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Some factors affecting on biological aspects of *Tetranychus urticae* koch (Acari: tetranychidae) on tomato hybrids

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ABSTRACT

The effect of both plant hybrid and essential oil on biological aspects of *Tetranychus urticae* reared on tomato leaves was studied. *T. urticae* was reared on four tomato hybrids namely, 550, 010 (at 20°C and 60% R.H.) and Blatenium, Super strain B (at 25°C and 65 % R.H.). Total immature on both tomato hybrids (550 and 010) for females and males were averaged (18.09 and 19.6) and (16.08 and 16.68) days, respectively. The fecundity of females were 3.75 and 2.8 eggs/female when reared on 550 and 010 hybrids respectively. Total longevity for females and males were averaged (6.85 and 7.5) and (6.7 and 6.42) days, respectively. Egg hatching for 550 hybrid was higher than 010 hybrid (90 and 88%), respectively. The fecundity of females reared on Blatenium and Super strain B were 2.75 and 3.47 eggs/female. Egg hatchability% was 88 and 80, respectively.

Orange oil as an alternative pesticide was tested for its toxicity against eggs and adults of *T. urticae* Koch. LC_{50} values for *T. urticae* adult females after 24 and 48 hours were 15128.479 and 10796.814 ppm, respectively. Biological aspects of treated mites were studied and showed that orange oil treatment could influence on biological indices of *T. urticae* in compare with control, As it greatly affected the percentage of nymphs that reached adult stages, the highest effect was recorded with directly egg treatment which obtained from untreated females and egg which obtained from treated females, while the lowest effect of orange oil on biology was observed when treated females. For directly egg treatment, mortalities in larvae, proto-nymph and deuto-nymph were 92, 95 and 98%, respectively. Mortalities were 44, 62, and 86 % and 8, 12, and 15 % on eggs from treated females and directly female treatment, respectively. Also, the effect of three concentrations (10000, 5000 and 2000 ppm) of orange oil on *T. urticae* biological aspects was studied.

Keywords: Tomato, *Tetranychus urticae* ,Biology, Orange oil, Acaricidal activity.

INTRODUCTION

Tetranychus urticae Koch has become one of the most severe pests of Solanaceae in Africa with estimated crop losses up to 90% in South East Africa **Sibanda, et al., 2000** and also one of the cosmopolitan spider mite pest reported as serious pest on many plants like tomato, okra, brinjal, cotton, french bean, cucurbits, alfalfa, flowers, etc. **Manjulata, et al., 2002**. Durations of *T. urticae* were very close with previous studies performed on different suitable hosts in the same climatic condition: sweet pepper (11.7 days), cucumber (10.4 days), bean (10.9 days) and tomato (11.6 days) plants **Kumral, et al., 2017**.

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Three tomato varieties: Alissa, 023 and 5043 were evaluated under laboratory conditions of 25±1ºC and 65±5% R. H. The developmental times from egg to adult stage ranged from 8.95 to 9.63 days on Alissa and 023 varieties, while, on 5043 variety it lasted 11.13 days for female, while, the male life cycle stayed 7.5, 8.32 and 9.71 days, when fed on the same tomato varieties. Female longevity was differed among the tested tomato varieties whereas, it lasted 11.67, 12.1 and 12.68 days when fed on Alissa, 023, and 5043 varieties of tomato respectively.

Rady, et al., 2018. 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**. Essential oils from orange peels are very complex matrices which consist of many compounds of various chemical classes which are majorly separated into two parts, viz. the volatile part which constitutes between 85 and 99% and the non-volatile part which constitutes between 1 and 15% **Palazzolo, et al., 2013**. The purpose of this study was to monitor the effect of both plant hybrid and essential oil on biological aspects of *Tetranychus urticae***.**

MATERIALS AND METHODS

B- Effect of commercial essential oil (orange oil) against *Tetranychus urticae*:

B-1- Mite culture:

T. urticae was collected from unsprayed castor bean plants and reared at the laboratory of Plant Protection, Faculty of Agriculture, Fayoum University, Fayoum, Egypt. The mites were reared on the lower surface of leave of castor, *Ricinus communis* and left to reproduce under laboratory condition in incubator (25±2°C and 60±5% R.H.).

