FEEDING HABITS OF *TETRANYCHUS URTICAE* KOCH (ACARI : TETRANYCHIDAE) ON *SOLANUM* SPECIES

By

Ahmed Eid Abdel-Megeed Mahgoob
B. Sc. (Entomology) Ain Shams University,1985
M. Sc. (Agric. Zoology**)** Ain Shams University, 1992

A thesis submitted in partial fulfillment
of
the requirement for the degree of

DOCTOR OF PHILOSOPHY
in
Agricultural Science

(Agricultural Zoology)

Department of Plant Protection
Faculty of Agriculture
Ain Shams University

2000

APPROVAL SHEET

FEEDING HABITS OF *TETRANYCHUS URTICAE* KOCH (ACARI : TETRANYCHIDAE) ON *SOLANUM* SPECIES

By

Ahmed Eid Abdel-Megeed Mahgoob
B. Sc. (Entomology) Fac. of Agic.,
Ain Shams University, 1985

M. Sc. (Agric. Zoology**)** Fac. of Agic.,
Ain Shams University, 1992

This thesis for Ph.D dgree has been approved by:

Prof. Dr. Madeha Mohamed Abdel Hameid……..

Prof. of Agricultural Zoology, Department of Economic Entomology Fac. of Agriculture, Al exandria University.

Prof. Dr. Mahmoud Ezz El Din Amhed Sarwat…….

Prof. Of Agricultural Zoology, Department of Plant Protection Fac. of Agriculture, Ain Shams University.

Prof. Dr. Sherief Mostafa Hafez……..

Prof. Of Agricultural Zoology, Department of Plant Protection

Fac. of Agriculture, Ain Shams University.

Date of examination : / / 2000

FEEDING HABITS OF *TETRANYCHUS URTICAE* KOCH (ACARI : TETRANYCHIDAE) ON *SOLANUM* SPECIES

By

Ahmed Eid Abdel-Megeed Mahgoob
B. Sc. (Entomology) Fac. of Agic.,Ain Shams University, 1985
M. Sc. (Agric. Zoology**)** Fac. of Agic., Ain Shams University, 1993

Under the supervision of:

Prof. Dr. Sherief Mostafa Hafez.

Prof. of Agricultural Zoology, Fac. of Agriculture, Ain Shams University.

Prof. Dr. Abdel-Fattah A. Selim
Prof. of Pesticide Chemistry and Toxicology**,** Fac. of Agriculture, Ain Shams University.

Prof. Dr. Sami A. Habib

Prof. of Agricultural Botany Fac. of Agriculture, Ain Shams University.

ABSTRAct

Ahmed Eid Abdel-Megeed Mahgoob. Feeding Habits of *Tetranychus urticae* Koch (Acari :Tetranychidae) on *Solanum* species. Unpublished Doctor of Philosophy Degree, Department of Plant Plant Protection, Faculty of Agriculture, Ain Shams University 2000.

Four *Solanum* species of eggplant and potato were evaluated for resistance to *Tetranychus urticae* Koch and its effect on the leaf chemical components. The egg-plant species were *S. mammosum* L. PI 245968 (a wild species) and *S. melongena* (a cultivated species), while potato species were *S. berthaultii* Haweeks PI 265857(a wild species) and *S. tuberosum* L. (a cultivaetd species). Evaluation of resistance was based on the mite population in the greenhouse. The wild species of eggplant and potato were more highly resistance than cultivated ones. The eggplant, *S. melongena*, was more highly susceptible than the potato *S. tuberosum*.

Mite infestation reduced the chlorophyll and phosphorus content in infested plant leaves of cultivated eggplant and potato. Also there were a reduction in the leaf area and plant length of eggplant *S. melongena*. Mite feeding affected the leaf tissue structure and destroyed chloroplasts at the feeding sites.

The leaf surfaces of eggplant and potato wild species were covered with glandular trichomes, while the cultivated eggplant had non-glandular trichomes. Crude leaf surface washes of eggplant and potato (wild species) caused repellency, reduced fecundity and were

toxic to females *T. urticae*. Crude washes of potato *S. tuberosum* had similar but less activity.

A series of experiments were conducted to study the biochemistry and activity of trichome exudates from the cultivated and wild species of eggplant and potato. Specifically, crude leaf washes were removed, then fractionated and subfractionated via Thin Layer Chromatography (TLC) and High Performance Liquid Chromatography (HPLC). To detect the toxic effect of subsequent fractions and subfractions against females of *T. urticae*, a novel bioassay technique was developed. All fractions and subfractions were bioassayed. Finally the highest toxic subfractions were purified using (HPLC), then were identified using Gas Chromatography-Mass spectrometer.

Crude washes of eggplant *S. mammosum* yielded 15 fractions, while crude washes of *S. melongena* yielded 5 fractions. Crude washes of potato *S. berthaultii* yielded 10 fractions, while crude washes of *S. tuberosum* yielded 4 fractions by TLC. The fractions of *S. mammosum* and *S. berthaultii* were more toxic than those of *S. melongena* and *S. tuberosum*.

The toxic fractions of *S. mammosum* yielded 57 subfractions, while the toxic fraction of *S. berthaultii* yielded 8 subfractions were which separated by HPLC. The subfractions from *S. mammosum* were more toxic than those from *S. berthaultii*. The highest toxic subfraction of *S. mammosum* was identified as dodecanal, while the most toxic subfraction obtained from *S. berthaultii* consisted of sugar esters.

Key words:

***Tetranychus urticae* (Tetranychidae); *Solanum* species, eggplant, potato, glandular trichomes, plant resistance, feeding damage, chlorophyll, phosphorous, phenol.**

ACKNOWLEDGEMENT

The successful completion of the research reported here is the product of input from many people who directly or indirectly generously supported author in various aspects. So the author wishes to express his deep gratitude and sincere and sincere appreciation to Dr. Sherief M. Hafez, Professor of Agricultural Zoology. Department of Plant Protection, Faculty of Agriculture, Ain Shams University, for suggesting the problem, technical guidance, and constructive criticism during the preparation of the of the manuscript.

The author feels most indebted to Dr. Abdel-Fattah A. Selim, Professor of pesticide Chemistry and Toxicology, Department of Plant Protection at the same Faculty, for his supervision and his generous aid.

Sincere thanks and appreciation are offered to Dr. Sami A. Habib Professor of plant anatomy, Department of Agricultural Botany at the same Faculty his supervision and keen interest to interpretation the damaged plant tissues and plant trichomes, and invaluable support of this research.

The author also feels most indebted to Dr. Grayson C. Brown Faculty of Agriculture, University of Kentucky USA, for his keen interest during the course of this work, providing facilities for practical studies, and for his unfailing help, cooperation, and hospitality during the two year stay in USA according to the Channel Program.

CONTENTS

Subjects Page

LIST OF TABLES

LIST OF FIGURES