Studies on the infestation of honey bee colonies with wax moths in Qena region

BY

Mostafa Abd-Elnaim Seddik Ahmed

B.Sc. Agric. Sci., South Valley University, Qena, 2003
M.Sc. Agric. Sci., Plant Protection (Economic Entomology), Faculty of Agriculture, Minia University, 2010

THESIS

Submitted in Partial Fulfillment of The Requirements for the Degree of

DOCTOR OF PHILOSOPHY

In

Agricultural Sciences
(Economic Entomology)
Department of Plant Protection
Faculty of Agriculture
South Valley University

(2019)

CONTENTS

LIST OF TABLE

LIST OF FIGURES

ABSTRACT

The present work was carried out for three successive years (2015 to 2017) for surveying and controlling of greater wax moth, ***Galleria mellonella*** **L** under Quna governorate. Results indicate that the populations of larvae and pupae of wax moth during 2016 and 2017 were concentrated in the period from June to December. Following a near normal distribution, the population increased gradually till reaching its peak at September (13.2 and 17.40 in 016 and 11.40 and 14.20 in 2017) for larvae and pupae, respectively, then decreased gradually till the end of the year. For adult moth, the average number of moths attracted to the different types of traps increased gradually from June till reaching the peak at October, then it decreased gradually till the end of the year. The attracted wax moth to the light traps increased by decreasing the distance of the traps from the colonies, where for the 1st row of light traps (at 5 meter distance from the apiary), the average numbers of wax moth gathered by the different types of traps were as follows: 9.71, 6.09, 5.33, 3.57 and 2.28 moths/trap for red, blue, green, white and yellow color traps, respectively. There were significant differences among different types of traps. For the 2nd row of light traps (at 10 meter distance from the apiary), the efficiency of the different types of traps were similar to that of the 1st row, but with moderate numbers. The average numbers of wax moth were: 6.57, 4.80, 3.71, 2.67 and 1.38 moths/trap, respectively. For the 3nd row of light traps (at 15 meter distance from the apiary), the efficiency of the different types of traps were similar to that of the 1st and 2nd rows but with lower numbers. The average numbers of wax moth were: 2.28, 1.71, 1.29, 0.95 and 0.52 moths/trap, respectively. The average number of moths attracted to the different types of traps peaked (11.06 moths / trap for the 1st row,7.87 moths / trap for the 2nd row and 2.73 moths / trap for the 3rd row) in October. **The diet of old bees-wax + pollen,** among the different types of bees-wax**,** represented the most important, where it enhanced the characteristics of wax moth (larval length, larval and pupal weights, larval and pupal periods, adult longevity) as well as food consumption.

For biological control agents, the larval mortality % of greater wax moth fed bees-wax treated with different concentrations of, ***Bacillus thuringiences, Beuvaria bassiana, Meterhizium. anispoliae*** and ***Paecilonyces. carneus***, increased with increasing each of exposure time and the concentrations, *P. carneus* and *B. thuringiences* were the most important. The highest slope value was 2.93 for *P. carneus* followed with 2.56, for *B.thuringiences*.. For pupation and adult emergence %, *P. Carneus* represented the most important followed with *B. thuringiences*. All treatments had no effect on honey bee workers as well as the colony activities. There were no infestations with *G. mollonella* when the combs treated with each of *B. thuringiences* or *P. Carneus* throughout the experimental period which extended for 3 months under store condition The other two agents (*B. bassiana* and *M.anisopliae*) were less important. **For propolis extract**, the mortality % after 3 days of exposure to diets treated with the Chinese and Egyptian propolis were 66.67, and 53.33%, respectively, compared with zero for control. Statistical analysis proved that there were significant differences between the control and all concentrations of Egyptian and Chinese propolis. **For plant extracts**, the mortality % increased with increasing the time of exposure to reach the highest after 72 hours . *D. stramonium* represented the most important, followed by *H. muticus*, the other two plants

(*E. Camalulensis*. and *N. oleander*) were less important. **For Neem and Nimbecidine**, Nimbecidine represented the most important than neem leaves and seeds extracts under laboratory or store conditions, where the highest mortality (86.67% for larvae and 100.00% for pupae) were obtained with 10% concentration, compared with 0.00 and 6.67%, respectively for control. On the contrary adult emergence decreased with increasing concentrations being, 0.00 and 46.67% at 10 and 2.5 concentrations, respectively compared with 93.33% for control. **For plant volatile oils**, ginger and clove oils were the most important as control agents under laboratory or store conditions. The other oils (anise, garlic, cinnamon and basil) were less important. **For acids** and **methyl salicylate**, methyl salicylate and formic acid were the most important as control agents under laboratory or store conditions. Where the infestation % were zero along the test period which extended for 3 months, the other acids (acetic, lactic and oxalic) were less important. **For bait traps,** trap with a diet of bees-wax was the best trap followed by banana peel trap then trap of dates, trap of molasses and control trap. October recorded the highest rate of attractive moths, while August was the lowest one.

Key words: surveying and controlling of greater wax moth, *Galleria mellonella* L, light traps , types of bees-wax, biological agents, *B. thuringiences*, *B. bassiana*, *M. anispoliae* , *P. carneus*, propolis extract , plant extracts, Neem and Nimbecidine ,plant volatile oils, bait traps,

.