

EFFICACY OF THYMOL IN CONTROLLING *VARROA DESTRUCTOR* ANDRERSON AND TRUEMAN USING A RANGE OF COMMERCIAL PRODUCTS WITH DIFFERENT APPLICATION METHODS.

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The purpose of this study was to confirm the acaricide efficacy of thymol in the field in combating *Varroa destructor* Anderson and Trueman.

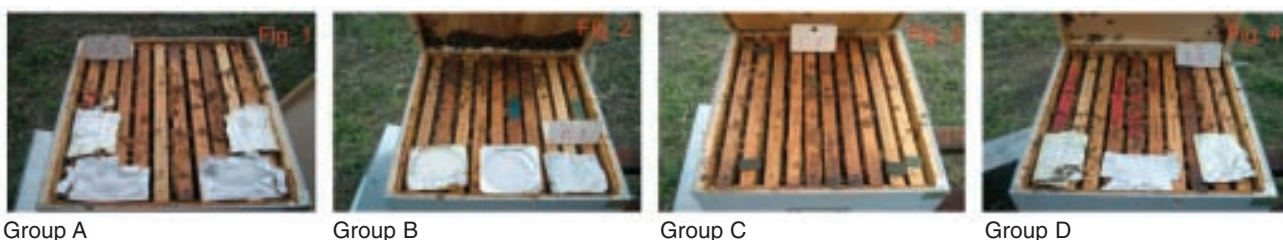
There are currently two commercial products available in Italy; we used them in our experiment under different conditions to those specified by the manufacturers in an attempt to intensify their killing properties (Figs. 1, 2, 3, 4).

Forty colonies, naturally infested with varroa and following migration, were divided at random into four groups of ten.

Thymol was administered to each group for four weeks. Control treatments were then performed using Apivar® for five weeks and Apistan® for seven weeks, and a final treatment with sublimated oxalic acid was given during January.

The dead mites at the base of the colony were counted at regular intervals throughout the test. During the first weeks, the number of dead mites was so consistent that counts had to be performed at 24-hour intervals after each application of thymol.

Figs. 1, 2, 3 and 4: Methods of application of the products in the four experimental groups



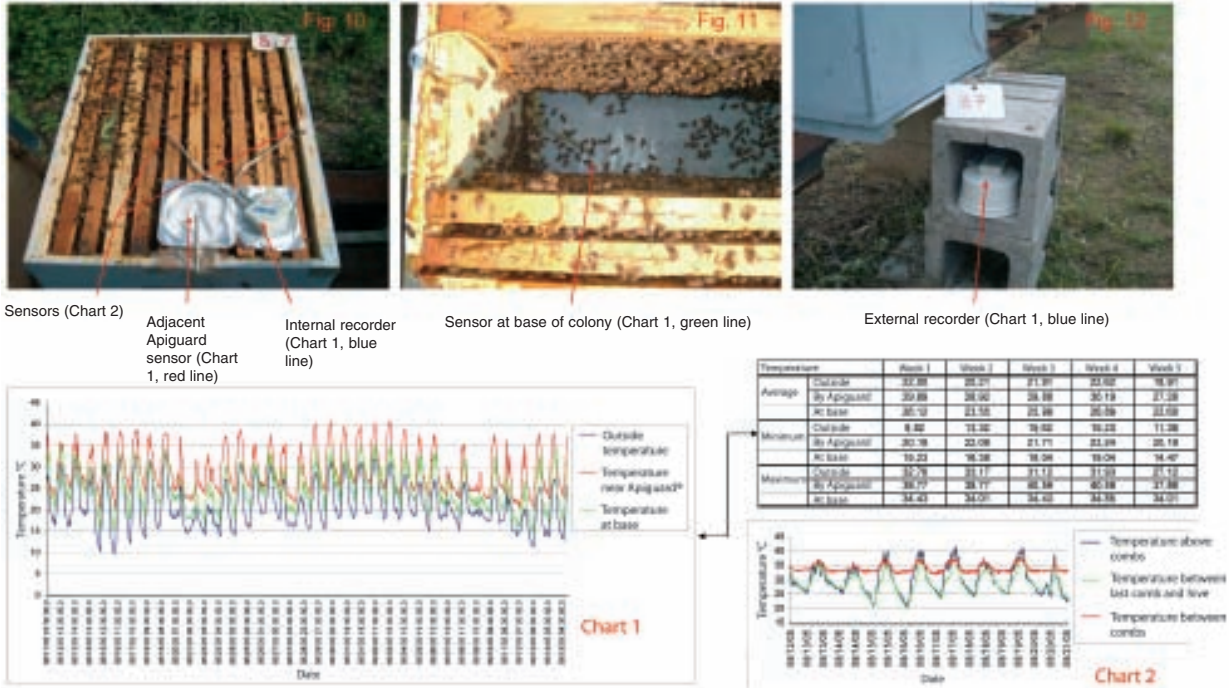
GROUP	PRODUCT	INTERVAL OF ADMINISTRATION
A (Fig 1)	Apiguard®, 2 x 25 g sachet	2 weeks
B (Fig 2)	Apiguard®, 50 g tray	2 weeks
C (Fig 3)	Apilife VAR® 1 tablet	1 week
D (Fig 4)	Apiguard®, 1 x 25 g sachet	1 week

