

**BIOLOGICAL STUDIES ON THE MANGO RED MITE,
OLIGONYCHUS MANGIFERUS (R.&S.) (TETRANYCHIDAE:
ACARINA) WHEN FED ON DIFFERENT MANGO LEAVES
VARIETIES**

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(Manuscript received 10 October 2007)

Abstract

The biological aspects of the mango red mite, *Oligonychus mangiferus* (R. & S.) studied on the different mango leaves varieties (Ewais, Zebda, Mabrouka, Alphons, LangraBenares and Keitt) under the laboratory condition of 25±2°C temperature and 65±5% relative humidity.

The biological aspects of mite, *O. mangiferus* on the six mango varieties such as egg stage (incubation period), immature periods, total developmental periods, life cycle, oviposition periods, pre-oviposition period, oviposition period, post-oviposition period, adult's longevity, and adult's life span were approximately similar in all varieties, while, female's fecundity was significantly increased when mite fed on leaves of Keitt and LangraBenares varieties than other mango leaves varieties (Ewais, Zebda, Mabrouka, and Alphons). Keitt mango variety was more favorable for *O. mangiferus* development and fecundity than leaves of LangraBenares, Ewais, Alphons, Zebda and Mabrouka. Keitt leaves highly elongated the mite oviposition period, longevity and highly enhanced the female fecundity. These explain the fact that leaves of Keitt mango variety were more susceptible to mite infestation than other varieties.

INTRODUCTION

In Egypt, mango (*Mangifera indica* L.) is considered one of the great economic, importance crops for local consumption and exportation, which helps to increase the national and grower's income. The mango trees are infesting with dangerous mite species such as, the mango red mite, *Oligonychus mangiferus* (R.&S.) (Tetranychidae: Acarina). *O. mangiferus* proved to be the most important pest as it destroyed the inflorescences and increase the number of infesting leaves (Zaher and Osman 1970). Also, Zaman and Maiti (1994) recorded *O. mangiferus* (R.&S.) on mango seedlings in a nursery. It infesting mango, loquat, peach and Vilus it widely and distributed in Asia, India, Pakistan, Africa, Egypt, Mauritius, Mozambique, Pacific Islands, and Hawaii (Anonymous 1965). Hanna *et al.* (1980) recorded it infesting ornamental and medical

plants in Giza and Qalyubiya Governorates in Egypt also Gerson (1986) recorded it in the first time in Israel.

The present work is an attempt to study the effect of mango leaves varieties, i.e. Ewais, Zebda, Mabrruka, Alphons, LangraBenares and Keitt on the biology and fecundity of the mango red mite, *Oligonychus mangiferus* (R.&S.) under the laboratory conditions ($25\pm 2^{\circ}\text{C}$ temperature and $65\pm 5\%$ R.H.).

MATERIALS AND METHODS

To study the effect of host plant variety on the biology of the mango red mite, *Oligonychus mangiferus* (R.&S.), the following technique was applied : leaves of Ewais, Zebda, Mabrruka, Alphons, LangraBenares and Keitt mango trees varieties were used for rearing the mite under the laboratory condition at $25\pm 2^{\circ}\text{C}$ temperature and $65\pm 5\%$ relative humidity. Leaves were placed on cotton wool in Petri dishes of 12.5cm diameter. Suitable moisture was maintained by adding few drops of water. Pure of *Oligonychus mangiferus* was maintained at the laboratory. Hatching larvae were transferred singly to a leaf disk (2m diameter) and left to continue their life span. Newly-emerged females were copulated and left deposit their eggs. Examination was made twice daily. Biological aspects were recorded.

Statistical analysis

The data was subjected to analysis of variance (ANOVA) and the means were compared by L.S.D. test at 0.05 level, using SAS program (SAS, 1988).

RESULTS AND DISCUSSION

Data in Table (1) showed that the biology of mango red mite, *Oligonychus mangiferus* (R. & S.) on Ewais, Alphons, Zebda, Mabrouka and Keitt mango varieties trees. During the study of population dynamics was found the Keitt, Ewais and Alphons mango varieties more infested with *O. mangiferus* than Zebda and Mabrouka varieties. So the biology of *O. mangiferus* estimated the developmental stages and its fecundity on these mango varieties under laboratory condition with constant temperature $25\pm 2^{\circ}\text{C}$ and relative humidity $65\pm 5\%$.

1. Durations of immature stages

The duration of immature stages of *O. mangiferus* were studied where mites fed on different varieties of mango leaves (Ewais, Zebda, Mabrruka, Alphons, LangraBenares and Keitt) under laboratory conditions.