B-2- Estimation of orange oil median lethal concentration (LC50):

Orange oil is an essential oil produced by cells within the rind of an orange fruit (*Citrus sinensis* fruit). Orange oil was bought from Kamena company Kafr Tohormos Road – EL Talbia, Giza, Egypt. Sixty newly emerged adult females were transferred to the lower surface of castor leave discs (2.5 cm diameter) placed separately on moist cotton wool in Petri dishes. Five petri dishes contain three replicates, twenty individuals in each replicate. The control is composed of water and one drop of triton x-100. Orange oil had three concentrations (10000, 5000 and 2000 ppm) which were sprayed on the

A- Rearing of *T. urticae* for biological studies:

Four stock cultures of *T. urticae* were made in the laboratory on four tomato hybrids (010, 550, Blatenium and Super strain B), 50 replicates for each hybrid were made , discs (2 cm in diameter) placed with upper surface down on cotton pad soaked with water in Petri dishes surrounded by a cotton strip saturated with water to serve as a barrier to prevent escaping of mites. Suitable moisture maintained by adding few drops of water as needed. Leaves were changed to avoid leaf deterioration and consequent mall nutrition. leaves of hybrids (010 and 550) were incubated at 20°C and 60% R.H., while for (Blatenium and Super strain B) were incubated at 25°C and 65% R.H. Sexed females were individually isolated and placed singly on replicated leaves for each hybrid. Immediately after the egg deposition, females were transferred to stock culture. The durations of egg, larval, protonymphal and deutonymphal stages were calculated, in addition to the durations of total immatures, life cycle and life span. Moreover, the preoviposition, oviposition, postoviposition and longevity periods were measured. The number of eggs laid per female was counted.

allowed to lay eggs for studying their biological aspects.

B-4- Effect of orange oil LC50 on some biological aspects of *T. urticae:*

Two hundred and forty adult females were divided to four groups, each group contain three petri dishes (20 adult females/ dish). The females of first group were left for 24 hours to deposit eggs then removed. Eggs were treated. The females of second group were also treated and then allowed to lay eggs. The females of third group and their eggs were treated (as females were treated) and then were allowed to lay eggs which were treated after 24 hours of deposition. The females of fourth group were used as control.

C- Statistical Analysis:

The data obtained were subjected to Duncan's test to separate the means and the lethal concentration (LC50) was calculated under probit analysis **(SPSS, 2021).**

individuals while the mites used as control were sprayed with water and one drop of Triton x-100. Then the adults were kept in the lab at 25±2°C and 60±5% R.H. Adult mortalities were determined under a stereomicroscope after 24h. Three replicates were used for each concentration and control. Mites were considered to be dead if their bodies or appendages did not move when prodded with fine brush. The LC50 value was corrected by Abbott's formula **(Abbot, 1925)** and was calculated using propit analysis. (The tested essential oil was dissolved in water and one drop of triton x-100).

B-3- Effect of different concentrations of orange oils on some biological aspects of *Tetranychus urticae*:

Newly emerged adult females were treated as illustrated in the previous experiments with four different concentrations (20000, 10000, 5000 and 2000 ppm). Females which were alive after spraying with orange oil were

RESULTS AND DISCUSSION

percentage of ability egg hatch for 550 and 010 hybrids were 90 and 88%, respectively. The egg incubation period on 010 hybrid was longer than 550 hybrid with average of 3.6 and 2.8 days, respectively. The newly hatched larvae lived for 8.42 and 5.52 days on tomato hybrids 010 and 550, respectively.

A- Biological aspects of *T. urticae* on tomato hybrids (550 and 010) reared at 20°C and 60% R.H:

1- Durations of female immature stages:

As shown in Table (1) and Fig.1, the biological aspects of *T. urticae* female immature stages on tomato hybrids (550 and 010) were illustrated as follows: The

Table (1): Durations of *T. urticae* female stages (mean days ±SE) on '550' and '010' tomato hybrids, at 20^{0}C & 60% R.H.

Tomato hybrids	Incubation period (in days)	Immature (in days)			Total immatures	Egg hatch (%)
		Larvae	Proto-nymph	Deuto-nymph		
550	2.8±0.136 (2-4)	5.52 ±0.23 (4-8)	6.28± 0.27 (4-9)	6.28 ± 0.18 (5-8)	18.09 ± 0.38 (14-20)	90%
010	3.6±0.08 (3-4)	8.42 ±0.35 (6-10)	5.57± 0.17 (5-7)	5.64 ± 0.13 (5-6)	19.6 ± 0.37 (17-21)	88%

While the protonymphal and deutonymphal periods were observed on 550 and 010 hybrids with average of 6.28, 6.28 and 5.57, 5.64, respectively. Total immature on both tomato hybrids 550 and 010 were averaged of 18.09 and 19.6, respectively.

