بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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Advanced studies on the integrated control of the native hard tick strain in Egypt

A Thesis submitted by

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(BVSc, Benha University, 2010; MVSc, Cairo University, 2016)

For the Degree of Ph.D.

(Parasitology)

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2021

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ABSTRACT

Tick control mostly depends on the use of chemical acaricides which resulted in the development of resistance and environmental pollution. Therefore, there is a need to discover eco-friendly alternatives for these chemicals. This study was designed to evaluate the acaricidal activity of some natural products and synthesized nanomaterials on different developmental stages of the camel tick *Hyalomma dromedarii* (*H. dromedarii*) and compared with reference acaricide Butox®5%. Petroleum ether and ethyl alcohol extracts of *Melia azedarach* (Zinzalikht) ripened fruits and *Artemisia herba-alba* (Sheih) whole aerial parts were prepared. Nickel oxide (NiO) and zinc oxide (ZnO) nanoparticles (NPs) were prepared using an aqueous extract of *Melia azedarach* ripened fruits, then characterized by UV- visible spectroscopy, Fourier transforms infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and energy-dispersive X-Ray spectroscopy (EDS). *A. herba-alba* and *M. azedarach* oil loaded nano-emulsions were prepared and characterized by

transmission electron microscopy (TEM) and Fourier Transforms Infrared Spectroscopy (FTIR). Egg, nymph, larva, and adult immersion tests were used for bioassay of tick stages. Mortality percentages and lethal concentration (LC) values of each tick stage were calculated. The egg productive index (EPI), egg number, and hatchability percentage of the engorged females that survived after treatment were calculated. A toxicity test was performed on the Swiss albino mice to evaluate the possible toxic effects of the prepared nanomaterials. The UV-Vis spectra of the NiO NPs showed an absorption peak at 307 nm and ZnO NPs at 377nm. FTIR analysis showed the possible functional groups used for capping and stabilization of NiO and ZnO NPs. The SEM images of the NiO NPs exhibited a size ranging from 21 to 35 nm and ZnO NPs 18 to 42 nm. TEM characterization revealed spherical droplets for *A. herba-alba* and *M. azedarach* oil loaded nano-emulsion with droplet size ranged from 62 to 69 nm and 52-91nm, respectively. FTIR revealed the absence of extra peaks in the loaded nano-emulsions that confirmed no chemical changes existed by ultrasonication. The calculated LC_{50} confirmed that *M. azedarach* had slightly higher toxicity on the dormant stages (embryonated eggs and engorged nymphs) than *A. herba-alba*. The LC_{50} values confirmed that the petroleum ether extracts were more toxic against the active stages (larvae, unfed adults, and engorged females) of *H. dromedarii* than the ethyl alcohol extracts of the two tested plants. Moreover, the petroleum ether extract of *A. herba-alba* was more toxic than *M. azedarach* against all active stages. The petroleum ether extract of *A. herba-alba* was more toxic against larvae followed by unfed adults and then engorged females. The LC_{50} values for NiO NPs on embryonated eggs, larvae, and engorged nymphs were 5.00, 7.15, and 1.90 mg/ml, respectively. The LC_{50} values for ZnO NPs on embryonated eggs, larvae, and engorged nymphs were 11.6 mg/ml, 8.03 mg/ml, and 3.9 mg/ml, respectively. The egg productive index (EPI), egg number, and hatchability percentage were lower in females treated with the NiO and ZnO NPs than control ticks. The LC_{50} values of *A. herba-alba* and *M. azedarach* oil loaded nano-emulsion on embryonated eggs, larvae, engorged nymphs, and unfed adults were 0.29% and 1.10%, 0.718% and 1.72%, 0.325% and 0.38%, 4.38%, and 22.24%, respectively. In the NiO NPs toxicity test, the hematological analysis showed a significant increase in the level of WBCs and Hb while the biochemical analysis showed insignificant decrease in ALP and ALT. ZnO NPs toxicity results revealed insignificant changes in the hematological and biochemical parameters. *A. herba-alba* and *M. azedarach* oil loaded nano-emulsion toxicity results revealed insignificant changes in the hematological and biochemical parameters.

Keywords: *Hyalomma dromedarii,* Acaricidal activity, *Artemisia herba-alba*, *Melia azedarach*, Nanoparticles, Nano-emulsion, Toxicity.

Dedication

I dedicate this study to my late father, my Husband, my Sons and all my family who have taught me endless things in life and encouraged me to complete my study whom I am indebted to them for happiness in my life.

Acknowledgements

First of all, I would like to express my deepest gratitude and thanks to"God" for his greatest help to accomplish this study.

I am greatly indebted to ***Dr. Magdy Mostafa Fahmy,*** *Professor of Parasitology, Faculty of Veterinary Medicine, Cairo University for his sponsor deep concern, moral support, and his guidance through the course of study. He has kindly oriented me and continuously followed up and processed the revealed data in all stages of this work.*

I would like to express my sincere thanks and gratefulness to ***Dr. Mai Abuowarda Mohamed,*** *Assistant professor of Parasitology Faculty of Veterinary Medicine, Cairo University, to whom the author feels greatly indebted for her stimulating guidance, constructive criticism, and valuable suggestion and encouragement through this work.*

I wish to express my deepest thanks and sincere gratitude to ***Dr. Sobhy Abd El-Shafy Hassan****, Professor of Parasitology, Dept. of Parasitology and animal diseases, Veterinary Division, National Research Centre for his kind supervision, keen interest, indispensable advice, enthusiasm in reading and criticizing the manuscript and valuable suggestions during the entire period. Under his guidance, I successfully overcame many difficulties and learned a lot. Thanks for everything!*

I would like to express deep thank to ***Dr. Rabab Mohamed El-Khateeb*** *Professor of Parasitology, National Research Centre for her kind moral support, valuable suggestion, and support throughout the work.*

I have, no words can express my cordial thanks and deep gratitude to ***Dr. Essam Mohamed Hoballah*** *(God rest his soul), Professor of Agriculture Microbiology, National Research Centre for his kind help, valuable advice, painstaking criticism, and a keen interest in the progress of the work.*

I would like to express my thanks to all ***staff members, colleagues, and workmen*** *in the Department of Parasitology and Animal Diseases., National Research Centre and Faculty of Veterinary Medicine, Cairo University for their continuous encouragement throughout the study.*

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