THERMOVAR

TREATMENT METHOD & DEVICE AGAINST THE VARROA BEE MITE

August 2006

Sponsored by the Operational Programme "Rural Development – Reconstruction of the Countryside 2000-2006", Axis 7

1. SUMMARY

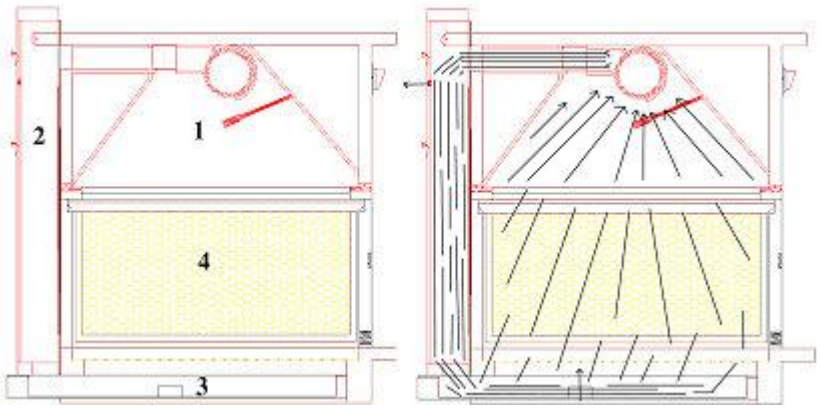
The device consists of three parts: the heat chamber (1), the hot air circulation conduit (2) and the mite collection drawer (3).

It is applied in single hives, in colonies without any or with the least possible brood.

In order to adjust the heat chamber, we first remove the hive's lid and we replace it a bee proof screen. Then we adjust the heat chamber on the top of the hive. Through the hot air circulation conduit, the heat chamber is connected with the mite collection drawer which is placed under a second bee proof screen at the bottom of the hive.

The whole system – hive, heat chamber, hot air circulation conduit and mite collection drawer – constitutes a closed air circuit. The only loss we have is a very small and controllable quantity of air that escapes from the small exit hole of the hot air circulation conduit and comes in from the entry hole of the mite collection drawer.

By putting into operation the heat chamber, the air inside the system starts to warm up gradually and with the help of the fan, it gets recycled as passes from the heat chamber to the circulation conduit, the drawer, the gaps between the honeycombs and ends back to the heat chamber. The device operates electronically, so that when the air reaches the desired temperature for the treatment, it remains stable for as long as we have set it up and it terminates the whole operation by itself.



Left: Heat chamber (1), hot air circulation conduit (2), mite collection drawer (3) and bee hive (4).

Right: Device in operation – representation of the recycled air.

2. INTRODUCTION

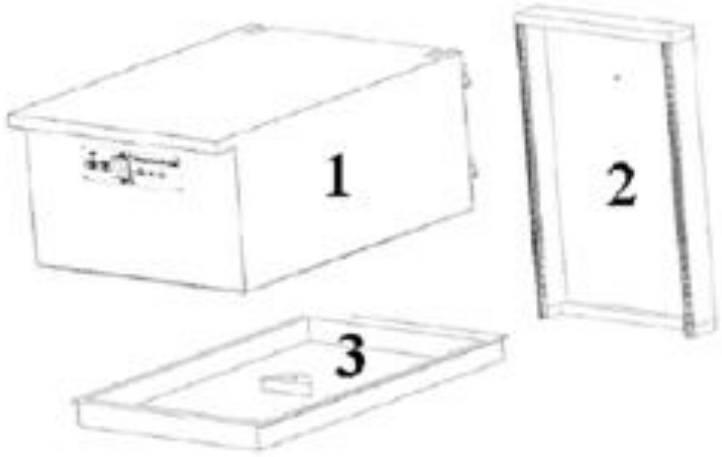
Hyperthermia is an alternative treatment method for the Varroa, which surpasses the negative side effects that common chemical products and acids have to the bees and the honey. It is based on the principles that 1) a combination of a specific temperature in a specific period of time can be proven harmful or fatal for any organism and 2) bees are more resistant than the Varroa to high temperatures. Any temperature higher than 40°C kills the Varroa in the brood (Engels 1998) and any temperature over 46-48°C kills the Varroa on the active bees (Harbo 2000). The brood shows resistance to temperatures up to 42°C and 43°C and the active bees can handle even higher ones.

Due to the different levels of resistibility between the brood and the active bees in high temperatures, the treatment was previously applied separately to the brood and to the active bees. This procedure was much more difficult and time consuming.

