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Acaricidal activity of essential oils for control of the honeybee mite *Tropilaelaps mercedesae* under laboratory and colony conditions

Veeranan Chaimanee^{1*} Natapot Warrit² and Jeffery S. Pettis^{3,4}

¹Department of Agro-Industrial Biotechnology, Maejo University Phrae Campus, Rong Kwang, Phrae, Thailand

²Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand

³Current address: Pettis and Assoc. LLC, Salisbury MD 21801

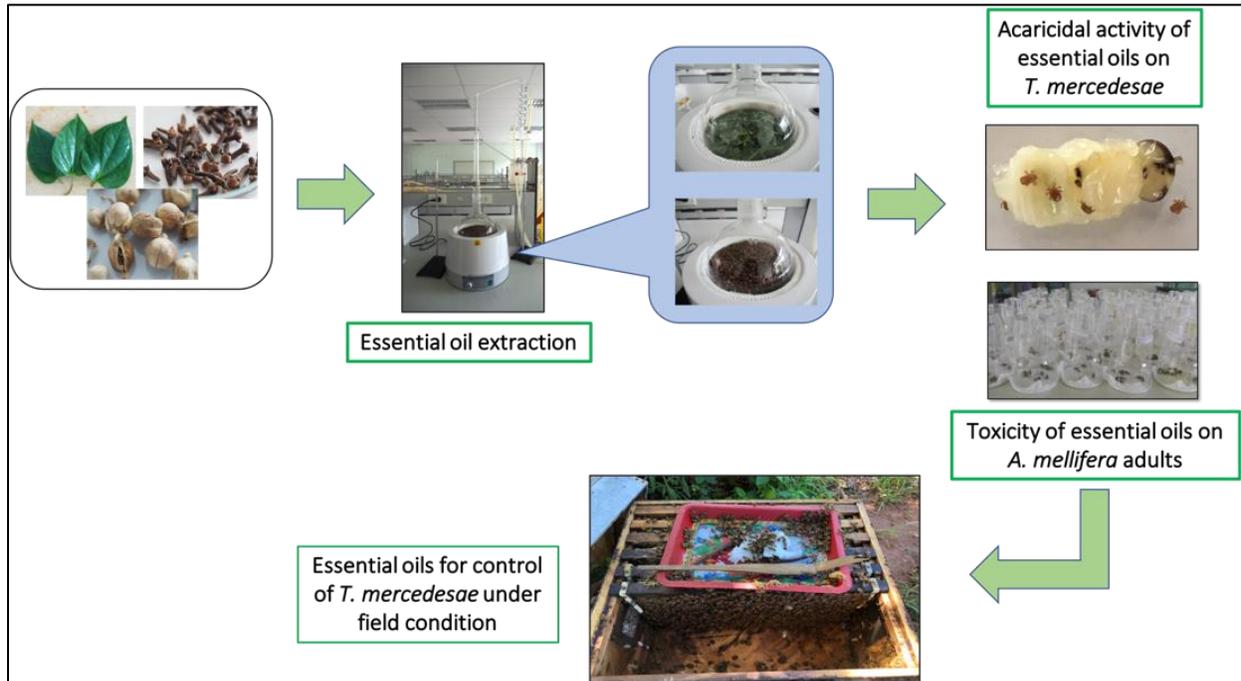
⁴USDA-ARS Bee Research Laboratory, Beltsville, MD USA

*E-mail: chveeranan@gmail.com

Abstract:

Tropilaelaps spp. mites are considered to be a major parasite of honeybees in many Asian countries. Several mite control products used to control *Varroa* mites are not always effective against *Tropilaelaps* and chemical residues can be found in the honeybee products and the colony. In this study, the essential oils (EO) of eleven plant species were evaluated for the acaricidal activity under laboratory and field conditions. The essential oil of *Piper betle* showed the highest acaricidal activity against *T. mercedesae* mites by killing all mites after only 4 h of exposure. The LC₅₀ values for other EOs tested at 4 h ranged between 0.002-0.74 (%v/v). Moreover, the EOs were of low toxicity on adult honeybees with 7.77-23.07 % (v/v) of LC₅₀ at 4 h. Essential oils of *P. betle*, *Amomum krervanh* and *Zanthoxylum limonella* were tested in the honeybee colony. Cardboard strips soaked with *A. krervanh* at a concentration of 1% (v/v) significantly decreased mite populations after 60 days (Steel-Dwass test, $p=0.0270$). We further tested different application methods to deliver the EO of *A. krervanh* by using grease and a sponge as the media to distribute the EO under field conditions. Mite populations decreased on day 60 but there was no significant difference between the treatment groups. Although, EOs demonstrated acaricidal activity against *Tropilaelaps* under laboratory conditions, under colony conditions, the EOs tested did not affect mite populations. Therefore, the concentration and the delivery methods into honey bee colonies of these promising EOs should be further investigated.

Graphical abstract



The research scope of the MRG 6280090 project