BIOLOGICAL STUDIES ON CITRUS BROWN MITE *EUTETRANYCHUS ORIENTALIS* (KLEIN) (TETRANYCHIDAE: ACARINA) WHEN FED ON LEAVES OF CARICA PAPAYA VARIETIES UNDER LABORATORY CONDITIONS

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Abstract

This work was carried out under laboratory conditions to study the biological aspects of citrus brown mite, *Eutetranychus orientalis* (Kelin) when fed on leaves of carica papaya (Solo and Fershold) varieties under laboratory conditions of 25 and 30°C and (60 ± 5% R.H.). The biological aspects of *E.orientalis* could be studied, the incubation period, life cycle, generation and life span for both female and male, in addition to female pre-ovipostion, oviposition, post-oviposition, and total number of female's deposited eggs. Life cycle lasted (13.7 & 11.1) and (12.7 & 10.5) days with solo variety at 25 and 30°C for female and male, respectively, while it elongate with fershold to (15.1& 13.3) and (14.2 & 12.2) days at the same pattern. On the other hand, female pre-oviposition, oviposition and post-oviposition periods durated (1.9 & 1.2), (10.3 & 8.7) and (3.2 & 2.1) days respectively at 25 and 30 °C on solo variety, while, on fershold variety it lasted (1.6 & 1.00), (12.3 & 10.6) and (2.7 & 2.2) days, respectively. Solo carica papaya variety was more favorable host of *E.orientalis* development and fecundity than fershold variety. Therefore, solo variety more susceptible to citus brown mite *E.orientalis*.

INTRODUCTION

The citrus brown mite *Eutetranychus orientalis* (Klein) attacks citrus and is a persistent pest in upper Egypt. It prefers sour lemon rather than mandarine, orange or sweet lemon, and also infests castor, peach, cucurbits, beans and cotton. Mites are usually on the upper side of leaf surface along the midrib. Severe infestations occur during summer, especially in nurseries. About 19 generations occur per year depending on temperature tranging from 16 to 30°C, one generation takes 1.5-11 weeks, eggs hatch in 4-18 days, immatures develop in 4-53 days and adult longevity lasts 6-20 days. An average female lays 10-25 eggs Zahar (1984).

Citurs brown mite *E.orientalis* was record recently on carica papaya in different localilies of Egypt and cause sever damage for leaves and reduction of the quality and quantity of the production. (Bana and Channa 1972, Lai 1977, Salmon 1978, Lu and Wang 2005 and Zhou *et al*., 2006).

This work aims to study the effect of two varieties of carica papaya and temperature on biological aspects of citrus brown mite *E.orientalis* under laboratory conditions.

MATERIALS AND METHODS

To study the effect of different degree of temperature and host plant variety on the biology of the citurs brown mite *Eutetranychus orientalis* (Klein), the following technique was applied: Leaves of carica papaya varieties solo and fershold were used for rearing the mite under the laboratory conditions of 25 and 30°C and 60 ± 5% R.H. Leaves were taken and well washed with running water to remove any possible residuals or mites which may be found were made and surrounded by tangle foot, which acts as a barrier to prevent mite individuals from ascaping. Leaves were placed on cotton wool in petri dishes of 12.5cm diameter suitable moisture was maintained by adding few drops of water.

Pure culture of *E.orientalis* was maintained at the laboratory. Newly hatching larvae were transferred singly to leaf discs (I cm diameter) and left to continue its life span. Newly emerged females were capulated and left to deposited eggs until dead. Examination was made twice daily, early morning and before sunset. Biological aspects of incubation, life cycle, generation life span of both female and male, in addition to female preovipesition, oviposition and postoviposition periods were recorded.

RESULTS AND DISCUSSION

The biological aspects of *Eutetranychus orientalis* (Klein) estimated the development stages and its fecundity on carica papaya varieties under laboratory conditions of temperature 25 and 30°C and 60 ± 5% R.H.