2. 1.1. Egg stage (incubation period)

The incubation period of *O. mangiferus* lasted 6.2 ± 0.42 , 6.2 ± 0.42 , 6.3 ± 0.48 , 6.3 ± 0.48 , 6.3 ± 0.48 and 6.3 ± 0.48 days for females, while reached to 6.2 ± 0.42 , 6.2 ± 0.42 , 6.3 ± 0.48 , 6.3 ± 0.48 and 6.3 ± 0.48 days for males when they fed on Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka varieties respectively.

1.2. Immature periods

The average active larva duration of females & males were 1.8 ± 0.26 & 1.75 ± 0.26 , 1.75 ± 0.26 & 1.75 ± 0.26 , 1.75 ± 0.26 & 1.7 ± 0.26 , 1.85 ± 0.33 & 1.85 ± 0.24 , 2.2 ± 0.26 & 2.1 ± 0.21 and 2.25 ± 0.26 & 2.2 ± 0.26 days on Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka varieties respectively at $25 \pm 2^\circ\text{C}$ temperature and $65 \pm 5\%$.

The active protonymph duration were durated 1.05 ± 0.16 & 0.90 ± 0.21 , 1.15 ± 0.33 & 0.85 ± 0.24 , 1.1 ± 0.22 & 0.09 ± 0.21 , 1.2 ± 0.26 & 0.90 ± 0.21 , 1.25 ± 0.26 & 1.2 ± 0.26 & 1.4 ± 0.21 & 1.3 ± 0.26 days for females & males, while the deutonymph duration were averaged 0.90 ± 0.21 & 0.80 ± 0.26 , 0.90 ± 0.21 & 0.85 ± 0.24 , 1.1 ± 0.22 & 0.85 ± 0.24 , 1.15 ± 0.21 & 0.90 ± 0.21 , 1.2 ± 0.26 & 0.90 ± 0.21 & 1.2 ± 0.26 & 0.90 ± 0.21 days when mite fed on the above mentioned varieties at the same trend.

The quiescent larva, protonymph and deutonymph stages for females averaged 0.75 ± 0.26 , 0.80 ± 0.26 and 0.65 ± 0.24 days on Keitt variety, 0.75 ± 0.26 , 0.90 ± 0.21 and 0.65 ± 0.24 days on LangraBenares variety, 0.80 ± 0.26 , 0.85 ± 0.24 and 0.75 ± 0.26 days on Ewais variety, 0.85 ± 0.24 , 0.80 ± 0.26 and 0.80 ± 0.26 days on Alphons variety, 0.90 ± 0.21 , 0.90 ± 0.21 and 0.80 ± 0.26 days on Zebda variety and 0.90 ± 0.21 , 0.95 ± 0.16 and 0.85 ± 0.24 days on Mabrouka variety respectively.

While, quiescent larva, protonymph and deutonymph stages for males lasted 0.75 ± 0.26 , 0.85 ± 0.24 and 0.65 ± 0.24 days on Keitt variety, 0.75 ± 0.26 , 0.75 ± 0.26 and 0.65 ± 0.24 days on LangraBenares variety, 0.80 ± 0.26 , 0.70 ± 0.26 and 0.80 ± 0.26 days on Ewais variety, 0.80 ± 0.26 , 0.75 ± 0.26 and 0.80 ± 0.26 days on Alphons variety, 0.90 ± 0.21 , 0.85 ± 0.24 and 0.70 ± 0.26 days on Zebda variety and 0.90 ± 0.21 , 0.75 ± 0.26 and 0.80 ± 0.26 days on Mabrouka variety, respectively.

1.3. Total developmental periods

The average of total immature stages of females and males were averaged 5.95 ± 0.37 and 5.7 ± 0.26 days on Keitt variety, 6.1 ± 0.46 and 5.65 ± 0.57 days on LangraBenares variety, 6.35 ± 0.71 and 5.75 ± 0.63 days on Ewais variety, 6.65 ± 0.67 and 6 ± 0.67 days on Alphons variety, 7.25 ± 0.42 and 6.65 ± 0.41 days on Zebda variety and 7.55 ± 0.50 and 6.85 ± 0.67 days on Mabrouka variety respectively. This difference was found statistical significant.

Statically analysis revealed that, there are highly significantly difference in the total immature stages of *O. mangiferus* females when reared on different mango leaves varieties (Ewais, Zebda, Mabrouka, Alphons, LangraBenares and Keitt) where $F = 8.46$, while non-significant difference in males where $F = 1.43$.

