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THE EVALUATION OF EFFICIENCY OF SOME PREPARATIONS NEEDED TO DECIMATE *VARROA DESTRUCTOR* PARASITES

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The effect of treatment is influenced not only by the preparations, but also by the time they are used and by the meteorological conditions. The aim of this study was to determine the efficiency of Apistan and Gabon PA92 for the prevention of varrosis in the time of autumn treatment of honeybee colonies and to evaluate the efficacy of Apistan to *Varroa destructor* mites depending on its localization in the honeybee colony. The study was carried out in the apiaries of northern Lithuania in the years 2009-2010. Twenty honeybee colonies with 9 combs squatted by honeybees were used. In the separate honeybee colony two Apistan strips were putted at the diaphragms of the hive or in the center of the hive. Gabon strips, two in the each honeybee colony, were putted at the diaphragms of the hive. The preparations (strips) were kept for 28 days. The catchers of the mites were put under the combs. The bottoms of the catchers were lined with paper sheets smeared with Vaseline. When the Apistan strips were kept at the diaphragms of the hive, 593.6 mites fallen and the level of the honeybee infestation with the mites decreased from 10.9 % to 2.0 % ($P<0.001$). When the Apistan strips were kept in the center of the hive, 875.2 mites fall down and the level of the honeybee infestation with the mites decreased from 10.6 % to 1.3 % ($P<0.001$). The efficiency of Apistan in the first case was 81.7 %, in the second case - 87.7 %. When the honeybees infestation with *Varroa destructor* parasites was 12.6 %, the efficiency of Gabon was 2.8 % higher than Apistan. The difference between the efficiency of these preparations is not statistically significant.

Key words: *Apis mellifera*, *Varroa destructor*, treatment, Apistan, Gabon.

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INTRODUCTION

The first sources of *Varroa jacobsoni* mites in Lithuania were discovered in 1979, and despite taken drastic measures (the honeybee colonies were put to sleep or burned), varrosis spread wider (Balžekas & Krikščiūnas 1980). Only in 2000 it was found that *Apis mellifera* kept in Europe was assailed by another mite *Varroa destructor* which also came from Asia (Anderson & Trueman 2000). Though the female mites most intensively penetrate into larvae of honeybees on 5-6th day of their development, they are found on 3-4th day on the ground of the honeycomb cell too (http://beekeeping.newhost.ru). Female mites develop from the ovus to adult in 8-9 days, males – in 7 days. Noninseminate female mites and male mites live in covered hatches only. Into the drone hatches the male mites begin to die on the 21st day of drone development (Muravskaja

1979). The influence of mites to the honeybees depends on the level of infection (Balžekas & Krikščiūnas 1980). There are no visible changes while observing not covered hatches. Some holes are found in the covers of covered hatches, but it happens not always, and the hatches themselves sometimes are dead. Honeybees infected with the mites are less viable (Villa et al. 2008), not normaly developed, weight less (Boven-Valker & Gun 2001), their wings become shabby. The latter symptom of the wings is not typical in the case of mite invasion, because it is observable when honeybees are infected with viral diseases too (Martin 2001). Mites can be the spreaders of the infectious diseases of the honeybees (Nordstrom 2003, Zhang et al. 2007). Additionally, honeybees infected with mites are less resistant to other infectious diseases (Shen et al. 2005, Celle et al. 2008).

52 of the 112 most popular growing cultures are based on the pollination with the help of honeybees. Recently it is attempted to stop the massive mortality of these insects. In the latter years died more then 30% in USA and 20% in Europe honeybee colonies. One of the reasons of this disaster could be parasites *Varroa destructor*, which attach to the bodies of honeybees and sucks their hemolimph (http://www.grynas.lt). Africanized honeybees are less sensitive to varroa mites, and at the same time the honeybee colonies are also more resistant to them (Martin & Medina 2004). The effect of treatment is influenced not only by the preparations, but also by the time they are used and by the meteorological conditions (Bacandritsos et al. 2007). A number of chemical substances are suggested to fight honeybee varrosis, but the mites become resistant to the preparations used against them (Lipinski & Szubstarski 2007, Xie et al. 2008).

The aim of this study was to determine the efficiency of Apistan and Gabon PA92 for the prevention of varrosis in the time of autumn treatment of honeybee colonies and to evaluate the efficacy of Apistan to *Varroa destructor* mites depending on its localization in the honeybee colony.

MATERIAL AND METHODS

The study was carried out in the apiaries of northern Lithuania in the years 2009-2010. Twenty honeybee colonies with 9 combs squatted by honeybees were used. For the investigation of the efficiency of different preparations, Apistan and Gabon strips, by two in the separate honeybee colony, were putted at the diaphragms of the hive (n=5, respectively). For the evaluation the efficacy of Apistan to *Varroa destructor* dependently on its localization, in the separate honeybee colony two Apistan strips were putted at the diaphragms of the hive (n=5) or in the center of the hive (n=5). Into the honeybee colony Apistan and Gabon spread when honeybees touch the strips or each other. The hatched from the honeycomb cells honeybees and mites get preparation when touching each other. The preparations (strips) were kept for 28 days. The catchers of the mites were put under the combs. The bottoms of the catchers were lined with paper sheets smeared with Vaseline. The number of mites fallen from honeybees has been chosen to be a efficiency criterion of substances used against mites.

