Biological and chemical studies on some microbial control agents and plant extracts against some insect pests

A Thesis submitted

To

The Department of Entomology
Faculty of Science, Ain Shams University

For

The award of the Ph.D. Degree
(Entomology)

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Cairo 2010

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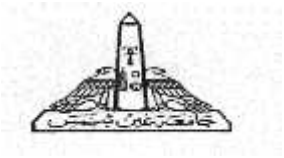

كلية العلوم
قسم علم الحشرات

APPROVAL SHEET

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بسم الله الرحمن الرحيم

اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ﴿1﴾ خَلَقَ الْإِنسَانَ مِنْ عَلَقٍ ﴿٢﴾ اقْرَأْ وَرَبُّكَ الْأَكْرَمُ ﴿٣﴾ الَّذِي عَلَّمَ بِالْقَلَمِ ﴿٤﴾ عَلَّمَ الْإِنسَانَ مَا لَمْ يَعْلَمْ ﴿٥﴾

"صدق الله العظيم"

ABSTRACT

The efficiency of 15 essential oils as repellent against *Ixodes ricinus* (Acari: *Ixodidae*) nymphs ticks was investigated by laboratory bioassay. The essential oils were obtained by steam distillation (SD) and were analyzed by gas chromatography–mass spectrometry (GC–MS) and their major components were identified. The oils exhibited a diversity of activity and were grouped into four categories according to their repellency effect. Volatile oils of *Calendula officinalis, Origanum majorana, Artemisia judaica, Mentha piperita, Conyza dioscoridis* and *Rosmarinus officinalis* showed the most pronounced and strong tick repellency effects observed (82 – 100%). Oils of *Ammi majus* and *Foeniculum vulgare* showed very close repellency of about 69% and 70%, respectively. Oils of *Nerium oleander, Ricinus Communis., Ammi visnaga, Ocimum basilicum* and *Lantana camara* showed very close and moderate repellency of about (60 – 65%). The last category is the oils of *Lawsonia inermis* and *Chamomilla recutita* possessed very weak repellence activity accounted to 58% and 42%, respectively. In a field in Sweden, the tick repellent activity of the highest three oils of *M. piperita, C. dioscoridis* and *R. officinalis* were tested by randomised, standardized methodology with concentration half of that used in the Lab., (65mg oil/m^2) by cloth-dragging trials. Collected and numbers recorded of *I. ricinus* nymphs ticks differed significantly between treated cloths and the untreated control. Some oils do represent a possible personal protection measure.

The insecticidal value of oil extracts of castor (*Ricinus communis*) seeds prepared using various solvents e.g. hexane, acetonitrile and methanol were studied against the whitefly, *Bemisia tabaci* (Homoptera: Aleyrodidae) and compared with some formulations based on Azadirachtin (neemix 4.5% EC) and Pyrethrum 5% SC). The crude oils were treated with an emulsifier to facilitate its mix with water. The oils showed insecticidal properties. Mortality of the whitefly, increased with increasing concentrations of castor oil. The lethal dose of the castor oil extracts was less for the immature fly than adult fly. GC/Mass analysis showed that the oils comprised largely of fatty acids and ricinoleic esters content.

Specifications, evaluations and quantifications of *Bacillus thuringiensis* (Bt) as an active ingredient in some microbial control agents currently applied in Egypt were studied using different methodologies by bioassays, electrophoresis and some molecular

techniques (PCR). The bioassays conducted on neonate larvae of cotton leaf worm, *Spodoptera littoralis* based on an artificial diet. The electrphoretic analysis of SDS-Page protein for the samples showed moderate to great differences and similarities between them, depending on the presence and absence of some bands between the samples. Molecular studies by RAPD- PCR technique using six random primers OPA – 01, OPB – 01, OPB – 03, OPC – 01, OPD – 01 and OPD – 03 were used to distinguish any variations or changes between the different strains of these formulations. The studies showed that combination of bioassays, SDS-PAGE and the genetic approach by means of PCR can satisfactory represent evaluations and specifications for the potential of *B. thuringiensis* strains of commercial products.

KEY WORDS: Essential oils, ticks, repellent, toxicity, *Ricinus communis*, *Bemisia tabaci*, *Spodoptera littoralis*, *Bacillus thuringiensis*, Bt formulations, SDS-Page, RAPD- PCR.

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