

INVASION OF BEE SAMPLES WITH *VARROA DESTRUCTOR*

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ABSTRACT

The aim of this work was to estimate the level of infestation of bee samples infested with *Varroa destructor*. It has been performed a laboratory assay of bee samples for the presence of the mite *Varroa destructor*. The investigation was for a period of two years – 2015 and 2016. The bee samples were collected from diseased and dead bee colonies owned by 149 beekeepers. The result showed that from 220 bee samples tested, 36% were positive for *Varroa* mite and negative samples were 64%. The level of infestation in positive samples was as follows: less than 5% were in 39.2% of samples, between 5 to 20% and more than 20% were found in 30.4% for each level, respectively. In conclusion more than a third of the bee samples were infested with *Varroa* mites. Most of the bee samples had a low degree of invasion (< 5%) and the average and the high level of invasion of bee samples were represented by the same values.

Key words: *Apis mellifera*, bee sample, *Varroa destructor*, laboratory assay.

Introduction

Varroa destructor mite (Anderson & Trueman, 2000) is an ectoparasite that poses a serious threat to the honeybee *Apis mellifera* L. worldwide. It is associated with the bee colony losses, although its role in bee mortality remains invisible. In temperate climates, infected colonies usually die within one to three years if the mite is not controlled (Bowen-Walker & Gunn, 2001). The first reports of honey bee colony losses attributed to the *Varroa* mite were made in the Far East as early as 1960. Since then the mite has spread to most areas of the world where *Apis mellifera* is grown. Today, *Varroa destructor* can be found in almost every apiary in Europe and in all continents except Australia (AQIS, Australian Government: <http://www.daff.gov.au/aqis/quarantine/pests-diseases/honeybees>, Visited Jan 4, 2010). Mite *Varroa destructor* is registered in Bulgaria in 1971. According to Ordinance No 11/2015 varroasis has been notifiable bee disease for Bulgaria, which is subject to obligatory notification under Ordinance No 23/2005.

A connection has been demonstrated between the presence of some viruses and varroosis (Martin et al., 2012; Francis et al., 2013). Mite is a vector of several viruses, especially deformed wing virus (DWV) and acute bee paralysis virus (ABPV), which in most cases are without symptoms and can affect the health of bees. Honey bee colonies die as a result of the increased sensitivity to the viral infection, the inflammation of the wounds on the body of bees caused by parasitizing of the mite, and the loss of hemolymph (Bailey, 1981; Ball, 1985). Viruses significantly contribute to damage of bee colonies by *Varroa destructor*, becoming a key factor in mite parasitic syndrome (Genersch E., 2010; Salkova, 2016).

The aim of the present work is to perform laboratory analyses of bee samples from the country on the prevalence and degree of infestation of bee colonies with *Varroa destructor*, a causative agent of the varroosis.

Material and methods

The study was conducted in two consecutive years 2015 and 2016 on a project between IEM-PAM-BAS and NDRVMI – BFSA.

Sample collection

In the NRL "Bee Health" were received 220 samples of bees, owned by 149 beekeepers from 21 different regions of the country. Samples, each containing about 100 bees were derived from sick or dead bees from colonies perished during the winter season.

Methods of investigation

The methods were used of OIE Terrestrial Manual, 2008 – Chapter 2.2.7. for *Varroa destructor* identification.

The bees of each sample were removed from the freezer, defrost, placed in a container with industrial alcohol and stirred continuously for around 5–10 minutes. Then the bees were separated from the mites by a sieve with a mesh size of approximately 2–3 mm.

The percentage of infestation level was calculated by following formula:

$$\% V. destructor = (\text{Number of foretic mites} / \text{number of adult bees}) \times 100$$

Results

The results of the laboratory analyses are shown in Fig. 1. The data obtained show that of the 220 samples tested 36% are positive for *Varroa destructor* and the remaining 64% are negative.

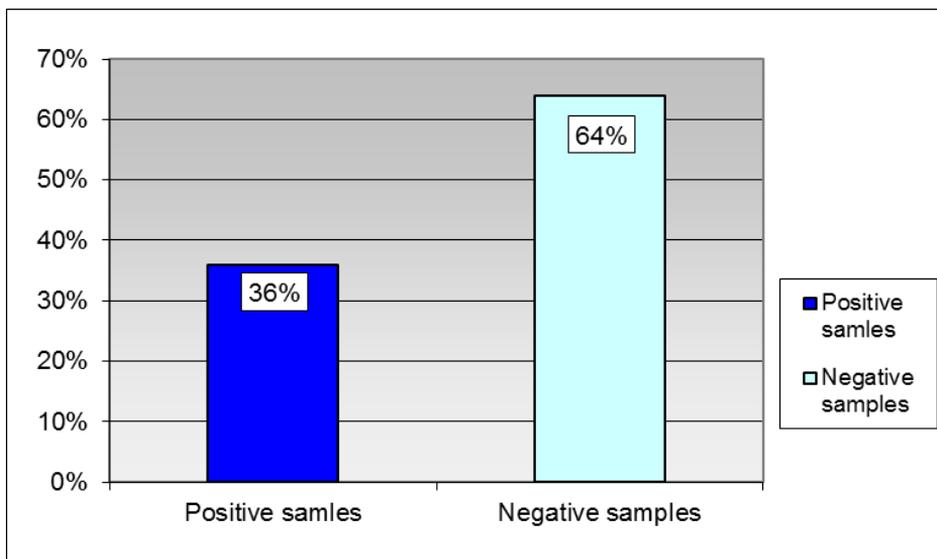


Figure 1: Results of investigated for *Varroa* bee samples during period of two years (2015–2016)

Figure 2 shows the data for the most number of received bee samples by regions.