We, in our effort to apply bee-friendly methods that are harmless to humans, use hyperthermia since 1995 and we apply it directly to the hive without removing the brood. This experience led us to the creation of “Thermovar”, a device that is used to successfully treat the Varroa mite.

3. DESCRIPTION OF THE DEVICE

The device consists of three parts: the heat chamber (1), the hot air circulation conduit (2) and the mite collection drawer (3).



The three parts of device

3.1. HEAT CHAMBER

The main part of the device is the heat chamber. It heats the air, it lets it circulate and it controls the whole procedure with regard to the temperature and time.

3.1.1. The Exterior of the Heat Chamber

The front and the back side of the heat chamber, as we see it from the bottom.

It consists of a rectangular wooden box. The external dimensions are exactly the same as the dimensions of the hive, i.e. 50.5 cm length x 41.5 cm width, so that it can be adjusted perfectly on the hive. Its height is 25 cm.

The bottom part of the heat chamber is completely open in order to be able to absorb the air of the hive. On its four sides there is insulation rubber that helps it seal and prevent accidental leakage of hot air.

The upper part, the lid, is closed and its front side is longer and exceeds from hive in order to protect the electronic components of the chamber from the bad weather conditions. On the back side it carries hooks that help the installation of the hot air circulation conduit.

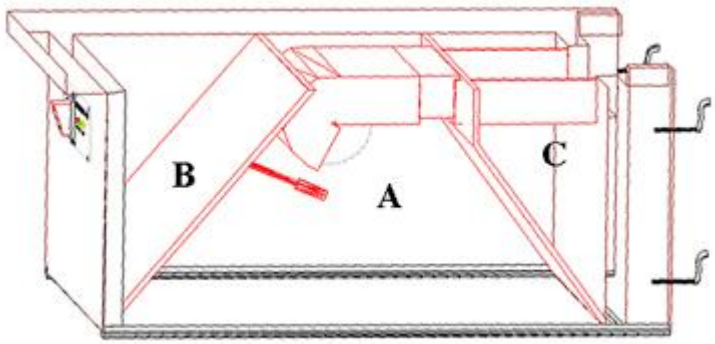
The hole at the back where the hot air comes out from is 21.5 cm x 3.5 cm.

The front side carries the general power switch and the indication buttons.

The heat chamber is made by marine plywood.

3.1.2. The interior of the heat chamber

The interior of the heat chamber is divided into 3 distinct sections, as shown in the picture.



The interior of the heat chamber as seen from the side

The middle section (A), which is the only one that comes into direct contact with the hive through the bee proof screen, has the shape of a triangle that allows a better distribution of the recycled hot air. On top of this triangle, namely the inner side of the lid, the cylindrical fan is adapted. Exactly under the fan is the temperature sensor which is connected to the control board.

The left section (B) is on the front side of the heat chamber and it is not in contact with the hot air circulation. That is where the control board is situated.

The right section (C) is at the back side of the heat chamber and carries the electrical heater which has a rectangular shape of 21.5 cm x 3.5 cm and is 500W strong. This electrical heater is responsible for warming up the recycled air and the interior of the hot air circulation conduit.

3.2. HOT AIR CIRCULATION CONDUIT

The hot air circulation conduit, as show in the picture, is adjusted on the back side of the heat chamber and leads the hot air from the exit of the electrical heater to the mite collection drawer.

Its dimensions are 37.5 cm x 4 cm and it is 65 cm high. Almost in the middle of its wider side, i.e. at 55 cm and opposite the hole of the heat chamber through which the hot air passes, there is another hole which has a diameter of 6 mm and lets the air escape.

It is made of marine plywood.

3.3. MITE COLLECTION DRAWER

It is placed on the base of the hive. Its dimensions are 33.5 cm x 55 cm and its depth is 3.5 cm

On the bottom side and towards the middle there is a small raised part which allows a better air distribution. In the middle of this raised part there is a 6mm hole which helps the air to get out. It is made of stainless steel and wood.

