Ain Shams University
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Protection of museum woolen textiles against the banded black carpet beetle*Attagenus fasciatus* (Thunberg) (Dermestidae: Coleoptera) By means of plant extracts

A Thesis
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LIST OF ABBREVIATIONS

Abbreviations	Words
DE	Diatomaceous earth
DEET	*N*, *N*-Diethyl-*meta*-toluamide
EC	Emulsifiable Concentrate
FTIR-ATR	Fourier Transform Infrared Spectroscopy with Attenuation Total Reflection
IPM	Integrated pest management
L.	Liter
LC_{50}	The median lethal concentration lines
LD_{50}	The median lethal dose lines
PDB	Paradichlorobenzene
RH	Relative humidity
ΔE	The total color difference
L	corresponding to the brightness (100 = white, 0 = black)
a	corresponding to the red–green coordinate (positive sign = red, negative sign = green)
b	corresponding to the yellow–blue coordinate (positive sign = yellow, negative sign = blue)

ABSTRACT

Bioassays were carried out to evaluate the toxic effects of three plant oil extracts; cinnamon, clove and eucalyptus against 3rd larval instars of *Attagenus fasciatus*. According to the LC_{50} of the tested oils in comparison with three traditional insecticides; carbon disulphide, paradichlorobenzene and Pestban, the order of toxicity was cinnamon oil >clove oil>carbon disulphide > eucalyptus oil > Pestban> paradichlorobenzene. Strong antifeedant effects of the three tested plant oils were observed after larval treatment with the $LC_{50}$of the tested oils. The effects of the tested oils and the insecticides after larval infestation on some physical, mechanical and chemical properties of artificially thermally aged woolen samples were evaluated. No perceivable color change in any of the tested samples was observed. A positive effect on the wool mechanical properties including increasing of treated wool strength was also detected. According to Fourier Transform Infrared Spectroscopy with Attenuation Total Reflection (FTIR-ATR) results, tested oils and insecticides affected positively on the wool structure.

Keywords: Toxicity- Antifeedant effect- *Attagenus fasciatus*- Plant oil extracts- Insecticides- Wool textiles- Color change- Wool strength

I- INTRODUCTION

Antiquities are an important economic resource in Egypt, so museum collections require special attention concerning their conservation and preservation. When museum collections are destroyed, or allowed to be destroyed not only the museum loses a valuable advantage, but also human kind loses an element of its cultural or scientific heritage that may be irreplaceable (**Edson and Dean, 1996**).

Natural history museum objects containing insect specimens and higher animals including stuffed birds and mammals, also cultural and historic objects having woolen or other animal materials are commonly infested by different insect species (**Rajendran and Hajira Parveen, 2005).**

Dermestid beetles are capable of feeding and developing on keratinaceous products and several are economically important pests on woolen textiles and museum specimens throughout the world **(Veer *et al.*, 1991).**

The black carpet beetle, *Attagenus fasciatus* (Thunberg) (O: Coleoptera, F: Dermestidae) considered one of the museums pest, where it attacks organic artifacts, such as furs, hides, insect specimens, wool and oil seeds **(Back and cotton, 1938).** Insect infestation may cause both physical damage (from burrowing and tunneling) and chemical damage (from saliva, other digestive fluids and feces) which resulting in a variety of problems including weakening, change of staining, losses and powdering of the infested textile **(1)**.