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Impact of essential oil from *Satureja kitaibelii* Wierzb. ex Heuff. harvested from mountain area on *Myzus persicae* Sulzer in tobacco and *Apis mellifera* L.

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Abstract

Essential oil (EO) vapours from *Satureja kitaibelii* Wierzb. ex Heuff. were tested in laboratory conditions against *Myzus persicae* Sulzer in tobacco and *Apis melifera* L. Efficacy of 100 % against *M. persicae* at 3 $\mu L \cdot L^{-1}$ air was established. Low efficacy of 17.6 % was found at 0.5 $\mu L \cdot L^{-1}$ air, increasing to 71.3 % at concentration of 1 $\mu L \cdot L^{-1}$ air, and reaching 95.3 % at 2 $\mu L \cdot L^{-1}$ air. The concentration of 3 $\mu L \cdot L^{-1}$ air applied under the same conditions to worker bees of *A. mellifera* rendered toxicity of almost one hundred per cent – 99.5 %, correspondingly. In the control group of bees, no mortality was established. The lifespan of bees depends on multiple factors and further studies are needed, also in field conditions.

Key words: green peach aphid, honey bees, mountain savory.

Introduction

The application of biopesticides in agriculture is a relevant issue today. *Myzus persicae* Sulzer is an important crop pest which reproduces fast and forms large colonies; it's widely distributed and causes significant economic damages (Bass et al. 2014). The aphid is known to develop resistance to insecticides (Contreras et al. 2013). The use of pesticides creates environmental risk of pollution and has unfavourable effects on non-target organisms (Tilman et al. 2011). Essential oils (EO) are an alternative, but more studies are needed for their further application (Radev 2022). EO could be obtained from various plants and such a plant is *Satureja kitaibelii* Wierzb. Ex Heuff. *Satureja* is also called mountain savory (Lawless 2002), naturally distributed in mountain areas (Centeno 2003). *Satureja* sp. EO has fungicidal (Soares et al. 2016), insecticidal (Tepe 2015) and nematicidal (Faria et al. 2015) activity.

The aim of this research is to study the potential insecticidal effect of *S. kitaibelii* EO, on *M. persicae*, and *A. mellifera* L. as a non-target organism.

Materials and Methods

The plant material of *S. kitaibelii* for obtaining EO was collected in flowering stage from a mountain area of the Eastern Rhodopes in July 2021. The collected sample of 1.5 kg was distilled for 3 h in a micro EO distillery with volume of 8 L. EO was stored in glass container.

The insecticidal efficacy of EO vapours of *S. kitaibelii* against *M. persicae* in tobacco was tested in laboratory conditions using a method similar to Digilio et al. (2008). Potted tobacco plants were infested with aphids. After 5 days the plants with counted aphids were placed in airtight cylinders with volume 10 L. Concentrations of 0.5, 1, 2 and 3 $\mu L \cdot L^{-1}$ air and one control without EO were tested with three repetitions for each variant. EO was placed onto filter paper on the cylinder floor. The mortality rate was taken after 24 h. The aphids which did not react to push were counted dead. EO efficacy was according to Abbott (1925).

The concentration with the highest efficacy was tested on 3 days old *A. mellifera* bees. In each repetition and control group 20 bees were placed for 24 h under the same conditions. The bees were newly emerged, separated in a cage and fed on 50 % sugar syrup.

The results were statistically processed by using one-way Anova in Excel.

Results and Discussion

According to the laboratory tests EO from *S. kitaibelii* exhibits insecticidal activity against *M. persicae*. When the concentration is increased aphid mortality also increases. According to Abbott (1925) the curve shows 100 % mortality at dose of 3 $\mu L \cdot L^{-1}$ air. Low efficacy of 17.7 % was reported at 0.5 $\mu L \cdot L^{-1}$ air, increasing to 71.3 % at 1 $\mu L \cdot L^{-1}$ air dose, and at 2 $\mu L \cdot L^{-1}$ air reaching efficacy of 95.3 % ($F > F_{crit}$, $p = 0.000$, $p \leq 0.05$) (Fig. 1).

The concentration of 3 $\mu L \cdot L^{-1}$ air exhib-

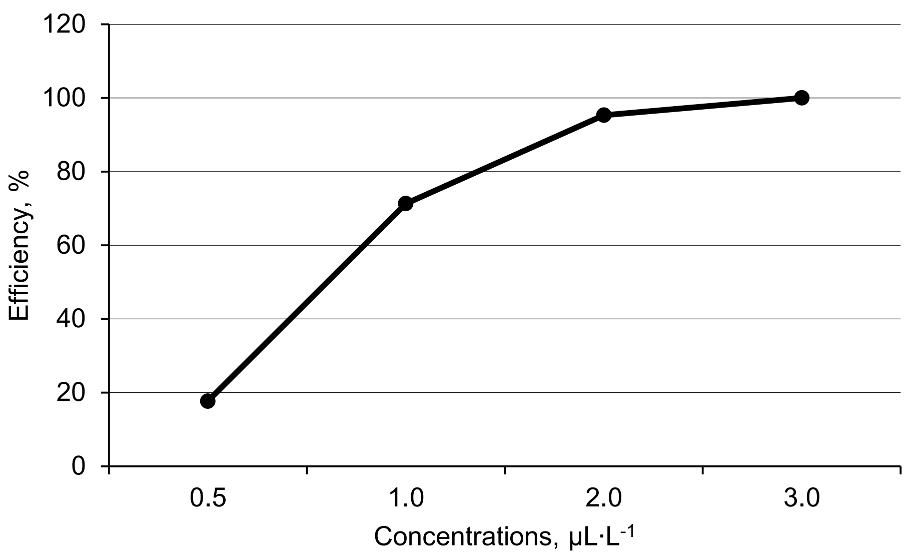

Fig. 1. Insecticidal efficacy of *S. kitaibelii* EO against *M. persicaea* in different doses.

iting the highest efficacy was tested for toxicity to *A. mellifera* in order to establish its effect on bees. The results show toxicity of EO vapours of *S. kitaibelii* to bees as well (means ±SD 99.5 ±0.87), while no mortality was reported for the control group of bees ($F > F_{crit}$, $p = 0.000$, $p \leq 0.05$). According to Regnault-Roger (1997), the way in which EOs are applied matters. The lifespan of bees depends on multiple factors and further studies are needed.

Conclusions

It has been established that EO vapours of *S. kitaibelii* exhibit insecticidal effect *against M. persicae* in tobacco and *A. mellifera*. The results can find practical application in the production of tobacco seedlings, and in bees for pest control. Field studies are required.

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