Breakthroughs in Honey Bee Health: Continuous-Release Mist Diffusion of Thymol-Based Essential Oils in Varroa Control, Part II: The Field Study

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Honey bee (Apis mellifera) pollination is responsible for approximately 80% of all cultivated crops. Unfortunately, reports suggest losses of 30-50% of all honey bee colonies in the US. The greatest contributor to the decline of honey bee health is the Varroa mite. Synthetic chemicals are used to control Varroa, but the mites are developing resistance. Essential oils (EOs) may be a viable alternative. EOs are cheaper, environmentally-friendly, pose fewer health risks to bees and consumers, and most importantly Varroa have not developed resistance to EOs. However, temperature and humidity affect the rate of evaporation and therefore the mites' exposure to EOs. Currently, all commercially available thymol-centered systems are gel-based and work only by direct contact with the mite. Following a laboratory investigation (Part I), this field study (Part II) examined the use of thymol-based EOs, dispersed via battery-operated mist diffusers, to provide miticide efficacy within beehives. Across all tested EOs, the highest miticide activity occurred in the first two weeks of treatment. Miticide efficacy was recorded as follows: thyme>oregano>rosemary>control (vegetable glycerin). The early elimination of mites is critical as it results in longer bee lifespan and higher colony survival after winter. Honey bee safety was found to be comparable to the control. Mist diffusers were also more cost-effective than commercially available thymol gel-based systems (US$3.20 versus US$15-$18 per application). Continuous-release mist diffusion of thymol-based essential oils may effectively, safely, and cost-effectively be incorporated as part of a natural miticide control plan to enhance the chances of honey bee colony survival.

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