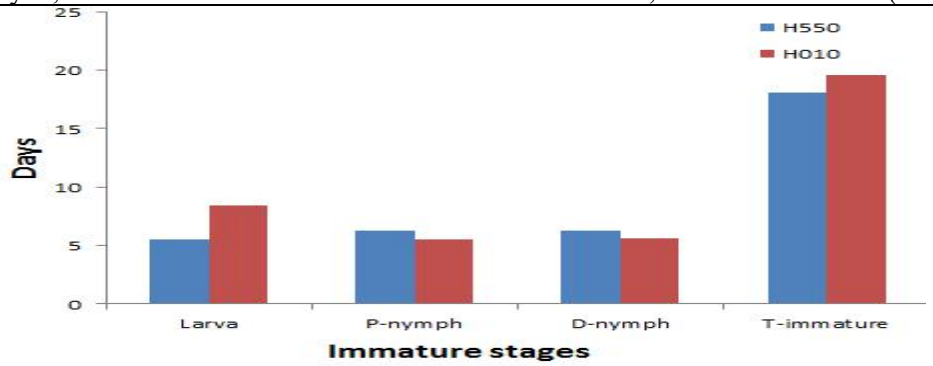

Fig. (1): Durations of *T. urticae* female stages on '550' and '010' tomato hybrids at 20^{0}C & 60% R.H.

2- Duration of male stages:

The egg incubation periods for tomato hybrids (550 and 010) were averaged of 2.8 and 3.6 days, respectively. The newly hatched larvae were observed to obtain the larval period they were 4.7 and 5.68 days, respectively.

As shown in Table (2) and Fig. 2, biological aspects of *T. urticae* males immature stages and adult longevity on tomato hybrids (550 and 010) were observed at 20°C and 60% R.H.:

Table (2): Durations of *T. urticae* male stages and longevity (Mean day ±SE) reared on '550' and '010' tomato hybrids at 20^{0}C & 60% R.H.

Tomato hybrids	Incubation period (in days)	Immature (in days) Larvae	Proto-nymph	Deuto-nymph	Total immatures	Longevity
550	2.8±0.136 (2-4)	4.7 ±0.23 (3-7)	5.83± 0.24 (4-8)	5.54 ± 0.18 (4-7)	16.08±0.42 (14-20)	6.7± 0.35 (4-9)
010	3.6±0.08 (3-4)	5.68 ±0.24 (4-8)	5.42± 0.32 (3-7)	5.57 ± 0.16 (4-7)	16.68±0.24 (15-18)	6.42± 0.2 (5-8)

16.08 and 16.68 days for two hybrids. Adult male longivety were averaged 6.7 and 6.42 days on tomato hybrids (550 and 010), respectively.

Protonymphs were recorded 5.83 and 5.42 days on tomato hybrids 550 and 010, respectively, deutonymphs were recorded 5.54 and 5.57 days. Total immatures were

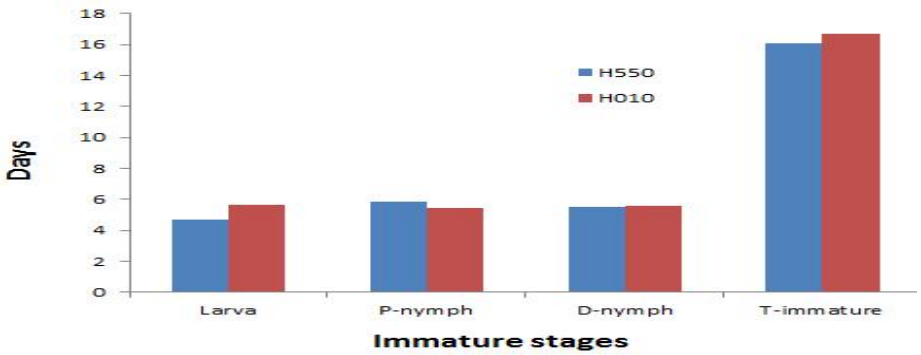

Fig.(2): Durations of *T. urticae* male stages on '550' and '010' tomato hybrids at 20^{0}C & 60% R.H.

2- Adult female longevity and fecundity:

postoviposition periods on both tomato hybrids 550 and 010 were averaged of 1.6, 3.3, 3.2 and 2.6, 2.05 and 1.5 days, respectively

As shown in Table (3) and Figs. 3, females longevity were averaged of 6.85 and 7.5 days on tomato hybrids 550 and 010, respectively, Preoviposition, oviposition and