1.4. Life cycle

The average life cycle period were 12.15 ± 0.34 , 12.3 ± 0.59 , 12.65 ± 0.53 , 12.95 ± 0.66 , 13.55 ± 0.37 and 13.85 ± 0.67 days for females, 11.9 ± 0.40 , 11.8 ± 0.35 , 12.05 ± 0.60 , 12.3 ± 0.35 , 12.95 ± 0.72 and 13.15 ± 0.75 days for males when mites fed on Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka varieties, respectively. This difference was found statistical significant.

Statically analysis revealed that, there are significantly difference in the life cycle of *O. mangiferus* females when reared on different mango leaves varieties (Ewais, Zebda, Mabrouka, Alphons, LangraBenares and Keitt) where $F = 3.38$, while non-significant difference in males where $F = 2.33$.

1.5. Oviposition periods

1.5.1. Pre-oviposition period

The average pre-oviposition period lasted 2.1 ± 0.21 , 2.1 ± 0.32 , 2.2 ± 0.42 , 2.3 ± 0.48 , 2.3 ± 0.48 and 2.3 ± 0.48 days on Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka varieties, respectively.

The average generation period were 14.25 ± 0.35 , 14.4 ± 0.61 , 14.85 ± 0.53 , 15.25 ± 0.98 , 15.85 ± 0.47 and 16.15 ± 0.75 days at the same pattern. This difference was found statistically significant.

1.5.2. Oviposition period

The average oviposition period were 19.7 ± 0.48 , 19.6 ± 0.52 , 18.5 ± 0.85 , 18 ± 0.47 , 16.2 ± 0.63 and 16 ± 0.47 days on Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka mango varieties, respectively. This difference was found statistically significant.

1.5.3. Post-oviposition period

The average post-oviposition period were 2 ± 0.47 , 1.80 ± 0.42 , 2.7 ± 0.48 , 2.9 ± 0.74 , 4.4 ± 0.70 and 4.6 ± 0.52 days on the above mentioned mango varieties.

1.5. Adult's longevity

Females longevity when female reared on Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka varieties were 23.8 ± 0.41 , 23.5 ± 0.53 , 23.4 ± 1.26 , 23.2 ± 0.63 , 22.9 ± 1.1 and 22.9 ± 0.99 days respectively. While male adult hood when reared on the above mentioned mango varieties durated 19 ± 1.05 , 17.1 ± 0.74 ,

17.1±0.74, 17.1±0.74, 15.4±0.70 and 14.9±0.74 days, respectively. This difference was found statistically significant.

Statistical analysis revealed that, there are non-significant difference in female longevity of *O. mangiferus* when reared on different mango leaves varieties (Ewais, Zebda, Mabrouka, Alphons, LangraBenares and Keitt) where $F = 0.84$, while found highly significant difference in male adulthood where $F = 38.42$.

1.6. Adult's life span

The average life span of *O. mangiferus* when reared on leaves of Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka varieties were averaged 36.15±0.41, 35.8±0.63, 36.05±1.14, 36.15±0.75, 36.45±1.01 and 36.75±1.35 days for females, 30.9±1.13, 28.9±0.97, 29.15±0.75, 29.4±0.61, 28.35±0.91 and 28.05±1.17 days for males, respectively. This difference was found statistically significant.

The mean life span for males was shorter than the females. The results showing significant difference on varieties. Significant in fecundity was evident when females reared on leaves of Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka varieties. Keitt leaves mango variety, highly stimulated of *O. mangiferus* fecundity than LangraBenares, Ewais, Alphons, Zebda and Mabrouka varieties. The females deposited 42.5±1.1, 40 ±0.67, 34.4±0.97, 32.1±1.60, 23.6±0.84 and 20.6±0.52 eggs with a daily rate of 2.16±0.07, 2.04±0.06, 1.86±0.09, 1.79±0.11, 1.46±0.09 and 1.29±0.04 eggs on Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka varieties, respectively. This mean that, female's fecundity was significantly increased when fed on leaves of Keitt and LangraBenares varieties.

Statistical analysis revealed that, there are non-significant difference in the female life span of *O. mangiferus* when reared on different mango leaves varieties (Ewais, Zebda, Mabrouka, Alphons, LangraBenares and Keitt) where $F = 0.94$, while found highly significant difference in males where $F = 9.40$.

Table 1. Biological aspects of immature stages of female and male of *Oligonychus mangiferus* (R.&S.) on Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka mango varieties trees at 25±2°C and 65±5% R.H. in 2005 season.

