

Ultrasonic combating of Varroa Destructor and Acarine mites

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INTRODUCTION

Several years of research to date have clearly shown that bee colonies can be protected against of the Varroa Destructor by the acoustic field of the sonic emitter [1]. The aim of the presented study was to determine the number of adult Varroa Destructor as well as a mite offspring in the sonic drop.

METHODOLOGY

The power density of the emitter's acoustic waves does not exceed 1 milliwatt per square centimetre and frequency covers the range of 22 – 24 kHz, powered by 12-14 V, direct current [1]. The emitter is located under the bee hive and ensures full safety for biological animal cells. Bees are safe at every stage of their development, and the subtle ultrasonic massage is manifested by their increased activity. The acoustic waves of the emitter cause vibrations in the mechanosensory organs of the parasite like gnathosoma and seta (Fig. 1). The vibrations significantly disrupt communication between parasites during their development cycle, through the disfunction of mechanosensory organs.

RESULTS

The sonic fall of Varroa destructor mites includes foundress females, young daughters, three times smaller adult males and larval forms (Fig. 2,3,4). For example, on August 6th, the daily fall contained 111 mites, among them: 59 female founders, 43 daughters, 9 larval forms and 7 alive (Fig.3).

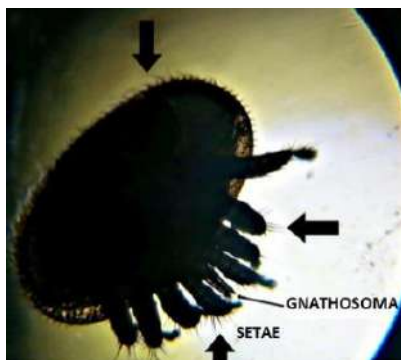


Fig. 1. Mechanosensory organs of Varroa mite

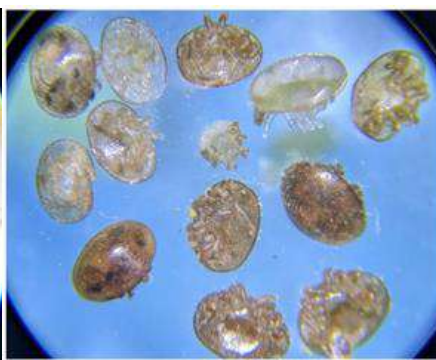


Fig. 2. Ultrasonic fall of parasites: young Varroa daughters

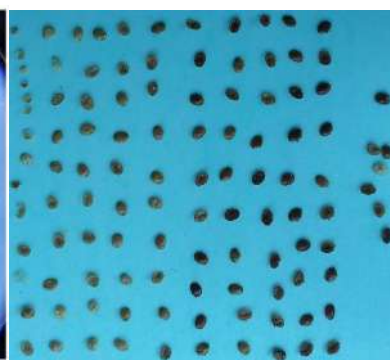


Fig. 3. Ultrasonic mites fall during 24 h; 111 pieces

An important feature of the sonic mites fall is the presence of young, light brown daughters - about 40%. In the period from October 1 to November 30, a total fall of 1572, usually dead or exhausted Varroa parasites, was recorded in one of the research bee colonies. On November 6, the daily fall contained 31 female founders, 22 daughter daughters, and 7 larval forms, a total of 60 Varroa mites. Additionally bees were stimulated to VSH and grooming behaviour (Fig. 5). In one of the surveyed bee colonies, the largest sonic fall of Acarine mites occurred so far - approximately 430 pieces per day (fig 6). The Acarine mite is unidentified till now, however the first report comes from 2011 (Giles San Martin) [2]. The fall of the Acarine mites, visible only under a microscope, subsided at the end of November.



Fig. 4. Adult males and larval stage of female - deutonymph



Fig. 5. Bees grooming behaviour - cut off part of ventral plate of Varroa female

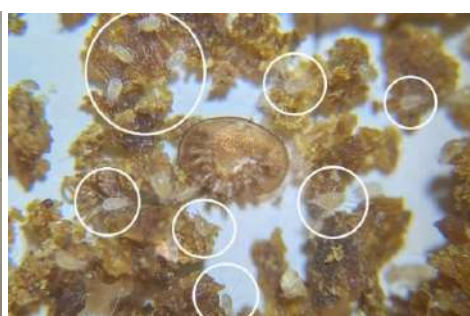


Fig. 6. Fall of the Acarine mites; in the middle - Varroa female

CONCLUSION

The ultrasonic emitter provides very easy and ecologic monitoring of Varroa mites as well as significant elimination of parasites in the bee colony – no less than 80%. In the case of autumn reinfestation it is advisable to apply an integrated support with one-time application of light chemistry, e.g. thymol. Ultrasonic vibrations accelerate diffusion of the chemical particles inside the hive and yield an integrated, multiplied effect in Varroa fall. Bee families are completely protected and safe.

References

- [1] O. Myczkowska, T. Surowiec, Patent PL240934, 2020;
- [2] Gilles San Martin, Bee nest mites, Uploaded by Jacopo Werther, 2011.

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Ultrasonic combating of Varroa Destructor and Acarapis Woodi mites

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Several years of research to date have clearly shown that bee colonies can be protected against of the Varroa destructor and Acarapis woodi mites by. the acoustic field of a sonic emitter. The power density of the emitter's acoustic waves does not exceed 1 milliwatt per square centimeter, which ensures full safety for biological animal cells. Bees are safe at every stage of their development, and the subtle ultrasonic massage, frequency of 22 – 24 kHz, is manifested by their increased activity. The aim of the presented study was to determine the number of Varroa destructor daughter offspring in the sonic drop with simultaneous determination of the condition of young Varroa mite offspring. During the implementation of this study, an intensive fall of Acarapis Woodi was observed in a few of the studied bee colonies. An important feature of the sonic fall of Varroa mites is the presence - about 30% - of young, light yellow daughters. In the period from October 1 to November 30, a total fall of 1572, usually dead or exhausted Varroa parasites, was recorded in one of the research colonies. The fall included foundress females, young daughters, and larval forms as well as males. For example, on November 6, the daily fall contained 31 female founders, 22 daughter daughters, and 7 larval forms, a total of 60 Varroa mites. Additionally bees were stimulated to grooming and VSH behaviour. In one of the surveyed bee colonies, the largest sonic fall of Acarapis woodi occurred so far - approximately 430 pieces per day. The bee mite causes a bee disease called acarapidosis. The mites parasitize in the first pair of spiracles of young bees. Acarapis woodi is an internal parasite that attacks honey bee colonies. It can lead to the collapse of a bee family. The bee mite is visible only under a microscope. The fall of the Acarapis Woodi mites subsided at the end of November. Our investigation show sufficient ultrasonic protection against both Varroa Destructor as well as Acarapis Woodi parasites.