Figure 2: Results for the highest percentage of varroosis positive bee samples by region (blue spot – low percentage of positive samples; red spot – high percentage of positive samples).

The most number of samples were obtained from the regions of Plevan, Sofia-city, Sofia-region, Pazardzhik, Rousse, Veliko Tarnovo, Blagoevgrad and Bourgas, with the highest percentage of positive for varroosis samples being established in Sofia-city, Sofia-region, Bourgas, Rousse, Blagoevgrad and Veliko Tarnovo.

The level of infestation in the positive samples (Fig. 3) is as follows: a level below 5% is found in 39.2% of samples, moderate (between 5–20%) and the highest level (over 20%) are established in 30.4% of bee samples, respectively.

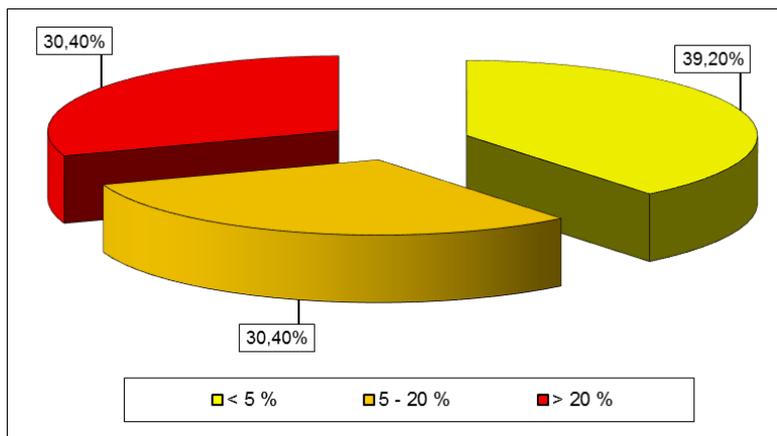


Figure 3: Infestation level of *Varroa destructor* in positive bee samples

Discussion

In our investigations it is found that 36% of the samples obtained are infested with *Varroa destructor* mite. This percentage indicates that approximately one-third of the bee samples tested are

affected by the mite. This is not a real indicator of the infestation of bee colonies, due to the fact that they originate mostly from bees that died during the winter. We believe, however, that *Varroa destructor* by direct damage to bees and aggravation of other infectious diseases has a significant part in the winter losses of bee colonies, as confirmed by other researchers (Boecking and Genersch, 2008, Genersch et al., 2010). Bee mortality, which does not detect the presence of mite, may be due to technological reasons and the action of other pathogens such as *Nosema* spp. and viruses. We have not taken them into consideration as they are not the purpose of our research.

The large number of samples obtained from a given area is not always in direct correlation with a high percentage of positive for varroosis samples from the same area. In the survey of 65 samples of bees from Pleven region it is found that 76% of them are negative for *Varroa destructor*, while for the Sofia-city and Sofia-region the negative samples are less – 34% and 43%, respectively. The data are not representative for the whole country due to the different number of samples obtained from the various areas.

A higher percentage of positive bee samples have a low level of infestation (<5%) and mean and the highest invasion levels are represented with the same values. This shows that the infestation of the bee colonies in the different levels is a similar and they occupy about a third of the positive samples. Although most bee samples have a low and medium degree of invasion, the *Varroa destructor* is a problem for bee colonies in our country due to its complexity as immunosuppressor and vector of infectious diseases. This is confirmed by many researchers (Tentcheva et al., 2004; Shen et al., 2005; Cordoni et al., 2007; Martin et al., 2012).

As a result of our research, we believe that in order to reduce the mortality of bee colonies, integrated pest management and control of *Varroa destructor* (Guide to Effective Varroa Sampling & Control, First Edition, 2015) are required which include the following measures:

- ✓ Regular monitoring and control of *Varroa destructor* mite.
- ✓ Treatment of bee colonies should be carried out when the mite populations are low (i.e. before mites reach bee-damaging levels).
- ✓ Treatment of bee colonies should be done simultaneously for the whole area.
- ✓ Use authorized veterinary medicinal products (VMPs) against varroosis. It is necessary to rotate the VMP in order to minimize the possibility of resistance.
- ✓ Beekeepers have to register their apiaries in accordance to Ordinance 10/2015.

Conclusions:

1. *Varroa destructor* is estimated in 36% of the bee samples tested.
2. The highest percentage of positive for varroosis samples are found in Sofia-city, Sofia-region, Burgas, Ruse, Blagoevgrad and Veliko Tarnovo.
3. Low-infestation level (<5%) is found in 39.2% of positive samples, mean (between 5 and 20%) and high (over 20%) invasion rates are demonstrated in the same percentage of samples, respectively 30.4%.

Acknowledgements

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