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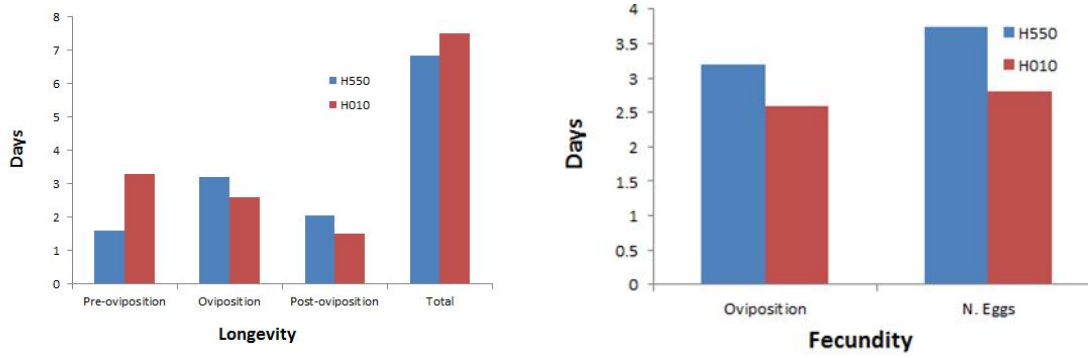
Table (3): Longevity and fecundity of *T. urticae* females (mean day ±SE) in days when reared on '550' and '010' tomato hybrids, at 20^{0}C & 60% R.H.

Tomato hybrids	Pre-oviposition	Oviposition	Post-oviposition	Longevity	No. egg female
550	1.6 ± 0.21 (0-3)	3.2 ± 0.15 (2-4)	2.05± 0.169 (1-3)	6.85 ± 0.26 (4-9)	3.75± 0.25 (2-6)
010	3.3± 0.22 (1-6)	2.6 ± 0.28 (1-4)	1.5± 0.24 (0-3)	7.5 ± 0.4 (5-10)	2.8± 0.43 (1-4)

The fecundity of females was 3.75 and 2.8 eggs/female on both tomato hybrids 550 and 010, respectively.



(a) **(b)**

Fig.(3): Female longevity (a) and fecundity (b) of *T. urticae* when reared on '550' and '010' tomato hybrids at 20^{0}C & 60% R.H.

B.2. Biological aspects of *Tetranychus urticae* on tomato hybrids (Blatenium and Super strain B) reared at 25°C and 65 %R.H:

Duration of immature stages:

4 and 2.88 days, while deutonymphs were lived for 3.8 and 2.82 days on previous hybrids respectively. Total immature were recorded 11.31 and 8.05 days, Egg hatchability were 88% and 80% on previous hybrids respectively.

As shown in Table (4) and Fig. 4, the egg incubation periods at 25°C and 65% R.H were averaged of 1 and 2 days on tomato hybrids Blatenium and Super strain B, respectively. The larval time of females were 3.44 and 2.35 days on tomato hybrids , respectively. The protonymph durations were

Table (4): Durations of *T. urticae* female stages (mean days ±SE) reared on Blatenium and Super strain B tomato hybrids at 25°C & 65% R.H.

Tomato hybrids	Incubation period (in days)	Immature (in days)			Total immatures	Egg hatch (%)
		Larvae	Protonymph	Deuto-nymph		
Blatenium	1±0.136 (1-1)	3.44 ±0.18 (2-5)	4± 0.16 (3-5)	3.8 ± 0.16 (3-5)	11.31 ± 0.22 (10-13)	88%
Super strain B	2±0.08 (1-2)	2.35 ±0.14 (1-3)	2.88± 0.14 (2-4)	2.82 ± 0.13 (2-4)	8.05 ± 0.20 (7-10)	80%

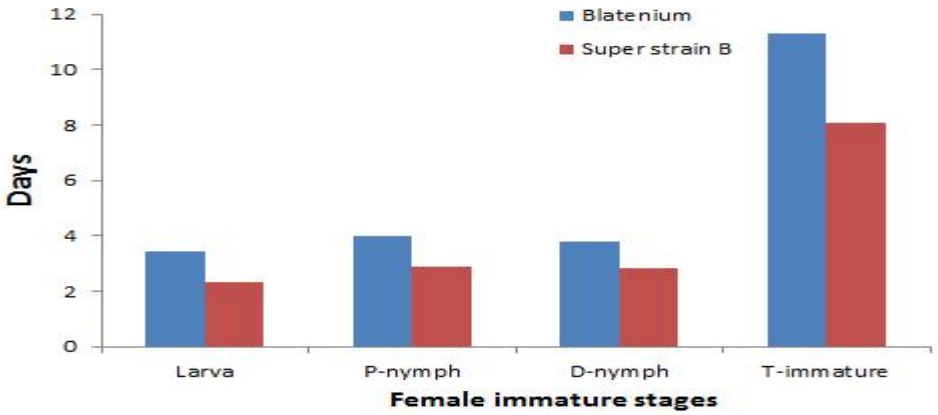


Fig. (4): Durations of *T. urticae* female stages reared on Blatenium and Super strain B at 25°C & 65% R.H.

averaged of 5 and 4.23 days on Blatenium and Super strain B respectively. Preoviposition, oviposition and postoviposition were averaged of 1.13, 2.25, 1.63 and 1.17, 1.76, 1.29 days on Blatenium and Super strain B respectively. Females fecundity were 2.75 and 3.47 eggs/female on tomato hybrids Blatenium and Super strain B, respectively.

