



Department of Entomology
Faculty of Science
Ain Shams University

**Effectiveness of some plant essential oil
formulations on the two-spotted spider mite
Tetranychus urticae Koch (Acari: Tetranychidae)
and its predacious mites of the family Phytoseiidae**

A thesis
Presented to the Department of Entomology, Faculty of Science,
Ain Shams University, For the
Award of the Ph.D.
Degree of Science
(Entomology)

BY

Shimaa Fahim Mohamed Fahim

B.Sc. Faculty of Science, 2005
M. Sc. Faculty of Science, 2011

Department of Entomology

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ABSTRACT

The present study aims to assess the effectiveness of five essential oils and their prepared formulations against the two-spotted spider mite, *Tetranychus urticae* Koch and its associated predatory mites of the family Phytoseiidae. The relative percentages of the main components of the tested essential oils (*Artemisia maritima* L., *Melissa officinalis* L., *Mentha longifolia* (L.) Huds., *Thymus vulgaris* L. and *Zingiber officinale* Roscoe oils) were identified by GC/MS.

The studied essential oils were tested for their acaricidal activity against the serious agricultural pest, *T. urticae*, using different application methods. All the tested essential oils proved that they have acaricidal, repellent and oviposition deterrence activity against *T. urticae* with variable degrees. In most cases, the direct spray application was the most effective application against eggs, nymphs and females of *T. urticae* while the systemic application was the least one against the nymphs and females. However, the fumigant application was the most effective application on *T. urticae* in case of *M. longifolia* oil.

The obtained data showed that the LC₅₀ values of *M. officinalis*, *T. vulgaris*, *Z. officinale*, *A. maritima* and *M. longifolia* oils on *T. urticae* females were 0.36, 0.40, 0.60, 0.77 and 1.43%, respectively using the direct spray application. In addition, the acaricidal activity of the prepared oil formulations (the prepared formulations labeled: Misicide, Melissacide, Mento, Thymo and Gingcide) were tested against *T. urticae* stages. Melissacide and Thymo were the most potent formulations against *T. urticae* nymphs and females while Mento being the least one.

The efficiency of the studied essential oils and their formulations on eggs and females of the tested predatory phytoseiid mites (*Neoseiulus barkeri* (Hughes), *Neoseiulus californicus* (McGregor) and *Typhlodromips swirskii* (Athias-Henriot)) were evaluated in the

present study. Based on the LC_{50} values, Thymo and Mento (LC_{50} = 0.44 and 0.72%) showed the least adulticidal activity against *N. barkeri* and *N. californicus*, while Melissacide and Misicide (LC_{50} = 0.016 and 0.174 %) showed the highest one, respectively. In addition, Mento (LC_{50} = 0.34%) was the least effective tested formulation against *T. swirskii* females, while Melissacide (LC_{50} = 0.002 %) was the most effective one.

The obtained data showed that females of *N. barkeri* and *T. swirskii* showed a significant reduction in food consumption and fecundity when sprayed with two sublethal concentrations (LC_{25} recorded on each predator and LC_{25} recorded on *T. urticae*) of the most tested formulations. On the other hand, spraying *N. californicus* females with the two sublethal concentrations of Misicide resulted in a significant reduction in both food consumption and fecundity. However, in most cases, spraying *N. californicus* females with the two sublethal concentrations of Melissacide, Mento, Thymo and Gingcide did not show any significant reduction in food consumption but resulted in a significant reduction in egg deposition. Evaluation of the persistence and phytotoxicity of the tested formulations was also included in the present study.

Key words: *Tetranychus urticae*, Tetranychidae, *Neoseiulus barkeri*, *Neoseiulus californicus*, *Typhlodromips swirskii*, Phytoseiidae, *Artemisia maritima*, *Melissa officinalis*, *Mentha longifolia*, *Thymus vulgaris*, *Zingiber officinale*, essential oils, oil formulations, acaricidal activity.

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