Developmental stages of predator	Average (in days) of immature stages of <i>O. mangiferus</i> on mango varieties:														F value
	Keitt		Langra Benares		Ewais		Alphons		Zebda		Mabrouka		Femal e	Male	
	Femal e	Male	Femal e	Male	Femal e	Male	Femal e	Male	Femal e	Male	Femal e	Male			
Incubation period	6.20± 0.42	6.20± 0.42	6.20± 0.42	6.30± 0.48	6.30± 0.48	6.30± 0.48	6.30± 0.48	6.30± 0.48	6.30± 0.48	6.30± 0.48	6.30± 0.48	6.30± 0.48	-	-	
Active larva	1.80± 0.26	1.75± 0.26	1.75± 0.26	1.75± 0.26	1.75± 0.26	1.75± 0.26	1.85± 0.34	1.85± 0.24	2.20± 0.26	2.10± 0.21	2.25± 0.26	2.20± 0.26	-	-	
Quiescent larva	0.75± 0.26	0.75± 0.26	0.75± 0.26	0.80± 0.26	0.80± 0.26	0.80± 0.26	0.85± 0.24	0.80± 0.26	0.90± 0.21	0.90± 0.21	0.90± 0.21	0.90± 0.21	-	-	
Active protonymph	1.05± 0.16	0.90± 0.21	1.15± 0.34	1.10± 0.21	1.10± 0.21	0.9± 0.21	1.20± 0.26	0.90± 0.21	1.25± 0.26	1.20± 0.26	1.40± 0.21	1.30± 0.26	-	-	
Quiescent protonymph	0.80± 0.26	0.85± 0.24	0.90± 0.21	0.85± 0.24	0.85± 0.24	0.7± 0.26	0.80± 0.26	0.75± 0.26	0.90± 0.21	0.85± 0.24	0.95± 0.16	0.75± 0.26	-	-	
Active deutonymph	0.90± 0.21	0.80± 0.26	0.90± 0.21	1.10± 0.21	1.10± 0.21	0.85± 0.24	1.15± 0.24	0.90± 0.21	1.20± 0.26	0.90± 0.21	1.20± 0.26	0.90± 0.21	-	-	
Quiescent deutonymph	0.65± 0.24	0.65± 0.24	0.65± 0.24	0.75± 0.26	0.75± 0.26	0.8± 0.26	0.80± 0.26	0.80± 0.26	0.80± 0.26	0.80± 0.26	0.85± 0.24	0.80± 0.26	-	-	
Total immature stages	5.95± 0.37	5.70± 0.26	6.10± 0.46	6.35± 0.71	6.35± 0.71	5.75± 0.63	6.65± 0.67	6.00± 0.67	7.25± 0.42	6.65± 0.41	7.55± 0.50	6.85± 0.67	8.46	1.43	
Lifecycle	12.15± 0.34	11.90± 0.39	12.30± 0.59	12.65± 0.53	12.65± 0.53	12.05± 0.60	12.95± 0.69	12.30± 0.35	13.55± 0.37	12.95± 0.72	13.85± 0.67	13.15± 0.75	3.38*	2.33ns	

Table 2. Biological aspects of female and male longevity of *Oligonychus mangiferus* (R. & S.) on Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka mango varieties trees at 25±2°C and 65±5% R.H. in 2006 season.

Developmental stages of predator *	Average (in days) of immature stages of <i>O. mangiferus</i> on mango varieties:														F value	
	Keitt		Langra Benares		Ewais		Alphons		Zebda		Mabrouka		Female	Male		
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male				
Pre-oviposition	2.10± 0.21	-	2.10± 0.32	-	2.20± 0.42	-	2.30± 0.48	-	2.30± 0.48	2.30± 0.48	-	2.30± 0.48	-	-	-	-
Oviposition	19.70± 0.48	-	19.60± 0.52	-	18.50± 0.85	-	18.00± 0.47	-	16.20± 0.63	16.20± 0.47	-	16.00± 0.47	-	-	-	-
Post-oviposition	2.00± 0.47	-	1.80± 0.42	-	2.70±0 .48	-	2.90± 0.74	-	4.40± 0.70	4.40± 0.70	-	4.60±0 .52	-	-	-	-
Longevity	23.80± 0.75	19.00± 1.05	23.50± 0.53	17.10± 0.74	23.40± 1.26	17.1± 0.74	23.20± 0.63	17.10± 0.74	22.90± 1.10	22.90± 1.10	15.40± 0.70	22.90± 0.99	14.90± 0.74	0.84 ns	0.84 ns	38.42 ***
Total No. of eggs	42.50± 1.08	-	40.00± 0.67	-	34.40± 0.97	-	32.10± 1.60	-	23.60± 0.84	23.60± 0.84	-	20.60± 0.52	-	-	-	-
Daily No. of eggs	2.16± 0.07	-	2.04± 0.06	-	1.86± 0.09	-	1.79± 0.11	-	1.46± 0.09	1.46± 0.09	-	1.29± 0.04	-	-	-	-
Life span	35.95± 0.64	30.90± 1.13	35.80± 0.63	28.90± 0.97	36.05± 1.14	29.15± 0.75	36.15± 0.75	29.40± 0.61	36.45± 1.01	36.45± 1.01	28.35± 0.91	36.75± 1.36	28.05± 1.17	0.94 ns	0.94 ns	9.40***
Generation	14.25± 0.35	-	14.40± 0.61	-	14.85± 0.53	-	15.25± 0.98	-	15.85± 0.47	15.85± 0.47	-	16.15± 0.75	-	-	-	-