As shown in Table (5) and Fig. 5, for males, larval duration lasted for 3.5 and 2.61 days, on tomato hybrids Blatenium and Super strain B, respectively, protonymphs were recorded 3.89 and 2.72 days, while deutonymphs were recorded 4.2 and 3.1. Total immatures were 11.6 and 8.44 days, respectively. In Table (6), Fig. (6), showed that longevity period of females were

Table (5): Durations of *T. urticae* male stages and longevity (mean day ±SE) reared on Blatenium and Super strain B tomato hybrids at 25°C &65% R.H.

Tomato hybrids	Incubation period (in days)	Immature (in days)			Total immatures	Longevity
		Larvae	Proto-nymph	Deuto-nymph		
Blatenium	1±0.136 (1-1)	3.5 ±0.12 (3-4)	3.89± 0.15 (3-5)	4.2 ± 0.12 (3-5)	11.6± 0.22 (10-13)	5.89±0.23 (4-8)
Super strain B	2±0.08 (1-2)	2.61 ±0.14 (2-4)	2.72± 0.13 (2-4)	3.1 ± 0.14 (2-4)	8.44± 0.22 (7-10)	4.8± 0.24 (7-10)

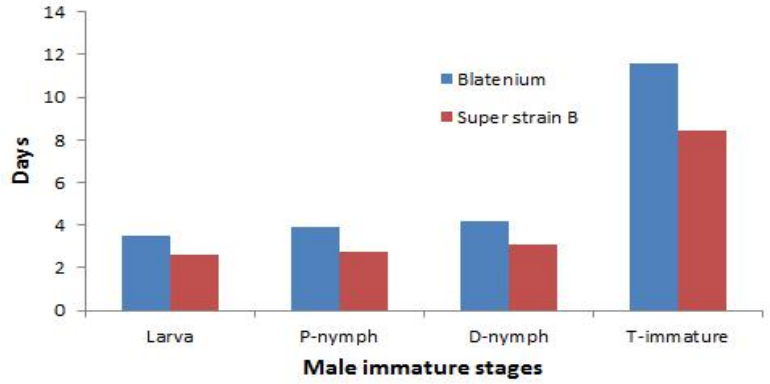


Fig. (5): Durations of *T. urticae* male stages reared on Blatenium and Super strain B tomato hybrids at 25^{0}C & 65% R.H.

Table (6): Longevity and fecundity (mean day ±SE) of *T. urticae* reared on Blatenium and Super strain B tomato hybrids at 25^{0}C & 65% R.H.

Tomato hybrids	Pre-oviposition	Oviposition	Post-oviposition	Longevity	No. eggs /female
Blatenium	1.13± 0.1 (0-2)	2.25 ± 0.2 (1-3)	1.63± 0.22 (1-3)	5± 0.33 (3-7)	2.75± 0.2 (1-4)
Super strain B	1.17± 0.12 (1-2)	1.76 ± 0.16 (1-3)	1.29± 0.11 (1-2)	4.23± 0.18 (3-6)	3.47± 0.15 (2-4)

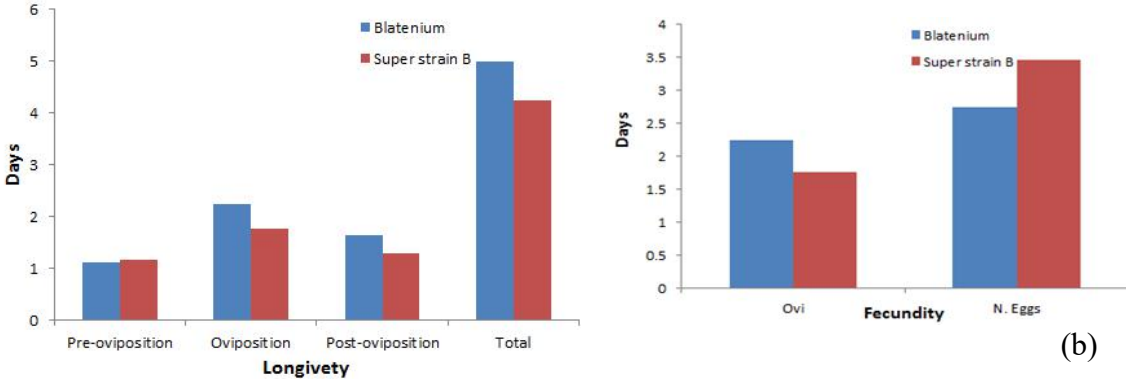


Fig. (6): Female longevity (a) and fecundity (b) of *T. urticae* reared on (Blatenium and Super strain B) tomato hybrids at 25^{0}C & 65% R.H.

