

EFFECTIVENESS OF TREATMENTS WITH THYMOL IN CONTROLLING VARROA DESTRUCTOR PARASITE OF THE HONEY BEE IN ALGERIA

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ABSTRACT

Varroa disease is a parasitic disease of adult bees and brood, due to a blood-sucking external parasitic mite, Varroa destructor. This is one of the most dangerous diseases in Algeria. The purpose of this study is to evaluate the effectiveness of two treatments approved based thymol (Thymovar® and Apiguard®) in the fight against varroa in Algerian conditions and to determine the side effects of these treatments on bee colonies local *Apis mellifera intermissa*. The test was performed on 80 colonies with two different formulations for each treatment. As the results show in our test, a wide variation in the effectiveness between colonies is recorded for both treatments. The average efficiency for the group of colonies ½ Thymovar strap in two applications stood at 84.43%. This efficiency is lower for the group ½ straps in one application (77.23%). For Apiguard, the average efficiency is 81% for formulation 2 x 25g spaced two weeks, against a 79% rate for the formulation of 2X25 spaced one week. During our tests, with a few dead bees and nymphs found on nappies, we never recorded unusually high bee mortality. Further tests are needed to determine the optimal dose and the best time for treatment.

Key words: Varroa destructor, Efficiency, Thymol, Algeria.

INTRODUCTION

Varroa disease is a parasitic disease of adult bees and brood, due to a blood-sucking external parasitic mite, Varroa destructor (Already stated in the abstract). Varroa

is responsible for an outbreak in *Apis mellifera* since joining the Asian bee, *Apis cerana*, the original host (Colin, 1999). From the invasion of Tunisia by varroa, it was due to its appearance in Algeria, and it was in 1981 and it is in an apiary of the East (Oum El theboul Meadows Kala Cooperative) has reported the disease for the first time. Since then, several products and treatments have been used to fight against disease (Adjlane, 2011). Today, chemical control with thongs containing pyrethrinoid can be used to a limited extent as these products are no longer optimal efficient (Adjlane et al. 2013). So it seems interesting to turn to other means of natural control. Essential oils are part of these natural products that can present an alternative. Thymol is in the essential oils of many plants, particularly in thyme (*Thymus vulgaris*) (Lee et al. 2005). In honey lime, thymol is a natural component that is present in the measured value of 0.16 mg / kg. Thymol has proved to be as one of the most effective essential oil compounds against varroa. Two commercial formulations are commonly used in several countries: The Thymovar™ (Andermat Biocontrol Inc.) and Apiguard™ (Vita ltd.). The first is a product in the form of fabric impregnated sponge thymol (15 g / plate) and the second is in the form of gel (25% thymol).

This test is intended to examine the effectiveness of acaricide Thymovar and Apiguard in local conditions depending on the dose and the number and duration of treatment. We also try to assess the side effects of the application of such a product on bees and colony development.

MATERIALS AND METHODS

The test was conducted in an apiary of 80 colonies located in the region of Blida (Algeria Centre). The hives are used Langstroth type; the number of frames occupied by bees varies between 8-10.

Treatments

Apiguard is in the form of trays (trays box of 10 to 50 g of gel). Each tray contains 25% of thymol (12.5 g of thymol in a coated slow-release gel). Thymovar is it is a product which is in the form of a sponge cloth (5 x 14.5 cm) which serves as support for the active substance. It contient 15 g Thymol.

To monitor the effectiveness of these formulations, treatment control with Bayvarol (Dietermann et al., 2013). Double check) Bayvarol is a treatment that is in the form of strips, each strip contains 3.6 mg of flumethrin.

Constitution of experimental batches

The apiary on which we conducted our experiment is divided into 4 lots:

- Lot I: 20 colonies treated ½ Thymovar thongs with two applications one week apart. These colonies are numbered from 1 to 20.
- Lot II: 20 colonies treated ½ thongs Thymovar in one application. These colonies are numbered from 21 to 40.
- Lot III: 20 colonies treated Apiguard® with two applications of 25 g one week apart. These colonies are numbered from 41 to 60.

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- Lot IV: 20 colonies treated Apiguard ® with two applications of 25 g spaced two weeks apart. These colonies are numbered from 60 to 80.

