF INFESTATION

A reasonable assessment of the degree of infestation may be obtained by placing a clean sheet of paper on the hive floor and withdrawing it 24 hours later. Beekeepers in Germany have linked the normal daily mortality of Varroa mites as counted with the degree of infestation, as shown in the table below.

Grade of Infestation	No. of Dead Mites per day	Infestation on Drone Comb	Infestation on Worker Comb	Infestation on Adult Bees	Observed Colony Behaviour
Light	0—4	Occasional	Not noticed	Not noticed	Normal
Medium	5—10	Clearly visible	Seldom noticed	Not noticed	Normal
Heavy	11—15	Almost everywhere	Clearly visible	Sometimes noticed	Fairly normal
Critical	16+	Complete	Widespread, looks like Foul Brood	Crippled, stunted bees seen	Irritated. Bees no longer clustered on brood

(With acknowledgement to Prof. W. Ritter)