generation of *T. urticae* on tomato leaves were higher than them on cucumber leaves. The life cycle were 13.58 and 9.52 days, respectively. The generation periods were 15.91 and 11.19 days on tomato leaves and cucumber leaves, respectively. On the other hand, longevity of *T. urticae* was higher on cucumber than on tomato. Longevity was 15.33 and 19.97 days on tomato and cucumber leaves, respectively.

The finding of this study is agreement with the results which obtained with **Mahmoud, 2017** who stated that the life cycle duration of *T. urticae* was 11.1, 11.3, 11.6, 11.8 and 11.4 days when reared on squash, cucumber, eggplant, tomato and bean, respectively. Moreover, **Nasr, et al., 2019** who studied the biological aspects *T. urticae* under laboratory conditions on tomato and cucumber leaves. They showed that the incubation period, the total immature stages, life cycle and

B. Effect of orange oil against *Tetranychus urticae*:

concentration 2000 ppm caused the lowest mortality proportion. The LC_{50} value of orange oil were 10796.814 and 15128.479 after 24 and 48 hours, respectively.

Data in Table (7) demonstrated that, 10000 ppm of organe oil caused the highest mortality proportion on *T. urticae* in all tested concentrations. While the

Table (7): Acaricidal activity of orange oil against *T. urticae* after 24 and 48 hours.

Concentration(ppm)	Mortality (%)	
	24 Hours	48 Hours
2000	5	8.33
5000	11.66	30
10000	38.33	46.66
Control	0	1.66
LC_{50}	15128.479	10796.814
Slope values	1.918828	2.061979

Figure (7) showed the relationship between *T. urticae* mortalities and concentrations of the orange oil. The slopes of the concentration-response lines of the orange oil for *T. urticae* adults were various.

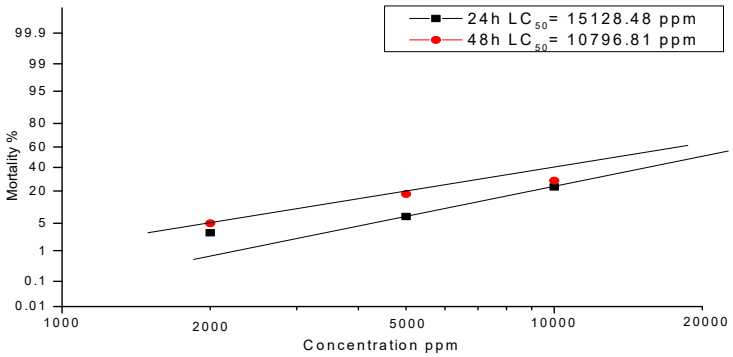


Fig. (7): Toxicity lines of orange oil after 24 and 48 hours of *T. urticae* exposure (LC_{50}=15128.479 and 10796.814).

Effect of Lc50 values of orange oil on incubation period of *T. urticae* eggs increased the incubation period to 5 days with treated eggs while in untreated eggs was 3.44 days. Mortality of immatures increased with the progress of immature age which treated with orange oil.

2- Egg produced from treated females:

As shown in table (9), LC_{50} of orange oil caused high mortality with treated females to record 5, 8, 12 and 15% compared with untreated females which caused about (1, 3 , 5 and 0) for eggs, larvae, proto-nymphs and deuto-nymphs, respectively.

As shown in Table (8), results indicated that *T. urticae* able to successfully develop when adult females were treated with LC_{50} of orange oil but its fecundity decreased to 6.98 eggs/female compared with 12.92 eggs/female in untreated females.

1- Egg treated directly which produced from untreated females:

The treatment of *T. urticae* eggs with orange oil elongated the immature periods and finally caused death the larval periods were recorded 3.6 and 2.49 & protonymphal periods were 3.31 and 3.35 and deutonymphal periods were 2.25 and 2.95 on treated and untreated eggs, respectively.

Table (8): Effect of orange oil (LC_{50}) on *T. urticae* eggs.

