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EFFECT OF SOME PLANT EXTRACTS AND PESTICIDES ON SOME BIOLOGICAL ASPECTS OF TWO DIFFERENT SPECIES OF TETRANYCHID MITES

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ABSTRACT

The effect of treatment with pesticides (sanmite) and four plant extracts on the biology of spider mite and citrus brown mite was investigated. Treatment with the pesticides decreased female longevity, preoviposition and oviposition period, number of eggs and percentage of hatchability in both Tetranychid mites; *Tetranychus urticae* Koch and *Eutetranychus orientalis (klein).*

Treatment with plant extracts; worm wood, caraway, lupin and lantana, decreased female adult longevity, oviposition period, egg hatchability and number of deposited eggs in both mite species.

INTRODUCTION

Plant extracts have been used as insecticides by humans before the time of the ancient Romans, a practice that continues to the present with many of plant species was known to have insecticidal properties. The two-spotted spider mite, *Tetranychus urticae* Koch and citrus brown mite *Eutetranychs orientalis* (Klein) are serious pests of food and fiber crops and often caused considerable reduction in yields. Mite control using acaricides on agriculture crops has become a routine practice by farmers all over the world.

As a result of continuous application of these chemicals on mite infested crops, the resistance problem has taken place beside residue contamination of human foods, mammalian toxicity and pollution of the environment.

Many investigators in different parts of the world studied the effect of plant extracts on the biology of insects and mites (Burce, 1976 ; Pandey, 1976; Amer, 1979 ; El-Naggar, 1980 ; El-Kabbany, 1980; Schauer and Schmutterer, 1981 ; Ali, 1981 ; Ahmed, 1983 ; Mohamed, 1983 ; Barakat & Shereef 1984; Afifi and Hafez, 1988 ; El-Halawany *et al.*, 1988 ; Pan *et al*, 1993 ; Iskander, 1993 ; Gladding, 1995 ; and Barakat, 2001).

The present work aimed to determine the efficacy of four plant extracts (worm wood, caraway, lupine and lantana) and one pesticide (sanmite 20% WP) at the LC_{50} level on the biological aspects of mites; *T.urticae* and *E.orientalis.*

MATERIAL AND METHODS

MITES:

The spider mite *T. urticae* koch was collected from the field and reared in the laboratory on lima bean plants *Phaseolus vulgaris* L. under

constant temperature (27±0.5) and relative humidity (70%) as described by (EL-Defrawi *et al*, 1965). While, citrus brown mite, *E.orientalis* (klein) was collected from heavily infested leaves of citrus trees. Collected strain was transferred to laboratory, then adult females were reared on the host plant, *Plumeria alba* at 27C°.and 70% R.H.

Selected sweet potato cuttings (20 cm. Length) with leaves placed in bottles filled with water and kept under laboratory conditions (27 C°, and 70% R.H.). Fluorescent tubes (40 watt) were used to maintain continuous illumination. Potato cuttings and water were changed every day. To get a homogeneous and sensitive culture, this colony was left for one year under the previous laboratory conditions.

CHEMICALS:

One pesticide was used (sanmite 20% WP)

PLANT EXTRACTS:

English name	Scientific name	Used part
Worm wood	*Artemisia heroalba* Asso.	Whole plant
Caraway	*Carum carvi* L.	Seeds
Lupine	*Lupinus termis* Forsk	Seeds
Lantana	*Lantana camara*	Leaves

EXTRACTION PROCEDURE:

The parts of each sample (100g.) were ground in a food grinder and extracted using acetone and ethyl ether as solvents. And each solvent was used at the rate of 5ml/g. plant material compared with the method described by Su and Horvat (1981). After 24 hours, the ether extract was transferred to separatory funnel, added about 30ml chloroform and shaked to allow the organic solvent layer and water layer to separate.

The crude extract was then weighted and adjusted to 10ml volume with acetone.

BIOLOGICAL STUDY:

About (50-60) adults females were placed on a single leaf of the host plant kept on moist cotton wool in Petri dishes. After egg deposition, adult females of the same age were sprayed then placed individually in Petri-dish. Fifteen replicates were used for each treatment. Old leaves were replaced with fresh ones. Incubation period, percentage of egg hatchability, preoviposition, oviposition, longevity and number of eggs were determined. Changes in the biology of mites were determined after treating adult females with pesticide or plant extracts at the LC_{50} level.

STATISTICAL ANALYSIS:

Biological data were statistically analyzed for standard error (S.E.) and least significant difference (L.S.D.) according to Steel and Torrie (1968). Data were statistically analyzed to estimate LC_{50} according to the method described by Finney (1952).

