



University of Zabol
Graduate school
Faculty of Agriculture
Department of Plant Protection

**The Thesis Submitted for PhD Degree
(In the field of Agricultural Entomology)**

**Evaluation of plant-based nano formulation for
treatment of varroosis in the European honey bee
(*Apis mellifera* L.)**

Supervisors:

Dr. A. Khani
Dr. V. Ghasemi

Advisors:

Dr. M. Ghadamyari
Dr. N. Sahebzadeh

By:

Babak Rashid

February 2020

Abstract

Research and development of safe medicaments to control varroa mite *Varroa destructor* Anderson and Trueman is an effective step in modern beekeeping industry of the world. In the present research, field experiments were conducted to evaluate the efficacy of a new plant-based nanoformulation for the control of varroa mite in the honey bee colonies during the summer and autumn of 2018 in Shirvan, North Khorasan, Iran. To do so, varroa-infected colonies were treated with five treatment groups including 60 ml 10% nanoformulation, 80 ml 10% nanoformulation, 100 ml 10% nanoformulation, 80 ml 65% formic acid (positive control), and 100 ml tap water (negative control) for four weeks. In the summer experiment, the side effects of the treatments were evaluated on brood and adult bees' population growth rate, queen health, the amount of collected nectar and pollen as well as biochemical indices of the honey bees. Results indicated that the varroacidal efficacy of the nanoformulation in the summer was significantly higher than that in the autumn. The average varroacidal efficacy of 100 ml 10% nanoformulation was 59.32% in the summer and 41.27% in the autumn. The test nanoformulation had no significant adverse effects on eggs, larvae, adults, queen bees as well as nectar and pollen collection rate. Based on the results of biochemical tests, the carbohydrate, glycogen, lipid, and total protein content and also the specific activity of acetylcholinesterase, glutathione S-transferase, α -esterase, and β -esterase were significantly reduced in the treated bees compared with the control.

Key words: *Varroa destructor*, plant-based nanoformulation, acaricidal efficacy, side effects, biochemical indices