Periods (in days)	Egg treatment Mean±SE and (range)	Mortality (%)	Control Mean±SE and (range)	Mortality (%)
Incubation period	5±0.1	75	3.44±0.08	5
Larva	3.6±0.328 (1-6)	92	2.49±0.073 (2-4)	7
Proto-nymph	3.31±0.382 (1-5)	95	3.35±0.043 (2-4)	0
Deuto-nymph	2.25±0.479 (1-3)	98	2.95±0.047 (2-3)	0
Pre-oviposition	-	-	1.86±0.11 (0-3)	0
Oviposition	-	-	3.53±0.093 (2-5)	0
Post-oviposition	-	-	2.22±0.12 (1-5)	0
Total longevity	-	-	7.61±0.11 (7-9)	-
No. eggs/ female	-	-	14.52±0.34 (5-17)	-
Males	-	-	5.88±0.11 (5-7)	0

Table (9): Effect of orange oil (LC50) on the biological aspects of *T. urticae* females.

Periods (in days)	Females treatment Mean±SE and (range)	Mortality (%)	Control Mean±SE and (range)	Mortality (%)
Incubation period	3.59±0.07	5	3.76±0.05	1
Larva	3.34±0.089 (2-4)	8	2.59±0.083 (2-4)	3
Proto-nymph	3.41±0.077 (2-4)	12	3.67±0.053 (2-4)	5
Deuto-nymph	3.48±0.055 (3-4)	15	2.85±0.037 (2-3)	0
Pre-oviposition	1.58±0.098 (0-3)	-	1.76±0.105 (0-3)	0
Oviposition	2.82±0.120 (1-4)	-	3.73±0.093 (2-5)	0
Post-oviposition	1.91±0.109 (1-3)	-	2.31±0.130 (1-5)	0
Total longevity	6.35±0.159 (3-8)	-	7.83±0.105 (7-9)	-
No. eggs/ female	6.98±0.33 (4-12)	-	12.92±0.393 (5-17)	-
Total longevity Males	5.36±0.188 (3-8)	-	5.98±0.10 (5-7)	0

3- Egg treated directly which produced from treated females:

eggs which obtained from treated females (40, 44, 62 and 86%) compared with control (2, 3, 5 and 0%) for egg, larvae, proto-nymph and deuto-nymph, respectively.

Application of *T. urticae* in this group was the most affected treatment compared with eggs treatment and females treatment, LC_{50} of orange oil caused high mortalities of

Table (10): Effect of orange oil (LC_{50}) on the biological aspects of *T. urticae* (treated females eggs)

Periods (in days)	Eggs from treated females treatment Mean±SE and (range)	Mortality (%)	Control Mean±SE and (range)	Mortality (%)
Incubation period	5±0.1	40	3.69±0.07	2
Larva	2.29±0.153 (1-4)	44	2.59±0.083 (2-4)	3
Proto-nymph	3.06±0.322 (1-5)	62	3.57±0.053 (2-4)	5
Deuto-nymph	3.83±0.477 (2-5)	86	2.85±0.037 (2-3)	0
Pre-oviposition	-	-	1.98±0.11 (0-3)	0
Oviposition	-	-	4.11±0.092 (2-5)	0
Post-oviposition	-	-	3.11±0.12 (1-5)	0
Total longevity	-	-	9.20±0.107 (7-10)	-
No. eggs/ female	-	-	16.54±0.35 (5-17)	-
Total longevity Males	-	-	6.12±0.10 (5-7)	0

longifolia and Henna *Lawsonia inermis* extracts against the tested mite *Tetranychus urticae* . The maximum mean mortality (88.0 ± 0.58%) of the most effective citrus peel oil was recorded with the highest concentration (10,000 ppm) after 48 hrs. of exposure followed by Henna *L. inermis* (78.0 ± 0.58%) then Wildment *M. longifolia* (62.0 ± 1.16%) at the same concentration and exposure time, while, minimum mean mortality was produced by Wildment *M. longifolia* extract (10.0 ± 0.40%) at lowest concentration of 1250 ppm revealed that, the mean mortalities of C. *sinensis, L. inermis* and *M. longifolia* after 24 hrs. (lowest exposure time) of treatment were 74.0 ± 0.87, 74.0 ± 0.86 and 60.0 ± 0.55% at the highest concentration (10,000 ppm) which significantly increased to 88.0 ± 0.58, 78.0 ± 0.58 and 62.0 ± 1.16% after 48 hrs. (the highest exposure time) against *T. urticae*. Also, the mortality of the other treatments was significantly increased with the increase in exposure time and concentration, this meaning that mortality of tested mite was time and concentration dependent.