Monitoring the effectiveness of treatment

Using the diapers in the bottom of the hive, the dead Varroa is collected and counted. These counts are performed on all of the colonies during the entire duration of treatment. From the results obtained, the effectiveness of different treatments in all the colonies is obtained using the following report:

Effectiveness Thymovar/Apiguard = $A/B \times 100$

A: Number of deaths of varroa treatment suites Thymovar / Apiguard

B: Number of deaths of varroa treatment suites Thymovar / Apiguard and control treatment (Bayvarol)

Evaluation of side effects on bees

An evaluation of the size of each colony is done to determine a possible treatment effect on the development of the colonies. Plastic lying on the floor in front of the hives is used for the assessment of the mortality of bees.

Statistical analysis

The data obtained are analyzed using the Statistica 8.0 software following the variance analysis process (ANOVA). The comparison of means was made by the test Newman - Keuls at 5% level.

RESULTS AND DISCUSSIONS

As the results show in our test, it does not always get a sufficient level of efficiency. A large variation in the efficiency is observed between the colonies for both treatments. The average efficiency for the group of colonies ½ Thymovar strap in two applications stood at 84.43% (Figure 1). This efficiency is lower for the group ½ straps in one application (77.23%) (Figure 2). The analysis of variance (ANOVA) showed a significant difference between treatments ($P < 0.05$). For Apiguard, the average efficiency is 81% for formulation 2 x 25g spaced two weeks (Figure 3), against a 79% rate for the spaced 2X25 formulation of one week (Figure 4) . There was no significant difference between the two treatments ($p > 0.05$). During our tests, with a few dead bees and nymphs found on nappies, we never recorded unusually high bee mortality. It is reported that two queens were lost after treatment with Thymovar®. In addition, we also recorded a single case of desertion of a colony after applying the second treatment Apiguard ®.

According to our results, the Thymovar has a higher efficiency compared to Apiguard, treatment ½ Thymovar strap in two applications had the highest rate of efficiency. Our results once again confirm the observations made in recent years, namely the large variation of efficiency of thymol from one colony to another.

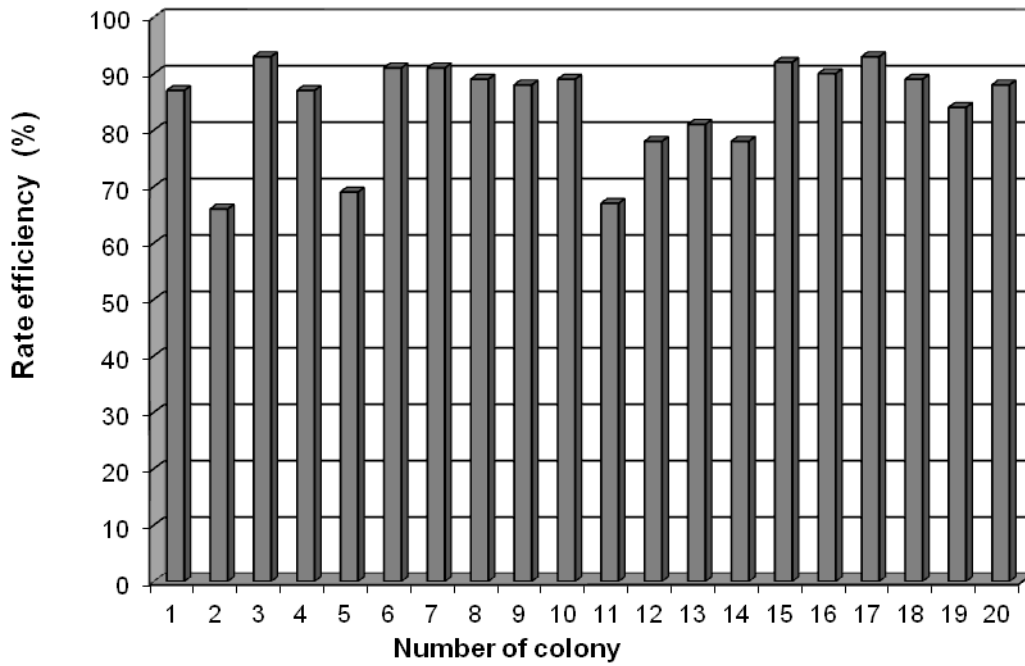


Figure 1: Thymovar thong $\frac{1}{2}$ Treatment Effectiveness in two applications

