BIOCHEMICAL STUDIES ON SOME PLANT EXTRACTS

By

AHMED FOUAD SHEHATA TURKY

B.Sc. Agric. Sci. (Plant Production), Fac. Agric., Cairo Univ., 2001
Diploma of Agric. Chemical Analysis, Fac. Agric., Cairo Univ., 2004

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APPROVAL SHEET

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ABSTRACT

Three essential oil plant extracts, of Chamomile; *Chamomilla recutita* (L.), Marjoram; *Marjorana hortensis* (L.), and Eucalyptus (*Eucalyptus* sp.) were screened to study their ability for controlling *Tetranychus urticae* Koch. Different concentrations of essential oil extracts (0.5, 1, 2, 3 and 4%) of *C. recutita* , *M. hortensis* and *Eucalyptus* sp. were used as acaricidal activity against *Tetranychus urticae.* Chamomile was asserted to be one of the most efficient agents against *T. urticae* followed by Marjoram and Eucalyptus. The LC_{50} values of these oils were 0.651, 1.83; 1, 19, 6.26 and 2.18, 7.33 for adults and eggs, respectively.

Herein, the bioassay experiments of the two essential oil of Chamomile and Marjoram proved relationship between essential oil contents and activity of enzyme glutathione S-transferase, non specific esterase and alkaline phosphatase in *T. urticae*.

GC-MS analysis of *C. recutita* and *M. hortensis* proved the presence of 13 and 14 essential oil components, respectively. The major essential oil contents of *C. recutita* are Bisabolol oxide A (35.25%), and Trans beta farersene (7.98%), while the main components of *M. hortensis* are Terpinen-4-ol (23.86%), p-cymene (23.40%) and sabinene (10.90%)

The major components of both plant extracts (Terpinen-4-ol 23.86% and Bisabolol oxide A 35.25% essential oil) may be are responsible for the activity of enzymes of *T. urticae*. (Glutathione S-transferase, non specific esterase, (acid, alkaline) phosphatases and protease.

Key words: Tetranychidae, essential oils, plant extracts, Biology and Enzyme. (Glutathione S -transferase, non specific esterase, (acid, alkaline) phosphatases and protease).

DEDICATION

I dedicate this work to whom my heart felt thanks; to my wife and my mother for their patience and help, as well as to my father and brothers for all the support they lovely offered along the period of my post graduation.

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عنوان الرسالة: دراسات بيوكيميائية على بعض المستخلصات النباتية

المشرفون: دكتور: عبد المنعم محمد رضوان عفيفى

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المستخلص العربى

الهدف الرئيسى لهذه الدراسة معرفة التأثير السام لبعض المستخلصات النباتية ضد أكاروس العنكبوت الأحمر ذى البقعتين واستخدمت فى هذة الدراسة الزيوت العطرية الناتجة من كل من عشب الكاموميل والبردقوش والكافور.

أظهرت ان زيت الكاموميل كان الاكثر فاعلية على بيض الاكاروس يلية زيت البردقوش بينما اظهر زيت الكافور تاثير ضعيف كما اظهرت النتائج ان زيت الكاموميل والبردقوش ذات فاعلية عاليه ضد اناث اكاروس العنكبوت الاحمر ذى البقعتين واظهرت ان زيت الكافورله تأثير متوسطاً ضد الاناث البالغه للاكاروس العنكبوت الاحمر ذى البقعتين.*Tetranychus urticae*

وتم دراسة العلاقة بين تاثير المستخلصات النباتية ونشاط الانزيمات واستخدمت الجرعة السامة النصفية بالرش لكلا من زيت الكاموميل وزيت البردقوش على الاناث البالغة للاكاروس العنكبوت الاحمرثم تم وضعها فى الحضان لمدة ٢٤ ساعة وتم اخذ الاناث التى ظلت حية بعد ٢٤ ساعة وتم تقدير نشاط بعض الانزيمات.

أظهرت النتائج ارتفاع فى مستوى نشاط انزيم الجلوتاثيون ترانس فيريز بالمعاملة بزيت الكاموميل وزيت البردقوش بالمقارنة بالمعاملةTriton X -100 والا كاروس الغير معامل.

وأظهرت النتائج ارتفاع فى مستوى نشاط انزيم الفا استريز وارتفاع فى مستوى نشاط انزيم بيتا استريز كما اظهرت النتائج ايضاً ارتفاع فى مستوى نشاط انزيم اسيد فوسفاتيز واخيراً انخفاض فى مستوى نشاط انزيم الكالين فوسفاتيز وانخفاض فى مستوى نشاط انزيم البروتيز واخيراً تم اختيار الزيوت التى اثبتت فاعلية عالية ضد العنكبوت الاحمر ذى البقعتين مكوناتها بواسطة GC/MS. وتم تعريف مكونات زيت الكاموميل

حيث تم تعريف ١٣ مركباً فى زيت الكاموميل وكانت المركبات الرئيسية هى:

Trans β- farersene (7.98%) , Bisabolol oxide A (35.25%)

وأيضا تم تعريف مكونات زيت البردقوش تم تعريف ١٤ مركباً فى زيت البردقوش وكانت المركبات الرئيسية هى: Sabinene (10.904%) , p -cymene (23.404%) , Terpinene- 4 -ol (23.860%)

β – Caryophllene (4.820%), γ – terpinene (9.034%), α -Terpineol (6.421%)

الكلمات الدالة : المستخلصات النباتية – انزيم (الجلوتاثيون ترانس فيريز – الفا وبيتا استريز– أسيد والكالين فوسفاتيز – بروتيز– العنكبوت الأحمر ذى البقعتين).

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INTRODUCTION

The two-spotted spider, *Tetranychus urticae* Koch is one of the most important pests responsible for yield losses of many horticultural ornamental and agronomic crops. *T. urticae* is a major pest of agricultural systems, mainly annual crops and vegetables (Helle and Sabelis, 1985). A major problem in the control of *T. urticae* is the response to develop resistance to many acaricides (Stumpf and Nauen, 2002). For several years, chemical control of mites has been extensively practiced in Egypt to check mite population increase. Resistance problems and high residual levels in food products may hinder its marketing. Such undesirable consequences have caused alienating effects on the irrational use of chemical agents (Ali, 2004). Therefore, the use of essential oils of plant extracts in pest management programs has recently attracted the attention of many scientists. Pesticides of plant origin seem to be recommended as they generally have a very short persistence on the plant (Isman, 1997 and Carbaras *et al.*, 2002). Chamomile, *chamomilla recutita* L., is a well known medicinal plant in folk medicine cultivated all over the world. Chamomile essential oil is widely used in pharmaceutics, cosmetics, and food industries. The pharmacological effect of chamomile is mainly connected with its essential oil for its spasmolytic, antimicrobial, and disincentives properties (Koppel and Arak1, 993).

Marjoram (*Marjorana hortensis* L.) is used world wide as a spice and a medicinal source in the form of the essential oil in