RESULTS AND DISCUSSION

Effect of pesticide (Sanmite WP 20%) on the biology of *T. urticae* and *E. orintalis*:

Data given in Table (1) show that the insecticidal treatment significantly shortened adult female longevity, number of eggs and oviposition period. The average of female longevity, oviposition period and number of deposited eggs were 14 days, 11 days and 90.6 eggs, respectively in case of mite *E. orintalis* (untreated), while in case of treated mites, the averages decreased to 5.1 days and 3.4 days and 39.1 eggs. While, in case of *T. urticae* (untreated) these average of were 12 days and 10.3 days and 76.4 eggs, respectively. All data observed between two mites with the insecticide were significant. On the other hand, in both two treated mites, the pesticide significantly prolonged pre-oviposition period compared with untreated mites. Egg hatchability was affected by pesticide, it recorded 70.9% in *T. urticae* and 67.2% in *E. orintalis* corresponding to 93.3% and 90% in untreated mites, respectively (Table 1). The results also show that the incubation period of both mite species was decreased in treated eggs.Thus, it could be concluded that, female longevity, pre-oviposition and oviposition periods, number of eggs and percentage of hatchability were significantly affected by exposing adult females of *T. urticae* and *E. orintalis* to the LC_{50} values.

These results agreed with Barakat & Shereef (1984), who mentioned that, the oviposition, longevity and fecundity decreased significantly 8 days when *T. urticae* exposed to plictran and cypermethrin.

Table (1): Effect of Sanmite WP on the biological aspects of *T. urticae* and *E. orintalis*.

Mites	Pesticide	LC_{50}	Incubation period/day	Hatchability %	Pre-oviposition period/day	Oviposition period/day	Longevity	Number of eggs
T. urticae	Sanmite Untreated L.S.D. level at 0.05	0.00056	2.0 ± 0.6 4 ± 0.5 4.61	70.9 ± 5.2 93.3 ± 6.2 4.06	3.5 ± 0.7 1.7 ± 0.2 0.43	1.9 ± 0.7 10.3 ± 0.4 4.6	4.4 ± 0.6 12 ± 1.5 1.56	23.7 ± 3.7 76.4 ± 4.6 17.1
E. orientalis	Sanmite Untreated L.S.D. level at 0.05	0.00109	1.7 ± 0.5 3.6 ± 0.4 3.6	67.2 ± 5.8 90 ± 6.4 4.23	4.3 ± 0.8 1.6 ± 0.4 0.40	3.4 ± 0.8 11 ± 0.8 4.1	5.1 ± 0.9 14 ± 0.8 1.73	39.1 ± 3.0 90.6 ± 10.2 15.3

Effect of plant extracts on the biology of *T. urticae* and *E. orintalis*:

It is clear from Table (2) that, the adult female longevity, oviposition period, egg hatchability and number of deposited eggs were decreased in all treatments when adult female in both mites; *T. urticae* and *E. orintalis* were treated with plant extracts; *Artemisia herboalba*, *Carum carvi*, *Lupinus termis* and *Lantana camara*. Data also showed that, the differences between treated and untreated females in both different species of mites were highly significant. Barakat *et al & Shereef* (1984), mentioned that, treatment with plant extracts had no effect on egg hatchability in case of *T. urticae*.

Treatment with plant extracts; *Artemisia herboalba* and *Carum carvi* prolonged pre-oviposition period (2.1 and 2.6 days) and (1.7 and 2.3 days) in case of *T. urticae* and *E. orintalis*, compared with 1.7 and 1.6 days in the control, respectively, and the difference between both mites were significant, while *Lantana camara* shorted this period (0.9 and 0.6 days) as compared with the untreated females (1.7 and 1.6 days) (Table 2). The incubation period was significantly prolonged by plant extracts using worm wood, caraway and lupine (4.9, 4.8 and 5 days) in case of *T. urticae* respectively and caraway, lupine and lantana (4, 4.2 and 4.7 days) in case of *E. orintalis* respectively. Barakat *et al* (1984) mentioned that, the treatment with plant extracts prolonged pre-oviposition of female *T. urticae* by using black pepper, glanybower, garlic, onion an canna, and also mentioned that, the generation period was apparently prolonged by treatment with garlic, turnip, black pepper, caraway and fenugreek. In case of *T. urticae* and *E. orintalis*, the oviposition period was highly decreased to (3.8, 4.4, 4.6 and 5.1 days) and (3.2, 5.4, 6 and 7.3 days) by using lantana, lupine, caraway and worm wood, respectively, while it was 10.3 and 11 days in both mites in the control, respectively (Table 2). Also, longevity of individuals from the treated replicates were (7.4, 6.3, 7.8 and 6 days) and (8.1, 8.2, 9.6 and 7.3 days) in case of *T. urticae* and *E. orintalis* by using worm wood, caraway, lupine and lantana respectively (Table 2). The same table revealed a pronounced reduction in the number of the deposited eggs per female, it was (31.6, 27.3, 11.7 and 9 eggs) in case of *T. urticae* and (44.5, 42.1, 15.8 and 10.6 eggs) in case of *E. orintalis* compared with 76.4 and 90.6 eggs for the control.