Duration of immature Stages

1- Incubation period

Data in tables (1 & 2) demonstrated that the incubation period of female and male lasted (4.8 ± 0.62 & 4.6 ± 0.52) and (3.9 ± 0.59 & 3.8 ± 0.38) days at 25 and 30°C respectively, when they fed on solo variety, while on fershold variety it reached to (5.3 ± 0.81 & 4.9 ± 0.58) and (4.8 ± 0.75 & 4.6 ± 0.45) days for female and male at the same trend.

2- Immature Periods

1- Female and male larval stage stayed (3.6 ± 0.66 & 3.4± 0.44) and (2.8 ± 0.38 & 2.5 ± 0.41) days when fed on solo variety, while it durated (3.9 ±

0.83 & 3.8 ± 0.26) and (3.5 ± 0.27 & 3.1 ± 0.56) days on fershold variety, at 25 & 30°C and 60 ± 5% RH.

2- The protonymphal stage lasted (2.5 ± 0.44 & 2.3 ± 0.37) and (2.1 ± 0.51 & 2.00 ± 0.50) days for female and male at 25 and 30°C, at the same pattern when fed on leaves of solo variety. While, this period lasted (2.8 ± 0.34 & 2.6 ± 0.52) and (2.2 ± 0.38 & 2.1 ± 0.56) days, for both females and male when mite fed on leaves of fershold variety respectively.

3- The deutonymphal stage durated (2.7 ± 0.54 & 2.4 ± 0.44) and (2.3 ± 0.39 & 2.1 ± 0.24) days for female and male on solo variety, respectively, while it elongate to (3.1 ± 0.48 & 2.8 ± 0.82) and (2.7 ± 0.38 & 2.3 ± 0.47) days respectively for female and male when they fed on leaves of fershold variety at 25 & 30°C and 60 ± 5% RH.

1- Total Immature Periods

The average total immature stages of females and males were (8.8 ± 0.97 & 8.1 ± 0.86) and (7.2 ± 0.72 & 6.6 ± 0.69) days on solo variety, while it averaged (9.8 ± 1.07 & 9.3 ± 52) and (8.5 ± 0.38 & 7.6 ± 1.18) days on fershold variety respectively.

2- Life Cycle

Data in Tables (1 , 2) revealed that the average life cycle period lasted (13.7 ± 1.06 & 12.7 ± 1.28) and (11.1 ± 0.91 & 10.5 ± 0.87) days for female and male when mite fed on leaves of solo variety at 25 and 30°C, respectively. Female and male life cycle was longer with fershold variety than solo variety as well as at 25°C than 30°C, where by the life cycle of female and male at 25 and 30°C durated (15.1 ± 0.63 & 14.2 ± 0.38) and (13.3 ± 0.84 & 12.2 ± 1.29) days, when they reared on leaves of fershold variety.

Table 1. Duration (days) of Eutetranychus orientalis (Klein) on leaves of solo carica papaya variety at 25 and 30oC and relative humidity 60 + 5%.

Developmental Stages	Duration in days			
	Mean ± SD at 25°C		Mean ± SD at 30°C	
	Female	Male	Female	Male
Incubation Period	4.8 ± 0.62	4.6 ± 0.52	3.9 ± 0.59	3.8 ± 0.38
Larva	3.6 ± 0.66	3.4 ± 0.44	2.8 ± 0.38	2.5 ± 0.41
Protonymph	2.5 ± 0.44	2.3 ± 0.37	2.1 ± 0.51	2.00 ± 0.50
Deutonymph	2.7 ± 0.54	2.4 ± 0.44	2.3 ± 0.39	2.1 ± 0.24
Total Immature	8.8 ± 0.97	8.1 ± 0.86	7.2 ± 0.72	6.6 ± 0.69
Life Cycle	13.7 ± 1.06	12.7 ± 1.28	11.1 ± 0.91	10.5 ± 0.87
Generation Period	15.5 ± 1.01	–	12.42 ± 0.95	–
Longevity	15.5 ± 1.39	9.75 ± 1.03	12.00 ± 1.13	7.19 ± 1.34
Life Span	29.5 ± 1.95	22.43 ± 1.67	23.17 ± 1.27	17.64 ± 1.65

Table 2. Duration (days) of Eutetranychus orientalis (Klein) on leaves of fershold carica papaya variety at 25 and 30oC and relative humidity 60 + 5%.

