

APIGUARD: AN INSTRUMENT ADAPTED TO MANY BEEKEEPING CONDITIONS

Jérôme TROUILLER

VITA (Europe) Limited. 21/23 Wote Street. Basingstoke. Hampshire. RG21 7NE. UK

ABSTRACT

APIGUARD is a new treatment based on natural ingredients against varroosis. It is a slow release gel containing thymol as active ingredient. The role of the gel is to regulate the release of thymol vapours in the hive. The gel can be used in a wide range of external temperature, and especially in hot condition which generally is not adapted to thymol based products.

APIGUARD has been tested in many countries and in many different beekeeping conditions. Different hive types and honeybee races were tested. It was used in a wide range of climate from Scandinavia to tropical Mexico, and at different seasons. The different results obtained for the kinetics of the gel, efficacy against varroa, thymol residues in hive products, and honeybee tolerance are presented and discussed according to the different conditions.

INTRODUCTION

In the last 10 years, varroa resistance to classical acaricides appeared in several regions of the world (Milani 1999, Trouiller 1998, Watkins 1996). Resistance to the main active ingredients used against *Vaaroa destructor* (pyrethroids, amitraz, and coumaphos) was recently noticed in Europe and America. New actives are necessary to allow rotation treatment.

Another important aspect is the increasing importance of organic production which is stimulated by consumers exigency. Honey and honeybee products in general are very sensible to such natural image. Thymol, a naturally occurring substance in honey and plants, is then an adapted substance.

Thymol is considered as not toxic to human. In European Union, it is accepted in food at the high level of 50 mg / kg. More, thymol is accumulating in wax from year to year. However, thymol can change the flavour of honey if present at a concentration higher than 2 mg / kg (Richard and Multon 1985).

Thymol has been noticed as an efficient active ingredient against varroosis and other honeybee diseases since the 1980s (Grobov 1981). Thymol has a good efficacy on varroosis, and is beneficial for the hygiene of the colony.

However, thymol has several negative effect lack a temperature dependant activity and the risk of the perturbation of the colony. Repeated application of thymol can lead to high residues and some negative effect on the colony.

A special gel has been developed to regulate the thymol release, the commercial name of this thymol gel is Apiguard. The gel, like a clever sponge, reacts to temperature, mesh is larger when cold, smaller when hot. The gel controls thymol

release leading to a more regular release in a wide range of temperature. It gives also a good safety for the user and only needs 2 applications.

The gel has been tested for its efficacy and possible thymol residues in several countries and climate condition. This paper is the summary of the experiments conducted since 1995.

MATERIALS AND METHODS

EFFICACY

The experiments were conducted by official research institutes in several countries. The sites were chosen to give a variety of climate and beekeeping condition (type of hive and race of bees).

For each experiment, tested hives were equipped with a screen bottom board which allows the mites to pass through and avoids the workers to remove the dead mites. The counting board placed under the screen was spread with mineral oil to avoid the insects removing the dead mites. Mites were recovered on the bottom board and regularly and counted.

Apiguard was applied successively 2 times (50g) at a 2 week interval. After the gel had disappeared in the colony (between 30 and 45 days), at least 2 control treatments, using active of different chemical families, were applied to recover the mites remaining in the colonies at the end of the Apiguard treatment. In that way the risk of a possible resistance leading to an overestimation of efficacy was avoided.

Efficacy was considered as the percentage of mites killed by Apiguard as regards to total mites (mites killed by Apiguard and the control treatments).

THYMOL RESIDUES IN HONEY

In 3 occasions, at the end of the Apiguard treatment in Summer, supers were placed on the top of the colonies. Ten colonies per experiment were tested. About one month after the supers had been placed on the colonies, one sample of honey was taken from the super for each colony. The samples of honey were then analysed for thymol residues.

RESULTS

EFFICACY

The results are presented in the table 1. The global value of efficacy was 91%. The extreme values of efficacy were 74 and 99%. Generally, efficacy was higher when colonies were treated in hot condition just after the removal of the supers. When treated later in the season, mean efficacy was lower and more variable between colonies.