It can be concluded that use of plant extracts induced an obvious reduction in oviposition period, longevity, hatchability and the average number of deposited eggs per female.

Table (2): Effect of four plant extracts on biological aspects of *T. urticae* and *E. orintalis*.

Mites	Plants	LC_{50} gm/ml	Incubation period/day	Hatchability %	Pre-oviposition period/day	Oviposition period/day	Longevity	Number of eggs
T. urticae	*Artemisia herboalba*	0.0223	4.9 ± 0.6	84.8	2.1 ± 0.6	5.1 ± 0.5	7.4 ± 0.5	31.6 ± 5.8
	Carum carvi	0.0167	4.8 ± 0.3	71.7	2.6 ± 0.5	4.6 ± 0.4	6.3 ± 1.0	27.3 ± 1.2
	Lupinus termis	0.0041	5.0 ± 0.6	74.4	1.6 ± 0.3	4.4 ± 0.5	7.8 ± 0.7	11.7 ± 1.6
	Lantana camara	0.0211	4.2 ± 0.7	84.5	0.9 ± 0.3	3.8 ± 0.7	6 ± 0.6	9.0 ± 1.4
	Untreated		4.0 ± 0.5	93.3	1.7 ± 0.2	10.3 ± 0.4	12 ± 1.5	76.4 ± 6.5
	L.S.D. level at 0.05		0.94	5.61	0.46	1.22	1.34	6.82
E. orientalis	*Artemisia herboalba*	0.0191	3.8 ± 0.5	80	1.7 ± 0.2	7.3 ± 0.3	8.1 ± 0.9	44.5 ± 5.0
	Carum carvi	0.0147	4.0 ± 0.6	80	2.3 ± 0.5	6.0 ± 0.6	8.2 ± 1.2	42.1 ± 2.2
	Lupinus termis	0.0086	4.2 ± 0.8	81.6	1.6 ± 0.4	5.4 ± 0.6	9.6 ± 1.1	15.8 ± 3.7
	Lantana camara	0.0113	4.7 ± 0.7	75.8	0.6 ± 0.2	3.2 ± 1.2	7.3 ± 0.8	10.6 ± 1.9
	Untreated		3.6 ± 0.4	90	1.6 ± 0.3	11.0 ± 0.8	14 ± 0.8	90.6 ± 10.2
	L.S.D. level at 0.05		0.82	5.12	0.93	1.40	1.42	6.31

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تأثير بعض المستخلصات النباتية والمبيدات على بيولوجيا نوعين من الاكاروسات التابعة لعائلة تترانيكيدي

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تعتبر المملكة النباتية مصدر رئيسي للمبيدات الطبيعية من زمن بعيد مما شجع الكثير من الباحثون في هذا المجال في البحث عن مبيدات متخصصة وفعالة وآمنة ، وذلك عن طريق إختبار عدد من النباتات لإختبار تأثيرها ولهذا فقد إشتمل البحث عن جزئين ، شمل الجزء الأول دراسة تأثير بعض المبيدات (سانميت ٢٠%) على بيولوجيا أكاروس العنكبوت الأحمر العادي وأكاروس الموالح البني ، بينما إشتمل الجزء الثاني على إختبار أربعة نباتات (نبات الشيح الجبلي وبذور الكراوية وبذور الترمس وأوراق نبات اللانتانا كامارا) حيث تم الإستخلاص بالأسيتون وكحول الإيثايل ثم قدرت فاعلية هذه المستخلصات على فترة حضانة البيض ونسبة الفقس وفترة ما قبل وضع البيض وفترة وضع البيض وفترة حياة الأنثى وكذلك خصوبة الأنثى لكل من أكاروس العنكبوت الأحمر العادي وأكاروس الموالح البني. وقد أوضحت النتائج الآتي:

١- أشارت النتائج أن إستخدام مبيد سانميت ٢٠% WP على بيولوجيا أكاروس الموالح البني كان أكثر حساسية من العنكبوت الأحمر العادي تجاه هذا المبيد حيث كانت نسبة الفقس ٧٠,٩% مقابل ٩٣,٣% للغير معامل في حالة أكاروس العنكبوت الأحمر العادي بينما كانت ٦٧,٢% مقابل ٩٠% لغير المعامل في حالة أكاروس الموالح البني. كما إنخفضت نسبة حضانة البيض إلى نصف المدة تقريباً في كلا النوعين من الأكاروسات (٢ ، ١,٧ يوم) لأكاروس العنكبوت الأحمر العادي وأكاروس الموالح البني على التوالي مقابل ٤ ، ٣,٦ يوم للغير معامل.