Figs. 5 - 9: Photographic sequence showing the B4 colony at various points in the experiment. Photos



Colony	Mites killed using thymol	Mites killed during control	Total	Efficacy (%)
B4	12831	2590	15421	83.2

Figs. 10 - 12: Position of temperature recorders and the associated sensors



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Chart 1: Records of outside temperature, close to the Apiguard® tray and at the base of the colony during thymol-based treatment. The table shows the recorded values broken down by week.

Chart 2: Records of temperatures between the brood combs, above the combs and between the last comb and the hive. Temperature variations are minimal between the combs close to the brood (red line).



Figs. 13 and 14: Adhesive film applied at the base of the colony, on which the dead mites were polled and counted

Fig. 13b: Dead mites in three days during treatment with thymol

Fig. 15: Eighteen colonies used in the experiment came from a test using an Apiguard® 25 g sachet (newly treated and new to the control) in the Oltrepò Pavese region from 4 to 14 July 2005, while nectar for herbal medicinal use was being gathered. Organoleptic analysis of a honey sample detected no thymol presence. However, chemical analysis showed a concentration of 300 ppm.

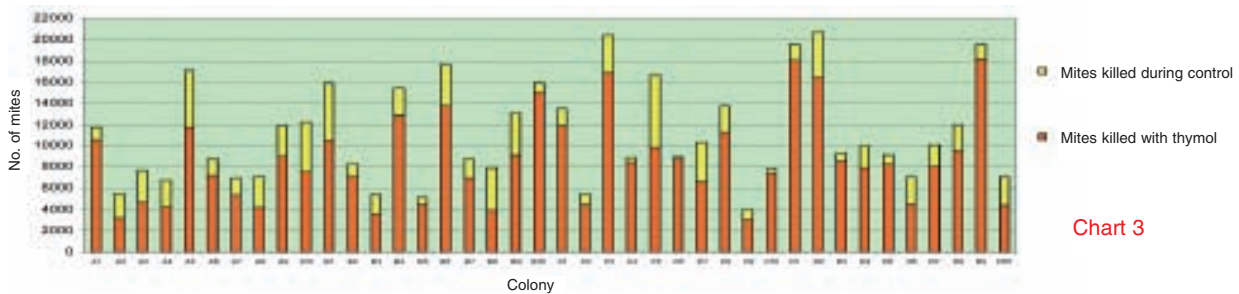


RESULTS:

The following results for average efficacy were recorded for the thymol-based treatments: - Group A 69.48%; Group B 75.87%; Group C 81.96%; Group D 81.22%. Variance analysis found no statistically significant differences between the four groups.

The number of mites per colony in some cases was higher than any forecast or reference from the literature, exceeding 18,000 mites killed during treatment with thymol alone.

The temperatures recorded close to the Apiguard® tray reached peaks of 40.59°C and did not fall below 20.19°C, even when the outside ambient temperature was less than 10°C (Chart 1).



CONCLUSIONS:

Treatment with thymol-based products is a valid tool to reduce Varroa destructor during the summer; however, it needs to be combined with other treatments during autumn and appropriate co-ordination at a regional level.

The number of mites per colony at the end of the treatment with thymol was still high, but this cannot be attributed to an ineffective action on the part of the product, but instead to a high number of parasites or re-infestation.

During the control treatments, the two chemicals Amitraz and Fluvalinate were used in succession; when the change was made from one to the other, an increase in dead mites was noted, which demonstrates that it is useful to base the fight against the mites on the use of acaricides from different chemical groups.

The temperatures recorded inside the colony suggest that the average daily temperature should be considered a limiting factor on the use of evaporating products. Indeed, at the point of application of the thymol, the temperatures depend not only on those outside the colony, but also on the thermoregulating activities of the bees on the brood combs, solar irradiation and the materials used to construct the hive. As a consequence, it would be desirable to achieve better insulation of the hives, in that this would permit a greater consistency in internal ambient conditions and a more regular release of the thymol.

Chart 4

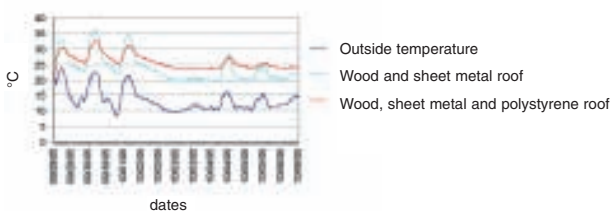


Chart 4: Record of external ambient temperature and temperature above the combs in two colonies with differently insulated roofs.



Fig. 16: Wood and sheet metal colony roof



Fig. 17: Wood and sheet metal colony roof insulated with polystyrene