The residue level of *Apis mellifera* infection with mites was estimated after the treatment with different preparations in the same honeybee colonies. In order to estimate the level of honeybee infection with mites, the honeybees were taken from three places of the hive (from the middle comb and from both edge combs). The honeybees were shaken down in to a vessel with a gauze pad attoched to the cover and moistened in ether. Then the honeybees and the mites on them were counted up. The level of the mites infestation was expressed in percentage and is equal to the number of mites divided by number of investigated honeybees and multiplied by 100. On the purpose to estimate the level of the mite infestation, no less than 100 insects were take from every honeybee colony.

The investigation data were processed using statistical package Statistica for Windows version 6.0 (StatSoft, 2001) and following the basic guide to the statistical analysis of biological data by L.

A. Tucker (2003). The difference was considered significant when P<0.05.

RESULTS AND DISCUSSION

The critical limit of *Varroa destructor* per one honeybee colony is 5000 (Caroline et al. 2001). Therefore, the main purpose of the treatment of honeybee colonies is not to let the mite invasion to reach this limit.

When the Apistan strips were kept at the diaphragms of the hive, 593.6±11.6 mites fallen and the level of the honeybee infestation with the mites decreased from 10.9±0.9 % to 2.0±0.3 % (P<0.001). When the Apistan strips were kept in the center of the hive, 875.2±38.1 mites fall down and the level of the honeybee infestation with the mites decreased from 10.6±0.9 % to 1.3±0.2 % (P<0.001). The efficiency of Apistan in the first case was 81.7 %, in the second case - 87.7 %. (Table 1). Thus, it is purposeful to use preparations as the impregnated strips in the center of the hive, because the highest concentration of mites was found on the honeybees in the central part of the hive. It is advisable to place anti-mite preparations in this part of the hive, because this way the interaction among honeybees and their interaction with impregnated strips of preparations is closer (Pileckas 2010).

Using Gabon for the honeybee treatment the effect for *Varroa destructor* mites was similar (Table 2). The strips were put into hives on 5th September, and put out on 3rd October. The number of fallen mites received by one percent of infestation when using Apistan was 77.8±10.5 mites, the efficacy ot the preparation is 82.8% (when comparing the percent of infestation with mites before and after the treatment). By the data of literature, the 6-8 weeks exposition of Apistan in the honeybee colonies guarantees the efficacy of 98-100% (http://www.vetlek.ru). After using Gabon 72.7±5.2 mites falled to one percent of infestation. The efficacy of this preparation is 85.6% or 2.8% higher then Apistan's (the difference is not statistically reliable). The greater number of the fallen mites when using Gabon to the honeybee colonies was influenced by more intense honeybee infestation with *Varroa destructor* mites. Furthermore, after the treatment it was found average 3.2±0.9 fallen mites in the colonies. It can be presumpted that Gabon is more toxic to the honeybees than Apistan, though the components of compound parts of Gabon are found very rarely on the honeybees (Bogdanov

Table 1. The efficacy of Apistan towards *Varroa destructor* mites dependently on the localization of the strips in the honeybee colonies

Localization of Apistan	No. of honeybee colonies	Infestation before treatment, %	Fallen mites	Infestation after treatment, %	Efficiency of Apistan, %
At the diaphragm	5	10.9±0.9	593.6±11.6	2.0±0.3*	81.7
In the centre of hive	5	10.6±0.9	875.2±38.1	1.3±0.2*	87.7

*P<0.001

Table 2. The comparing evaluation of the efficiency of Apistan and Gabon towards *Varroa destructor* mites

Preparation	No. of honeybee colonies	Infestation before treatment, %	Fallen mites	Infestation after treatment, %	Efficiency, %
Apistan	5	9.3±0.3	717.0±53.3	1.6±0.2*	82.8
Gabon	5	12.6±0.6	900.6±29.2	1.9±0.1*	85.6

*P<0.001

1998). This relativelly small number of fallen mites can be explained by the resistance to the active material of the preparations that mites gain (Trouiller 1998). Besides, if the strips impregnated with Gabon, Apistan or another medicine are used after the honeybee feeding for winter, when the activity of honeybees is low, the active substances of these preparations do not penetrate honeybees colony and their efficiency to strive against *Varroa destructor* mites decreases http:// www.bitininkas.lt.

CONCLUSIONS

When the Apistan strips were kept at the diaphragms of the hive, efficiency of preparation was 81.7 %, when the Apistan lines were kept in the center of the hive - 87.7 %. Using Gabon for the honeybee treatment the effect for *Varroa destructor* mites was similar (only 2.8 % higher) to Apistan's. The difference between the efficiency of these preparations is not statistically significant.

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