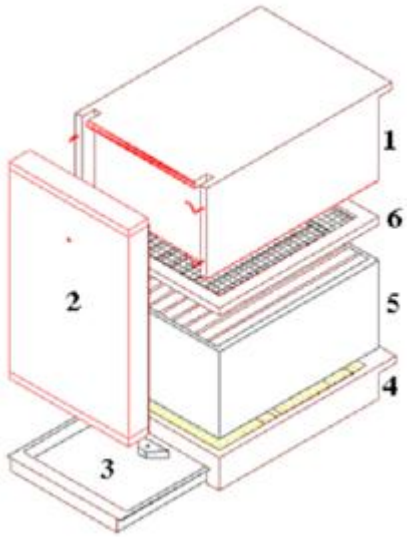
4. METHOD OF OPERATION

4.1. REQUIREMENTS – PREPARATION

In order to apply the method to your hives, just as it is described below, it is important that:

- You have access to electricity of 220-230V or a generator.
- The base of the hive is covered with a screen and under it there is a slot to adjust the mite collection drawer.
- You have put a bee proof screen on the top of the hive.

The ideal time of the year for the treatments differs from place to place. In our apiary in Kefalonia we do the treatment twice throughout the year; once in August-September and once in early January. The main criteria are: single hives, without any or with the least possible brood.



1. Heat chamber
2. Hot air circulation conduit
3. Mite collection drawer
4. Bottom of the hive – screen
5. Brood chamber
6. Screen

4.2. OPERATION OF THE DEVICE

In order to get the device started, you need to do the following:

1. Seal the hive

2. Remove the lid and replace it with the heat chamber

3. Place the mite collection drawer

4. Insert and tighten the hot air circulation conduit

5. Press the switch

The whole system – hive, heat chamber, hot air circulation conduit and mite collection drawer – constitutes a closed air circuit. The only loss we have is a very small and controllable quantity of air that escapes from the small exit hole of the hot air circulation conduit and comes in from the entry hole of the mite collection drawer.

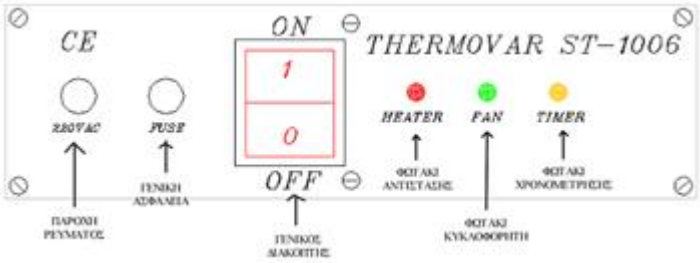
By putting into operation the heat chamber, the air inside the system starts to warm up gradually and with the help of the fan, it gets recycled as passes from the heat chamber to the circulation conduit, the drawer, the gaps between the honeycombs and ends back to the heat chamber.

Note:

- Pay attention to the back side of the heat chamber so that the exit hole of the fan faces the back. Also, make sure you don't place the mite collection drawer backwards, because then the raised part will have the opposite effect to the distribution of the air.
- Close the hive when all the bees are inside.
- While you are placing the heat chamber and the hot air circulation conduit, make sure the insulation rubber does not leave any gaps which would cause unwanted air leakage.

4.2.1 Control of the Operation

We can monitor the operation of the device through a panel that is located on the upper front side of the heat chamber. This panel constitutes the front part of the electronic board, which is the "brain" of the device. The electronic board contains all temperature, time and energy settings for the opening and closing of the heater, the fan and the device as a whole.



Control Panel

When the device starts working, the small led lights of the heater and the fan switch on. This means that the heater warms up the air and the fan recycles it. When the temperature reaches the degree we have set (see below: Choice of treatment), the light of the timer starts flashing.

The device will keep a constant temperature by switching on and off the heater for as long as we have set it (see below: Choice of treatment) and when the process is complete, the device will shut everything down by itself and it will notify us with a characteristic beep.

4.2.2. Completion of the Process – Counting the Mites

The beep sound will let us know that the process is complete.

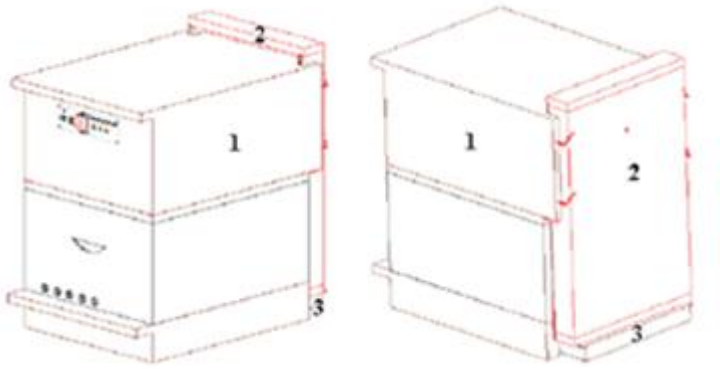
We switch off the switch on the heat chamber, we remove the hot air circulation conduit and we repeat all actions mentioned in paragraph 4.2 in order to start treating another hive after we place there a mite collection drawer. For that reason, it is useful to have more than one collection drawers; at least two in total.