Developmental Stages	Duration in days			
	Mean ± SD at 25°C		Mean ± SD at 30°C	
	Female	Male	Female	Male
Incubation Period	5.3 ± 0.81	4.9 ± 0.58	4.8 ± 0.75	4.6 ± 0.45
Larva	3.9 ± 0.83	3.8 ± 0.26	3.5 ± 0.27	3.1 ± 0.56
Protonymph	2.8 ± 0.34	2.6 ± 0.52	2.2 ± 0.38	2.1 ± 0.56
Deutonymph	3.1 ± 0.48	2.8 ± 0.82	2.7 ± 0.38	2.3 ± 0.47
Total Immature	9.8 ± 1.07	9.3 ± 0.52	8.5 ± 0.38	7.06 ± 1.18
Life Cycle	15.1 ± 0.63	14.2 ± 0.38	13.3 ± 0.84	12.2 ± 1.29
Generation Period	16.75 ± 0.92	–	14.31 ± 0.70	–
Longevity	16.6 ± 2.26	11.16 ± 1.17	13.8 ± 1.54	9.14 ± 1.34
Life Span	31.79 ± 2.67	25.75 ± 1.21	27.2 ± 1.18	21.36 ± 1.03

Table 3. Longevity and Fecundity of Eutetranychus orientalis (Klein) when fed on leaves of solo carica papaya variety

Temperature	Pre-Oviposition Period	Oviposition Period	Post-Oviposition Period	Fecundity	
				No.f eggs	Daily rate
25°C	1.9 ± 0.58	10.3 ± 1.70	3.2 ± 0.63	19 ± 2.62	2.37 ± 0.14
30°C	1.2 ± 0.34	8.7 ± 0.89	2.1 ± 0.56	31 ± 2.31	3.87 ± 0.23

Table 4. Longevity and Fecundity of Eutetranychus orientalis (Klein) when fed of leaves of fershold carica papaya variety

Temperature	Pre-Oviposition Period	Oviposition Period	Post-Oviposition Period	Fecundity	
				No.f eggs	Daily rate
25°C	1.6 ± 0.47	12.3 ± 1.82	2.7 ± 0.62	16 ± 2.31	2 ± 4.11
30°C	1.00 ± 0.42	10.6 ± 1.85	2.2 ± 0.75	22 ± 3.1	2.75 ± 0.16

5- Female Longevity

Data in tables (3 & 4) demonstrated that, the average of pre-oviposition period lasted 1.9 ± 0.58 and 1.2 ± 0.34 days on solo variety at 25 and 30°C, respectively, while reached to 1.6 ± 0.47 and 1.00 ± 0.42 days on fershold variety at the previous temperature. The oviposition period of female durated (10.3 ± 1.70 & 8.7 ± 0.89) and (12.3 ± 1.82 & 10.6 ± 1.85) days on solo and fershold varieties at 25 and 30°C, respectively, the average post-oviposition period were (3.2 ± 0.63 &

2.1 ± 0.56) and (2.7 ± 0.62 & 2.2 ± 0.75) days on the above mentioned carica papaya varieties at the previous temperature.

The average generation period lasted (15.5 ± 1.01 & 12.42 ± 0.95) and (16.75 ± 0.92 & 14.13 ± 0.70) days at 25 and 30°C on solo and fershold varieties, respectively.

Female longevity lasted (15.5 ± 1.39 & 12.00 ± 1.13) and (16.6 ± 2.26 & 13.8 ± 1.54) while male adulthood durated (9.75 ± 1.03 & 7.14 ± 1.34) and (11.16 ± 1.17 & 9.14 ± 1.34) days when they fed on the also mentioned hosts at 25 and 30°C.

Females deposited an average of 19 and 31 eggs with a daily rate of 2.37 and 3.87 eggs at 25 and 30°C, when females fed on leaves of solo variety, while the average number of deposited eggs decreased to 16 and 22 eggs with a daily rate of 2.0 and 2.75 eggs on leaves of fershold variety at the previous temperature. Solo leaves carica papaya variety, highly stimulated of *E.orientalis* fecundity than fershold variety.

