Abstract of thesis No. 11653, Faculty of Veterinary Medicine, Urmia University, The Academic year 2025-2026

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Title of thesis: Study on effects of plants extracts of *Thymus* and *Lavandula* on *Varroa destractor* and *Nosema ceranae* in apiaries of East Azarbaijan

Abstract

Varroa destructor is one of the most important pests of European honey bees (*Apis mellifera*) in Iran and worldwide, causing serious damage to the beekeeping industry. Nosema serrana in the European honey bee, which is its main host, is the cause of mortality and reduction in the population of honey bee colonies. The use of chemical pesticides leads to increased treatment costs, resistance to pesticides, and contamination of hive products. Nowadays, considering the easy access to extracts and their low risk to the environment and human health, the use of medicinal plants is a suitable alternative to chemical pesticides to combat *Varroa* mites and *Nosema* in honey bees. The aim of this study was to evaluate the effects of two hydroalcoholic extracts of thyme (*Thymus vulgaris*) and lavender (*Lavandula angustifolia*) on *V. destructor* mites and *N. ceranae* on honey bees under hive conditions. In the *V. destructor* mite treatment group, 2%, 5%, and 10% of the aqueous alcoholic extracts of thyme and lavender were sprayed in the presence of Apistan and the control group with three replications. Dead mites were collected and counted on the floor of each hive at 12, 24, 36, 48, and 72 hours. In the *N. ceranae* treatment group, 1% and 2% of the two extracts were sprayed in the presence of Fumagillin and the control group with three replications. At 0, 24, 48 and 72 hours, 20 honeybees were collected from the study hives and the reduction in the number of *N. ceranae* spores was determined. During the treatment period, the highest mortality of *V. destructor* mites in the thyme and lavender treatment groups with a concentration of 5% at 48 hours was 87% and 76%, respectively. During the treatment period, the highest mortality of *V. destructor* mites was in the thyme and lavender treatment groups with 2% concentration at 48 hours, 81% and 76%, respectively, and 10% concentration at 36 hours, 97% and 89%, respectively. The difference in the effect of plant extracts on the mortality of *V. destructor* mites was significant compared to the Apistan and control groups. The difference in the reduction of *N. ceranae* spores at 36 hours in the fumagillin group was significant with the treatments of thyme and lavender hydroalcoholic extracts. The results showed that the effect of thyme hydroalcoholic extract on the reduction of *N. ceranae* spores was greater than that of lavender extract. In this study, the plant extracts used did not have a toxic effect on honeybees in the hive. The effectiveness of the tested thyme and lavender hydroalcoholic extracts on honeybee infestation with *V. destructor* and *N. ceranae* mites was significant. Control and treatment of *V. destructor* and *N. ceranae* in honey bee hives with thyme and lavender hydroalcoholic extracts as alternative compounds require additional studies.

Keywords: Honey bee, Thyme, Lavender, *Varroa destructor*, *Nosema ceranae*, East Azerbaijan, Iran