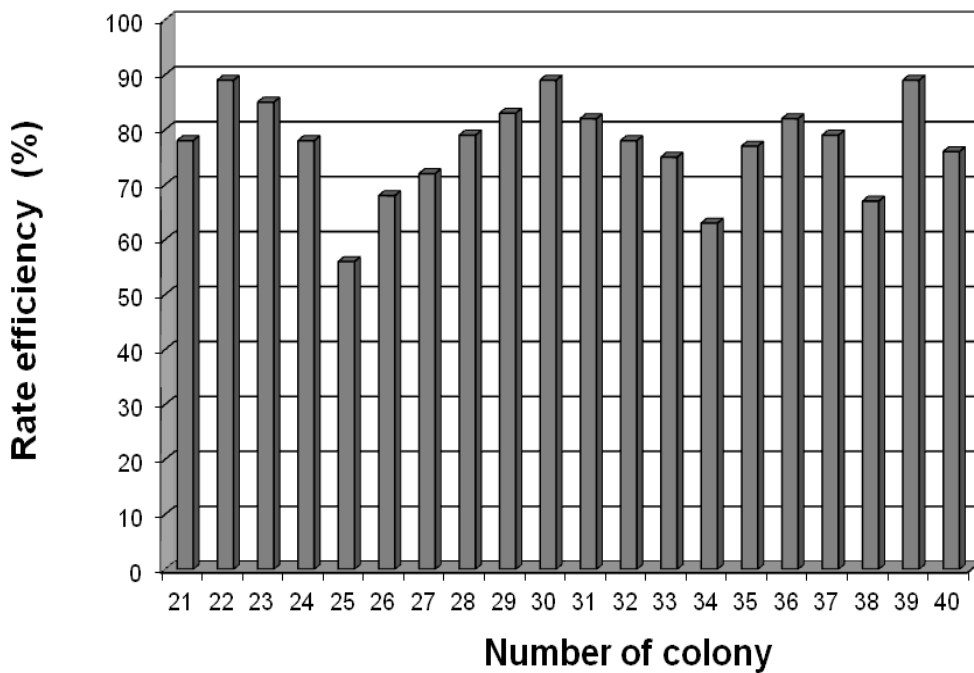


Figure 2: Thymovar $\frac{1}{2}$ thong of treatment efficacy in a single application

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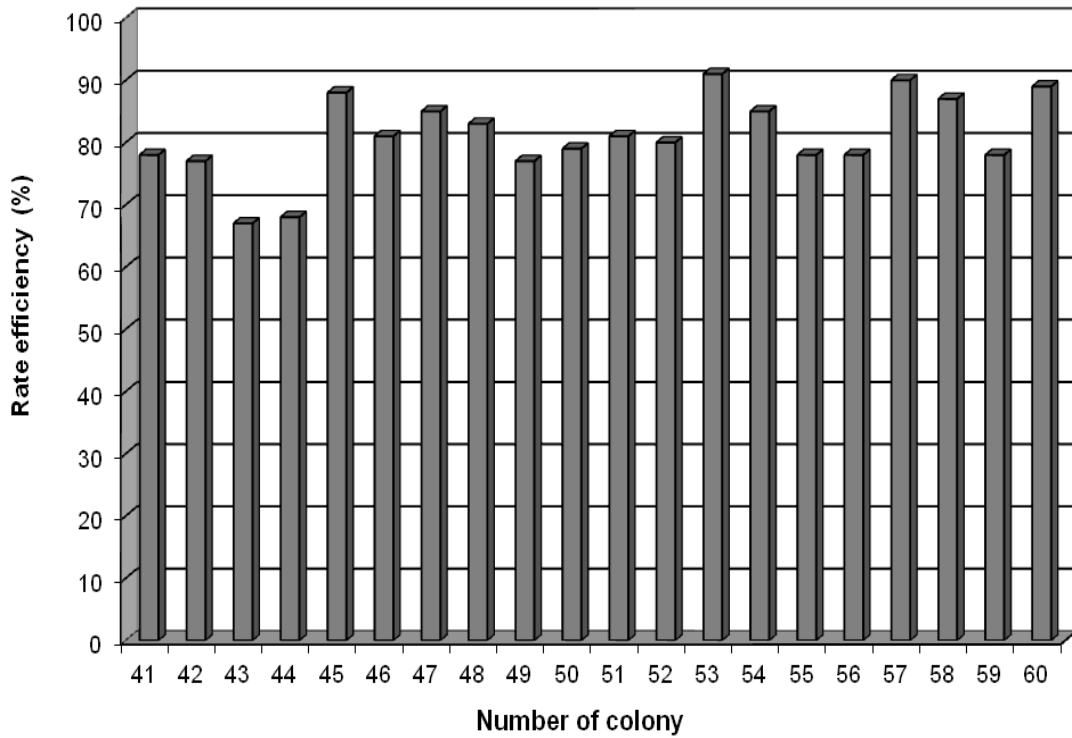