Back to the hive that we have just finished treating, we take out the drawer and we count the mites. We keep an archive of the results so that we can later have an overview of the treatments in each hive and know which queen is more resistant to the mite in order to use it for the production of new queens.

4.3. CHOICE OF TREATMENT – EFFECTIVENESS

Our experience so far, but also the experiments of other beekeepers and researchers at the university have led us to build three different electronic boards. Every beekeeper, depending on his/her practices, can choose a treatment with a different duration and temperatures.

Thermovar Model	Temperature	Duration of constant temperature	Arming period of the timer
ST-1013	48.5 °C	13 min	30-40 min
ST-1006	42.0 °C	360 min	20-25 min
ST-1008	42.0 °C	480 min	20-25 min



The device in use

EFFECTIVENESS OF THE DIFFERENT MODELS		
Thermovar Model	**Varroa that fell from the bees**	**Dead Varroa on the sealed brood**
ST-1013	60-70 %	0-5 %
ST-1006	75-80 % *	93 %*
ST-1008	80-85 % *	100 % *

* Source: Apiculture Laboratory of the Aristotle University of Thessaloniki

Important Notes:

- After numerous applications with all Thermovar models, we have observed **zero bee mortality**, **no queen loss** and no aggressive behavior of the colony.

- With models ST-1006 and ST-1008 partial loss of the brood was observed.

- Models ST-1006 and ST-1008 were created in 2006, following the experiments and research results of the Apiculture Laboratory of Aristotle University of Thessaloniki under the supervision of Dr. A. Thrasivoulos.

- A large percentage of the mites that fell from the active bees after each application were not dead but unconscious. Therefore it is important to remove them immediately. For the same reason, the use of a screen that covers the whole bottom of the hive and the placement of a mite collection drawer are considered necessary for the correct application of the method. The use of Thermovar without screen or mite collection drawer is not recommended also because it has never been tested so far.

- A considerable number of mites continue to fall during the next 3-4 days after the application.

5. PATENT OF INVENTION

ΟΡΓΑΝΙΣΜΟΣ ΒΙΟΜΗΧΑΝΙΚΗΣ ΙΔΙΟΚΤΗΣΙΑΣ

ΔΙΠΛΩΜΑ ΕΥΡΕΣΙΤΕΧΝΙΑΣ

Αριθμ. 1005196

Εχοντας υπόψη :

Αποδίδουμε

ΑΘΑΝΑΣΑΚΗ ΑΘΑΝΑΣΙΟ του Αγγέλου

ΣΥΜΦΩΝΟ ΣΥΛΛΟΓΟΥ

The device as well as the method have been perfected in order to be effective and safe for the bees.

During this process, however, we lost numerous bees and colonies and we wasted a lot of time and money.

In order to avoid someone making profit at our expense, we established proprietary rights over the method and the device with a Patent of Invention by the Industrial Property Organization in 2004.

If you are interested in using the device for the treatment of Varroa in your beehives, please contact us.

6. MAINTENANCE – POTENTIAL PROBLEMS – WARRANTY

The device does not require any special care. Storing it in a dry place is enough to maintain it. It is likely, however, that after extensive use, the insulation rubber will be damaged and it will need to be replaced.

We use the device (ST-1013) for more than ten years without experiencing any problems.

For our safety and the safety of the bees, when we want to use the device after a long storage period, we first test it in an empty hive without bees.

If you have obtained the device:

- Read the instructions carefully. If something is unclear, ask for more information or for a demonstration of its use.
- Do not use the device in any other way than the one described above. There is accident risk due to misuse.
- Caution! Do not intervene in any other part of the device besides the main operation switch.
- If for any reason the device is not working, contact us immediately.

The device is made according to certain specification and with materials that are resistant to adverse weather conditions.

Thanks to the almost zero problems we have faced during this decade of using the device, we are able to provide a 10 year repair guarantee and a 5 year guarantee for the materials.

The guarantee is valid as long as the device is used properly and exclusively for the purpose it was purchased and the damage has not been caused by an accident.

We do not cover any transport costs.

In our effort to optimize the method, we maintain the right to make any kind of change to the device without warning.

7. CONTACT

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