The effect of six mango varieties, Keitt, LangraBenares, Ewais, Alphons, Zebda and Mabrouka on the biology of *O. mangiferus* was investigated at temperature of $25\pm 2^{\circ}\text{C}$ and relative humidity $65\pm 5\%$. Our results proved that leaves of Keitt mango variety were more favorable for *O. mangiferus* development and fecundity than leaves of LangraBenares, Ewais, Alphons, Zebda and Mabrouka. Keitt leaves highly elongated the mite oviposition period, longevity and highly enhanced the female fecundity. This explain the fact that leaves of Keitt mango variety were more susceptible to mite *O. mangiferus* infestation than leaves of other varieties.

The obtained results are not in harmony with those obtained by, Sirsakar and Nagabhushanam (1989&1984) they reported that virgin females of *Oligonychus mangiferus* were confined in the laboratory on leaf discs of 13 varieties of mango, the total egg output per female averaged 23.4-72.0, the adult lifespan 19.6-27.4 days and the number of eggs laid per days 1.01-2.88. All varieties were found to be suitable for feeding and breeding, with slight resistant.

Rai *et al.* (1988) studied that the biology of *O. mangiferus* at $22-31^{\circ}\text{C}$. The incubation period averaged 4.65 days. The larval, protonymph and deutonymph stages averaged 1.16, 1.13 and 1.17 days, respectively, for females and 0.97, 1.02 and 1.07 days for males. The combined larval-nymphal period averaged 5.93 days for females and 5.08 days for males. The preoviposition period averaged 2.20 days, and each female laid an average of 10.67 eggs during the oviposition period, which averaged 5.80 days of the eggs laid, 90-100% hatched. The adult lifespan averaged 10.11 days for females and 4.21 days for males. These result was in harmony with obtained results.

In conclusion the afromention result demonstrates the mango grower to determine the mango varieties less susceptible of mango red mite infestation.

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دراسات بيولوجية لأكاروس المانجو الأحمر

OLIGONYCHUS MANGIFERUS

عند تربيته على ستة أصناف مختلفة من أوراق المانجو

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تم دراسة المظاهر البيولوجية لأكاروس المانجو الأحمر *Oligonychus mangiferus* عند تربيته على ستة أصناف من المانجو (عويسي - زبدة - مبروكة - ألفونس - لانجرا-كيت) وجد بصفة عامة أن المظاهر البيولوجية لهذا الأكاروس (فترة للحضانة للبيض - فترة الأطوار غير الكاملة - فترة الحياة- - فترة ما قبل وضع البيض - فترة وضع البيض - فترة ما بعد وضع البيض - كمية البيض الموضوعة يوميا - النسبة الجنسية - دورة الحياة) متشابهة لحد ما على أصناف المانجو عدا الصنفين كيت ولانجرا .

حيث أن الفترة الجنسية للإناث تزيد عند التغذية على صنف المانجو كيت ولانجرا عن التغذية على بقية الأصناف كما أن فترة حضانة البيض ، فترة الأعمار غير الكاملة، فترة ما قبل وضع البيض ، فترة وضع البيض ، فترة ما بعد وضع البيض، كمية البيض الموضوعة يوميا، النسبة الجنسية ، دورة الحياة مناسبة عند التربية على الصنف كيت حيث يعتبر من أفضل الأصناف لتطور وتغذية الأكاروس. كما يعتبر الصنف كيت هو أكثر الأصناف حساسية للإصابة بأكاروس المانجو الأحمر. مما سبق يمكن توصية المزارعين بالإهتمام بفحص هذا الصنف مبكرا لتحديد الميعاد الأمثل للتدخل بالكفاح في الوقت المناسب.