Figure 3: Efficiency formulation of 2 x 25g Apiguard spaced two weeks

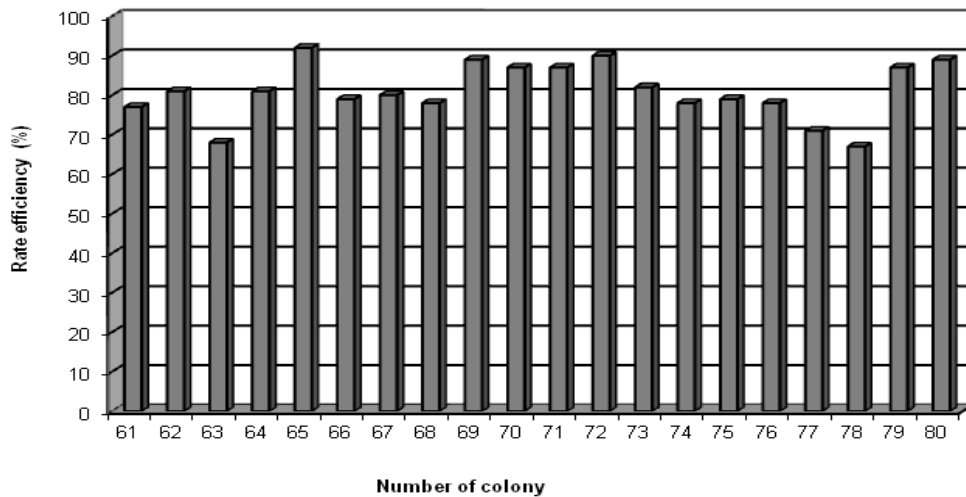


Figure 4: Efficiency formulation of 2 x 25g Apiguard spaced a week

The biggest problem thymol regards its dependence on the outdoor temperature. (Imdorf et al., 1996). Akyol and Yeninar (2007) obtained an average efficiency for Thymovar 96% in scientific trials in Turkey. The results obtained by Swiss Bollhalder (1998) show an efficiency of 85- 97% for the application of two strips Thymovar to 4 week interval (8-week treatment period) and an efficiency of 66-95 % for the same dosage for a 6-week treatment period. In Belgium, the average efficiency rate always obtained with the same product 46 colony is 76, 5%. If we examine the effectiveness of Apiguard between the two doses, a slight improvement is achieved with the first dose, this can probably be explained by the fact that an interval of 15 days between applications is required, and this for make the most of the action of Apiguard ®. In fact, even after a week, the product will not be completely eliminated in some colonies. Indeed, this is mentioned by Della Vedova and Milani (1998) through their trials, the results show an average efficiency of 92% with the application of the product at 15-day intervals, against an efficiency of 87% for application of Apiguard ® 10 days apart.

Trouiller reports a 90% average efficiency in tests on 905 colonies distributed in 162 apiaries in France: the testing conditions were not similar (temperature, beekeeping, type of hive). This percentage is obtained by the use of two applications of 50 g Apiguard ® at 15 day intervals. Matilla and Otis (1999) obtained with the same dose an average efficiency of 75%. Always with the same dosage, the same authors revealed in a second test an average efficiency of 78% (Matilla and Otis, 2000).

Regarding the side effects of these treatments on bees, we never recorded unusually high bee mortality. Giovenazzo and Dubreuil (2011) reported equivalent efficacy and greater than 90% for both products. By cons, with the Apigard™, there has been a reduction in the strength of colonies following the fall and spring treatment. A study that examined the effect of treatment with Apiguard, has shown toxicity of thymol on young larvae but not the adult (Mattila et al., 2000).

CONCLUSION

The results are very encouraging and can be improved in the future. For this, further tests are needed to accurately determine the optimal dose and the best time for treatment.

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