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Research Article

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Ultrasonic Combating of Varroa Destructor and Acarine Mites in Bee Families Apis Mellifera

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ABSTRACT

The aim of the presented study was to determine the number of adult Varroa Destructor females as well as a mite offspring in the parasite drop caused by the sonic emitter. 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. The emitter is located under the bee hive and ensures full safety for bees at every stage of their development and the subtle ultrasonic massage is manifested by an increased activity of adult bees. An important feature of the sonic might fall is the presence of young, light brown daughters - about 40%. Additionally, bees were stimulated to VSH and grooming behaviour. In one of the surveyed bee colonies, the largest sonic fall of Acarine mites occurred so far - approximately 430 pieces per day. The Acarine mite is unidentified till now. The fall of the Acarine mites, visible only under a microscope, subsided at the end of November.

Keywords: Ultrasonic Varroa Destructor Fall, Bee Colony Ultrasonic Protection, Acarine Mite Drop

Introduction

The dynamic development of varroa and its pathogenic effect have a definitely negative impact on the bee family. When attacked by Varroa females and their brood, the brood develops poorly or dies. The beekeeper must constantly limit the number of parasites in families. However, the annual and excessive use of chemicals causes negative consequences.

In 2004, Karl Ruemmelin [1] initiated research on the use of a physical method using ultrasound to combat varroosis in bee families. The range of frequencies used coincided with the range of frequencies audible by humans, which was a nuisance for the beekeeper and bystanders. Sound emitters used, were produced by trial-and-error way, apparently with a power exceeding the safe level for the bees themselves [2]. A team of Irish researchers confirmed that acoustic waves are not harmful to bees over a wide frequency range [3]. No changes in bee behaviour were observed when the ultrasound volume range was 90 to 110 dB at frequencies ranging from 14 kHz to 80 kHz. During the 30-minute effect of ultrasound on bees, 32 pieces of varroa fell. The counting of fallen Varroa parasites should take into account the young generation of mites, both females and males, which are yellow or white and much smaller.

Methodology

Several years of our research to date have clearly shown that bee colonies can be protected against of the Varroa Destructor by the acoustic field of our sonic emitter [4]. The aim of the presented study was to determine the number of adult Varroa Destructor as well as a mite offspring in the sonic mite drop. The power density of the emitter's acoustic waves does not exceed 1

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milliwatt per square centimetre and frequency covers the range of 22 – 24 kHz, powered by 12-14 V, direct current [4]. The emitter is located under the bee hive and it works over the year. Emitted sonic energy 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 vibrations significantly disrupt communication between parasites during their development cycle, through the disfunction of mechanosensory organs. Both the female founders and the young generation of Varroa encounter difficulties in extracting food from their host.

Results

The sonic fall of Varroa destructor mites includes foundress females (Fig. 1), young daughters Fig. 2), three times smaller adult males and larval forms (Fig. 3). 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.4). 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 actions resulting in removing mites from the nests (Fig. 4a). Note an imprint of the bee's mandabiles on the dorsal plate The grooming behaviour were also observed (Fig. 4b), were damage of mites is visible. In one of the surveyed bee colonies, the largest sonic fall of Acarine mites occurred so far - approximately 430 pieces per day (Fig. 5). The Acarine mite is unidentified till now, however the first report comes from 2011 (Giles San Martin) [5]. The fall of the Acarine mites, visible only under a microscope, subsided at the end of November.

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 severe autumn reinfestation [6], 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. The fall of the Acarine mites is rare fenomenon.

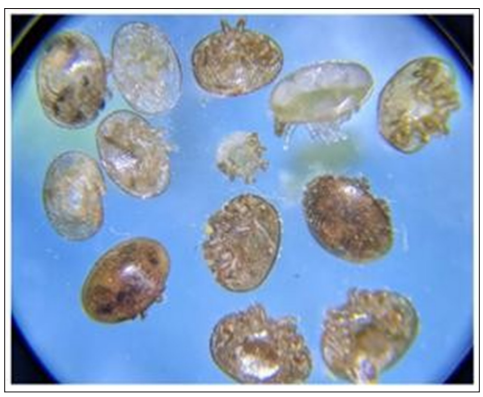

Figure 1: Ultrasonic fall of parasites: young Varroa daughters and male in the center

Figure 2: Adult males (left) and larval stage of female deutonymph

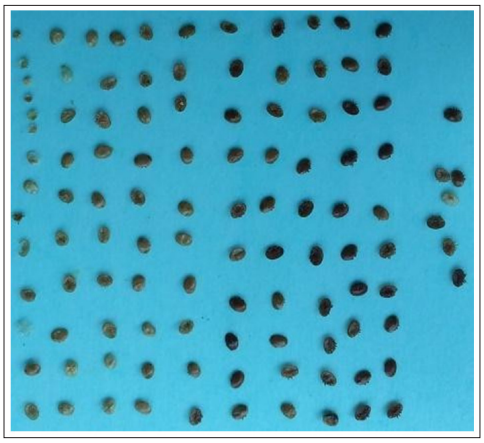

Figure 3: Ultrasonic Varroa mites fall during 24 h; 111 pieces

Figure 4(a): Bees VSH and grooming Behaviour

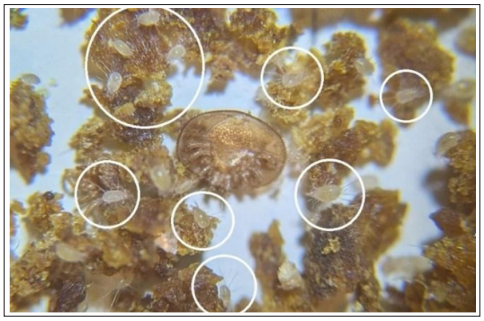

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Figure 5: Fall of the Acarine mites; in the middle - Varroa female

References

1. Patent DE10161677B4
2. Berg S Wirkt der Varroa-Killer-Sound® doch? Bienen & Natur, 2/ 2018. https://www.bienenundnatur.de/bienenkrankheiten/varroabehandlung/wirkt-der-varroa-killer-soundr-doch-649.
3. Barry BC, Verstraten L, Butler FT, Whelan PM, Wright WM. The use of airborne ultrasound for Varroa destructor mite control in beehives. In2018 IEEE International Ultrasonics Symposium (IUS). IEEE. 2018. 1-9.
4. Myczkowska O, Surowiec T. Patent PL240934. 2020.
5. Gilles SM. Bee nest mites, Uploaded by Jacopo Werther. 2011.
6. Frey E, Rosenkranz P. Autumn invasion rates of Varroa destructor (Mesostigmata: Varroidae) into honey bee (Hymenoptera: Apidae) colonies and the resulting increase in mite populations. Journal of economic entomology. 2014. 107: 508-515.