As shown in Table (11), when females were treated with different concentrations of orange oil (20000, 10000,5000 and 2000 ppm) the eggs which were laid after female spraying were hatched and their incubation periods lasted for 7, 6, 6, and 7 days on the previous concentrations, respectively compared with 4 days for control. The larval periods were lasted for 2.4, 2.5, 2.29 and 2.58 days compared with 2.54 days for control. The proto-nymphal and deuto-nymphal periods were lasted for 2, 3.38, 3.4 and 3.4 days and 3.5, 3.6, 3.5 and 3.6 days compared with 3.4 and 3.06 days for control, respectively. In case of the three other concentrations, females failed to develop and were died before reach to the adult stage, while some males reach to the adult stage for less days compared with control. The findings of acaricidal effect of orange oil are fully agreement with several studies. **Hassan, et al., 2021** indicated that citrus peel oil and the two methanolic leaves extracts showed significant toxicity against *T. urticae.* Mean toxic effect of citrus peel oil was the higher and more potent than Wildment *Mentha*

Table (11): Effects of different concentrations of orange oil on *T. urticae* biological aspects.

Periods (in days) Mean±SE and (range)	20000 ppm	10000 ppm	5000 ppm	2000 ppm	Control
Incubation period	7.00	6.00	6.00	7.00	4.00
Larvae	2.4±0.4 (1-3)	2.5±0.189 (2-3)	2.29±0.286 (1-3)	2.58±0.229 (2-4)	2.54±0.077 (2-4)
Proto-nymph	2±0.316 (1-3)	3.38±0.183 (3-4)	3.4±0.245 (3-4)	3.4±0.245 (3-4)	3.4±0.086 (2-4)
Deuto-nymph	3.5±0.5 (3-4)	3.6±0.4 (3-5)	3.5±0.5 (3-4)	3.6±0.245 (3-4)	3.06±0.034 (2-5)
Pre-oviposition	-	-	-	-	1.67±0.138 (0-3)
Oviposition	-	-	-	-	3.6±0.132 (3-5)
Post-oviposition	-	-	-	-	2.47±0.171 (0-4)
Female longevity	-	-	-	-	7.73±0.126 (7-9)
No. egg female	-	-	-	-	9.1±0.43 (2-14)
Males	-	-	-	4.5±0.5 (4-5)	6.55±0.135 (6-8)

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الملخص العربى

بعض العوامل المؤثرة على الظواهر البيولوجية لـ(*Tetranychus urticae* Koch (Acari: Tetranychidae على أصناف الطماطم

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تم إجراء بعض الدراسات البيولوجية على النوع *Tetranychus urticae* بالتربيه على أوراق نبات الطماطم على الصنفين 010 و550 على درجة حرارة 20مْ ورطوبة نسبيه 60 % وعلى الصنفين Blatenium , Super strain B على درجة حراره 52مْ ورطوبة نسبيه 65% . بالنسبه بالنسبه للصنفين 010 و550 بلغ متوسط حياة الذكور والاناث غير البالغة (16.68 و 16.08)(19.6 و 18.09) يوماً على التوالى بينما بلغ متوسط حياة الذكور والاناث البالغه (6.42 و 6.7) (7.5 و 6.85) يوم على التوالي. ومتوسط عدد البيض لكل أنثى 3.75 و نسبة االفقس 90٪ مع فترة حضانه 2.8 يوم للصنف 550 بينما الصنف 010 كان متوسط عدد البيض لكل أنثى 2.8 و نسبة الفقس 88٪ مع فترة حضانه 3.6 يوم وذلك على درجة حرارة 20ْم ورطوبة نسبيه 60 %.

أما بالنسبة للإناث على اصناف الطماطم Blatenium) وSuper strain B) بلغ متوسط عمر الاطوار الغير بالغه 11.31 و 8.05 يوم على التوالي بينما الذكور كانت 11.6 و 8.44 يوم على التوالي. بينما فترة حياة الاناث البالغة فقد بلغ متوسط 5 أيام و 4.23 يوم على التوالي ، بينما بلغ متوسط حياة الذكور البالغة 5.89 و 4.8 يوم على التوالي. وكان عدد البيض 2.75 و 3.47 بيضة / أنثى على التوالي وبلغت نسبة فقس البيض 88٪ و 80٪ على التوالى وذلك على درجة حرارة 25ْم ورطوبة نسبيه 65 %.

كما تمت دراسة تأثير ثلاثه تركيزات (10000 ، 5000 ، ppm2000) من زيت البرتقال على الظواهر البيولوجيه لأفراد النوع *T. urticae* وقد أظهر تأثيره نسب موت مختلفة بالمقارنة بالكنترول.

الكلمات الدالة: الطماطم , أكاروس العنكبوت الاحمر, بيولوجى ، زيت البرتقال.