٢- أظهرت نتائج معاملة الإناث البالغة لأكاروس العنكبوت الأحمر العادي وأكاروس الموالح البني بمبيد سانميت ٢٠% إطالة فترة ما قبل وضع البيض (٣,٥ ، ٤,٣ يوم) مقابل ١,٧ ، ١,٦ يوم للإناث الغير معاملة في كلا النوعين من الأكاروسات على التوالي.

٣- أشارت النتائج أن فترة حياة الأنثى وفترة وضع البيض وخصوبة الأنثى تأثرت نتيجة المعاملة بالمبيد حيث إنخفضت فترة وضع البيض إلى ١,٩ ، ٣,٤ يوم مقابل ١٠,٣ ، ١١ يوم للإناث الغير معاملة ، كما إنخفضت فترة حياة الأنثى إلى ٤.٤ ، ٥,١ يوم مقابل ١٢ ، ١٤ يوم للإناث الغير معاملة بينما إنخفض أيضا عدد البيض الذي تضعه الأنثى المعاملة إلى ٢٣,٧ ، ٣٩,١ بيضة مقابل ٧٦,٤ ، ٣٩,١ بيضة وذلك في حالة أكاروس العنكبوت الأحمر العادي وأكاروس الموالح البني على التوالي.

٤- أوضحت الدراسة أن إستخدام المستخلصات النباتية (الشيح الجبلي ، الكراوية ، بذور الترمس ، اللانتانا كامارا) أدت إلى إطالة فترة حضانة البيض بالمقارنة بالغير معاملة لكل من أكاروس العنكبوت الأحمر العادي وأكاروس الموالح البني.

٥- أدى إستخدام مستخلصات الشيح الجبلي والكراوية إلى إطالة فترة ما قبل وضع البيض (٢,١ ، ٢,٦ يوم) في حالة العنكبوت الأحمر العادي مقابل ١,٧ يوم للإناث الغير معاملة ، (١,٧ ، ٢,٣ يوم) في حالة أكاروس الموالح البني مقابل ١,٦ يوم للإناث الغير معاملة.

٦- إنخفضت فترة وضع البيض في جميع المعاملات التي إستخدمت فيها المستخلصات بالمقارنة بالإناث الغير معاملة في كلا النوعين من الأكاروسات وبصفة خاصة مع اللانتانا كامارا حيث كانت الفترة ٣,٨ يوم ، ٣,٢ يوم مقابل ١٠,٣ يوم ، ١١ يوم لأكاروس العنكبوت الأحمر العادي وأكاروس الموالح البني على التوالي.

٧- تأثرت فترة حياة الأنثى وخصوبتها بإستخدام المستخلصات وكان لإستخدام اللانتانا كامارا وبذور الترمس أشد تأثير حيث كانت فترة حياة الأنثى عندها ٦ ، ٧,٨ يوم وضعت خلالها ٩ ، ١١,٧ بيضة على التوالي في حالة أكاروس العنكبوت الأحمر العادي مقابل ١٢ يوم للإناث الغير معاملة والتي وضعت خلالها ٧٦,٤ بيضة. بينما في حالة أكاروس الموالح البني كان نفس التأثير حيث بلغت فترة حياة الأنثى ٧,٣ ، ٩,٦ يوم وضعت خلالها ١٠,٦ ، ١٥,٨ بيضة عند معاملتها بمستخلص اللانتانا كامارا وبذور الترمس على التوالي وذلك مقابل ١٤ يوم للإناث الغير معاملة والتي وضعت خلالها ٩٠,٦ بيضة.

٨- يتضح من كل ما سبق أنه يمكن الإستفادة من المستخلصات النباتية في مكافحة أكاروس العنكبوت الأحمر وأكاروس الموالح البني والإشتراك بهما ضمن برامج المكافحة المتكاملة حيث أن إستخدامهما أعطى نتائج جيدة علاوة على أن إستخدامهما يعتبر أقل ضرراً للإنسان والحيوان والأعداء الطبيعية كما أن تأثيرهما أقل تلوث للبيئة.