



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:

Lethality and repellency of *Capparis spinosa* L., *Calotropis procera* and *Cannabis sativa* extracts on the greater wax moth (*Galleria mellonella* linnaeus)

Supervisor:

Dr. Abbas Khani

Advisors:

Dr. Najmeh Sahebzade
Dr. Ali Mirshekar

By:

Shohreh Eskandari

September 2024

Abstract:

Greater wax moth, *Galleria mellonella* (Lepidoptera: Pyralidae) is the most serious pest of honeybee wax combs in storage places and can cause substantial losses to combs, hive material and bees in beehives all over the world. The larval stage is the only feeding stage of GWM and the most destructive stage. During its development it builds silk-lined tunnels in the honey comb and feed on honey, pollen, wax, faeces and cocoons of the bee larvae. This leads to destruction of honeycombs and subsequent deterioration of the weakened colonies. Natural plant products possess insecticidal activity. Plant-based insecticides are having a potential impact on the control of *Galleria mellonella*. The botanical pesticides are encouraged over chemical pesticides because they have less toxicity to non-target organisms and have the capacity to degrade quickly and hence their use against pests has gained importance all over the world. This study aimed to determine the efficacy of *Calotropis procera*, *Capaparis spinosa* and *Cannabis sativa* water extracts against the late larval instar of the greeter wax moth and to study their effects on survival and some biological aspects of the insect, in laboratory conditions with temperature conditions of 27 ± 1 °C and relative humidity of 60 ± 5 %. The lethality of the extract on larvae was investigated by contact and digestive methods and the repelling effect and prevention of laying eggs was studied on adults. Although the amount of wax feeding in different concentrations of aqueous extracts of *Capaparis spinosa* and *Cannabis sativa* was more than the control, but this increase in feeding was not significantly different from the control. In the case of *Calotropis procera*, inhibition of feeding was observed at the highest concentration of the extract at the rate of 60 mg per gram wax. The mortality rate after feeding on wax impregnated with different concentrations of aqueous extracts of *Capaparis spinosa* and *Cannabis sativa* increased with increasing concentration from 15 to 60 mg per gram of wax, but this increase was not statistically significant. However, in the case of the *Calotropis procera*, a high and significant death of larvae was observed at the rate of 44% at a concentration of 60 mg per gram of wax. The percentage of specific growth rate (SGR) of larvae in two days after feeding from one gram of wax impregnated with different concentrations of plant extracts compared to the control (feeding with wax) showed a significant decrease for all three plants. The larval bioassay tests using the immersion method, indicating the significant contact toxicity of all three plants, with a LC_{50} = 27.4, 17.4 and 21.5 mg/ml of the extract, for cannabis, caparis and astrabrag, respectively. Plant extracts at concentration of 15 mg/ml of the extract, did not prevent egg laying and attraction was observed for both sexes, except in the case of caparis on the female sex. It is necessary to survey the extract of these plants after checking their negative effect on bees, as a practical application in apiaries or to protect the stored wax.

Keywords: Astrabrag, Cannabis, Caparis, Contact and digestive toxicity, Greater wax moth, Specific growth rate,