6- Life Span

The average life span of *E.orientalis* when, reared on leaves of solo variety were (29.05 ± 1.95 & 22.43 ± 1.67) and (23.17 ± 1.27 & 17.64 ± 1.65) days of female and male at 25 and 30°C, respectively, while it averaged (31.79 ± 2.67&25.75 ± 1.21) and (27.2 ± 1.18 & 21.36 ± 1.03) days of female and male at the previous temperature when this mite reared on leaves of fershold variety. Female life span longer than male under different conditions.

The effect of two carica papaya varieties solo and fershold on the biology of *E.orientalis* was investigated at constant temperature of 25 and 30°C and relative humidity 60 ± 5%, these results demonstrated that leaves of solo variety more favorable for *E.orientalis* development and fecundity than leaves of fershold variety, thus solo variety was more susceptible to oriental red mite *E.orientails* infestation than fershold variety. On the other hand the biodata showed that positive relationship between female fecundity and temperature. This results agreements with, Banu and Channa (1972) Jeppson *et al* (1975), Lai (1977), Rasmy (1978), Salmon (1978), Dhooria (1981), Smith-Mayer (1981), Dhooria and Butani (1984), Hafez *et al* (1984), Zahar (1984), Tanigoshi *et al* (1990) Yadav *et al* (2003), Lu and Wang (2005) and Zhou *et al* (2006).

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دراسات بيولوجية لاكاروس الموالح البنى Eutetranychus orientalis عند تربيته على أوراق صنفين من الباباظ تحت ظروف معملية

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يعتبر الباباظ من الفاكهة الاستوائية وقد نجحت زراعته فى مصر بمعظم المحافظات وقد وجد إصابته الشديدة كعائل جديد لأكاروس الموالح البنى حيث يصيب السطح العلوى للأوراق ويؤدي إلى إصفرار الأوراق وتساقطها فى حالة الإصابة الشديدة وبالتالي يؤثر على محصول الباباظ كماً ونوعاً لذا كان من الضرورى عمل دراسة إحيائية على أوراق صنفين من الباباظ هما سولو، فيرشولد على درجتي حرارة مختلفة 25 ، 30°م ورطوبة نسبية 6 ± 5%.

وتهدف الدراسة إلى معرفة تأثير صنفين من الباباظ ودرجة الحرارة على تطور وخصوبة أكاروس الموالح البنى ومدى قابلية الصنفين للإصابة بهذه الآفة.

وتشير النتائج المتحصل عليها بأن دورة حياة أكاروس الموالح البنى عند تربيته على أوراق الباباظ صنف سولو بلغت 13.7 ، 11.1 يوماً فى حالة الأنثى أما فى حالة الذكر فقد بلغت 12.7 ، 10.5 يوماً على درجتى حرارة 25 ، 30°م على التوالى. أما بالنسبة لدورة الحياة لأكاروس الموالح البنى عند تربيته على أوراق الباباظ صنف فيرشولد فقد بلغت 15.1 ، 13.3 يوماً فى حالة الأنثى أما فى حالة الذكر فقد بلغت 14.2 ، 12.2 يوم على درجتى حرارة 25 ، 30°م وكان عدد البيض التى تضعه الأنثى التى تم تربيتها على أوراق صنف سولو بلغت 19 ، 31 بيضة على درجتى حرارة 25 ، 30°م على التوالى، أما بالنسبة لصنف فيرشولد فقد بلغ عدد البيض للأنثى 16 ، 22 بيضة على درجتى حرارة 25 ، 30°م على التوالى.

على ضوء هذه النتائج نجد أن صنف سولو أكثر قابلية للإصابة بأكاروس الموالح البنى وكذلك كفاءة الإناث فى وضع البيض أعلى، ودورة الحياة أسرع، كما وجد أن درجة الحرارة لها تأثير إيجابي على نشاط وخصوبة الإناث فى وضع البيض.