



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

The Thesis Submitted for the Degree of M.Sc
(in the field of Plant Entomology)

Title:

The mortality and repellency effect of nanoformulation of *Mentha longifolia* (Lamiaceae) and *Salvia mirzayanii* (Lamiaceae) essential oils on Date Lesser Moth *Batrachedra amydraula* Meyr (Lepidoptera: Batrachedridae)

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Abstract:

The essence of medicinal plants of *Mentha longifolia* and *Salvia mirzayanii* have insecticidal, repellent, antimicrobial and therapeutic properties. In this research, the lethality and repellent effect of the nanoformulation of the essential oil of *Mentha longifolia* and *Salvia mirzayanii* on the date fruitworm *Batrachedra amydraula* Meyr was investigated in laboratory conditions with temperature conditions of 27 ± 1 and relative humidity of 60 ± 5 . For this, first, the essential oils of the plants were separated by a Cloninger machine. To prepare the nanoformulation, a solution of zein and acetic acid was prepared, and after that, microcapsules were produced by the electrospray method. To analyze the data, SPSS software was used, and the mean comparison test was performed at the 5% error level by Tukey's method. The results showed that oregano essential oil is more toxic to the date fruitworm than *Mentha longifolia*, and the death rate of the insect also increases with the increase in concentration and test time. For *Mentha longifolia* essential oil in the lowest concentration of normal and encapsulated essential oil (272.7 and 90.9 microliters per liter of air) on the larva, respectively, the amount of 23.33 and 26.66 and on the whole insect in the concentration of 66.7 and 55.6 The order of 23.20 and 33.33 percent lethality and at the highest concentration (500.1 and 909.1 microliters per liter of air) 90.66 and 96.00 for larvae and at a concentration of 333.3 microliters per liter of air for the whole insect respectively 63.33 and 70.33 lethality after 24 hours percentage was obtained. While for *Salvia mirzayanii*, these values for larvae in low concentration (166.7 microliters per liter of air) were 13.33 and 42% and for the complete insect in a concentration of 166.7 microliters per liter of air, the amount was 66. It is 36.66 and 26% and in the highest concentration 888.9 and 80.60% for larvae and 80.76% for full insect in 888.9 concentration. In the investigations conducted on the repellency of *Salvia mirzayanii* plant and *Mentha longifolia*, both plants had the repellency properties of 41.66 and 29.33 on date fruitworm. *Salvia mirzayanii* contains pulegone, alpha-terpineol, piperitone, 1,8 cineole, and cis piperitone epoxide, which are 20.4, 17.7, 12.1, 9.6, and 7.4 percent, respectively, while for the essential oil of *Mentha longifolia* plant, δ -cadinene, linalool, and 1, 8-Cineole, α -Terpineol and γ -Cadinene, which were 16.8, 13.8, 8.5, 5.8 and 5.7% of the main chemical compounds, respectively.

Keywords: *Batrachedra amydraula*, plant essential oils, Encapsulation, *Salvia mirzayanii*