Table 1: Application of Apiguard in trays (2 times 50 g at a 2 week interval)

Site	Year	Number of hives	Types of hives and honeybees	Period of treatment	Temperature range (°C)	Total infestation	Efficacy (%)
Algeria Alger		5	L I	8-9	42-24	1219	93
Italy Lombardy 1		15	D L	7-8	40-24	1060	99
Italy Lombardy 2		15	D L	7-8	40-24	942	99
Italy Lombardy 3		12	D L	7-8	40-24	1237	98
Italy Lombardy 4		12	D L	7-8	40-24	2009	98
Italy Lombardy 5		12	D L	7-8	40-24	1743	99
Greece Thessaloniki 2	2002	10	D MA	8-9	36-18	1383	95
Morocco Azemour 4	2002	14	D I	8-9	35-26	2008	95
Morocco Azemour 1		5	D I	6-7	32-28	926	91
Morocco Azemour 2		5	D I	8-9	32-28	2555	92
France Nice		10	L M	7-10	34-23	2106	93
Morocco Azemour 3	2001	10	D I	9-10	32-22	2302	98
Italy Udine 1		10	D L/C	6-7	32-21	2352	85
Italy Udine 2		10	D L/C	6-7	32-21	1988	87

Belgium 1		14	IG B	8-9	32-15	2962	96
Belgium 2		5	D B	8-9	?	8545	97
Belgium 3		1	D B	8-9	?	3266	98
Belgium 4		15	MIX B	8-9	24-14	5278	74
Belgium 5		9	MIX B	8-9	?	5639	83
Switzerl. 1		10	S M	8-9	38-17	1002	96
Switzerl. 2		10	D M	8-9	37-18	2112	86
Switzerl. 3		10	S C	8-9	38-16	217	87
Switzerl. 4		3	D C	8-9	36-18	2339	85
Switzerl. 5		3	S C	8-9	36-18	1491	92
Switzerl. 6		10	S C	8-9	31-15	306	91
Switzerl. 7		10	D L	8-9	33-21	2295	75
Greece Thessaloniki 1	2002	10	L MA	3-4	25-8	1088	89
France North		4	D L	10-11	24-10	3787	77
France Alsace 1		5	Z C	7-8	24-12	750	98
France Alsace 2		2	Z C	7-8	26-7	3143	95

Greece	2002	10	L	10-11	22-9	3852	80
Thessaloniki 3			MA				
MEAN		279				1623	91

Honeybee type : B : buckfast, C : carnica, I : intermissa, L : ligustica, M : mellifera, MA : macedonica, MIX : mixture.

Hive type : D : Dadant, L : Langstroth, S : Swiss, Z : Zander.

Honeybee tolerance was good with the posology recommended. However, it is important not to increase the surface of contact to avoid perturbation in the hive.

THYMOL RESIDUES IN HONEY

For the 3 experiments (table 2), individual values for thymol residues were never over the taste threshold (2 mg / kg). The mean values for the 3 experiments were < 0.03 (Udine), 0.17 (Lombardy), and 0.87 (Greece). For Greece a very poor harvest at the end of the Summer that caused a higher thymol residue value.

Table 2: Thymol residues in honey after an Apiguard treatment

Site	Year	Number of samples	Mean value (mg / kg)	Extreme values (mg / kg)
Italy Udine	1997	10	< 0.03	0.08 - < 0.03
Italy Lombardy	2003	10	0.17	0.38 – 0.05
Greece Thessaloniki	2003	10	0.87	1.7 – 0.07

For each experiment, the supers were placed immediately after the treatment of Apiguard. This is representing the worst case for thymol residues risk. Adding supers on the same colonies in the following Spring led to much lower thymol residues values.

It must be pointed out that in previous experiments that using Apiguard during the harvest period can lead to a level of thymol residues that can be detected by taste and lead to taste tainting.

CONCLUSION

The thymol gel Apiguard showed a good to excellent efficacy when it is used in the appropriate temperature. When used late in the season, Apiguard may need a complementary treatment in Winter or at the beginning of the Spring.

When used out of the harvest period, thymol residues in honey were low and did not have any effect on the flavour of honey. When treating during harvest period, taste tainting can occur in some cases. When treating with Apiguard out of the harvest period no taste tainting of the honey was observed.

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