ACARINES, 3: 59-64, 2009

Typhlodromips swirskii (Acari: Phytoseiidae): A Predator of Eriophyid and Tetranychid Mango Mites in Egypt

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ABSTRACT

The predacious mite *Typhlodromips swirskii* (Athias-Henriot) successfully developed to the adult stage when fed on the motile stages of the mango bud mite *Aceria mangiferae* Sayed, the mango rust mite *Metaculus mangiferae* (Attiah), the leaf coating mite *Cisaberoptus kenyae* Keifer and nymphs of the mango red mite *Oligonychus mangiferus* (Rahman and Sabra) in the laboratory at different temperatures and relative humidities. The increase of temperature degree and decrease relative humidity from 25°C and 60% R.H. to 30°C & 55%R.H. and 35 °C & 50 %R.H. shortened development and increased reproduction and prey consumption. Different eriophyid prey species promoted faster development of the predator compared to feeding on the tetranychid nymphs. The rate of egg laying (2.62, 2.23, 2.35 and 1.83 eggs/♀/day) was recorded at the highest temperatures and lowest R.H., while the minimum reproduction (1.92, 1.72, 1.62 and 1.20 eggs/♀/day) was noted at the lowest temperature and highest R.H. when fed on the four aforementioned prey species, respectively. Life table parameters indicated that feeding *T. swirskii* on *A. mangiferae* led to the highest reproduction rate (rm = 0.216 and 0.157 females/female/day), while feeding on *O. mangiferus* gave the lowest reproduction rate (rm= 0.183 and 0.133) nymphs at 35°C and 50%R.H. and 25°C and 60% R.H., respectively. The adult predatory female consumed an average of 117.8 *A. mangiferare*, 114.18 *C kenyae*, 94.4 *M. mangiferae* motile stages and 14.58 *O. mangiferus* nymphs at 35°C and 50% R.H./day, while it devoured 102.8, 96.59, 90.44 and 12.35 individuals, respectively at 25°C and 60% R.H. The three eriophyid mango mites, particularly A. *mangiferae*, proved to be suitable prey for *T. swirskii*, as a facultative predator, compared to the tetranychid mango mite.

Key Words: *Typhlodrompis swirskii*, Phytoseiidae, Eriophyidae, Tetranychidae.

INTRODUCTION

Typhlodromips swirskii (Athias-Henriot) (= *Amblyseius swirskii* Athias-Henriot) has a significant role in the biological control of some mite pests in Egypt (Yousef and Shehata, 1971; Momen and El–Sawi, 1993; Abou-Awad *et al*., 1999). It feeds not only on phytophagous mites, but also on coccids and mealy bugs (Swirski *et al*., 1967; Ragusa and Swirski, 1976; Metwally *et al*., 1984). During a 2-year study on abandoned mango trees near Cairo, three specific eriophyid mango, i.e. Mango bud mite *Aceria mangiferae* Sayed, Mango rust mite *Metaculus mangiferae (*Attiah) and Leaf coating mite *Cisaberoptus kenyae* Keifer and the tetranychid. Mango red mite *Oligonychus mangiferus* (Rahman and Sabra) were noted associated with 85% of the samples. Their populations started to increase in May and reached their peaks in August, then tailed off in December (Al-Azzazy, 2005).

Many phytoseiids have low rates of egg production below 50% R.H. Low humidity affects development and predatory efficiency of phytoseiids (Sabelis, 1985; van Dinh *et al*., 1988; Mangini and Hain, 1991; Abou-Elela, 2003). The present study reveals the effect of different temperature degrees and relative humidities on the development of *T. swirskii* on mango mite pests. Special attention was also paid to the effect of eriophyid and tetranychid mites infesting mango trees on the life table parameters of the predator.

MATERIALS AND METHODS

The efficiency of *T. swirskii* as a predator was studied in the laboratory at different temperature degrees and relative humidities, i.e. 25±1°C & 60% R.H.; 30±1°C & 55% R.H.; 35±1°C & 50% R.H. and a 12/12 h light/dark period, against motile stages of the mango bud mite *A. mangiferae*, the mango rust mite *M. mangiferae*, the leaf coating mite *C. kenyae* and nymphs of the mango red mite *O. mangiferus*. Individuals of *T. swirskii* were obtained from a mass culture maintained on the eriophyid mite *Eriophyes olivi* Zaher and Abou-Awad. Gravid females were left for 24 h to lay eggs. Eggs were then isolated for the different biological tests. Mulberry leaf discs, *Morus alba* L., 2.0 cm in diameter, were used as rearing arenas in Petri dishes with upper surfaces downwards on water saturated cotton wool.

Predatory eggs were placed singly on individual arenas, and the newly hatched larvae, 50 for every test, were supplied with a food resource of each of the four aforementioned prey. Due to the difficulty of transferring the eriophyid bud mite *A. mangiferae* and the two eriophyids mango leaves *M. mangiferae* and *C. kenyae*, an outer bract of heavily infested bud or a small disc 0.25 cm in diameter of heavily infested host leaves was carefully examined and the total number of individuals per each was recorded before introduced them to the arenas. Replacement of the consumed prey was carried out daily and notes on development, food consumption and reproduction were recorded twice a day. After the last moulting, males were coupled with females for mating. Males were then transferred to new arenas and individually reared until death. Every 3-4 days, the predators were transferred to new arenas, while its eggs were removed daily from the arenas. To test the sex ratio, 30 eggs were confined, singly in new arenas and the hatched larvae were reared until maturity. Life table parameters were estimated according to Hulting *et al*., (1990).

RESULTS AND DISCUSSION

The present results revealed that increase of temperature from 25 ^oC to 35 ^oC joined with a decrease in relative humidity from 60% to 50% enhanced faster development of *T. swirsikii*, and adult longevity was significantly shortened. The four prey mite species, *i.e. A. mangifeae, M. mangiferae*, *C. Kenya* and *O. mangiferus* resulted in a similar trend (Tables 1 & 2).

It is also of interest to note that increasing the temperature degree up to 35^{o}C joined with decreasing the relative humidity enhanced a higher rate of egg laying. Moreover, feeding the predator on the eriophyid mite *A. mangiferae* resulted in the highest female fecundity followed by that of females fed on the other two eriophyid species *M. mangiferae* and *C. Kenyae*. On the other hand, feeding the predator on the tetranychid mite *O. mangiferus* gave in the lowest fecundity (Table 3).

However, these results are in agreement with that reported by Abou- Awad *et al*., (1999) when reared the predator on the fig bud mite *Aceria ficus* (Colte) and the fig leaf mite, *Rhyncaphytoptus ficifoliae* Keifer. Also similar results were reported by El–Laithy and Fouly (1992) when reared the predator on the two spotted spider mite *Tetranychus urticae* Koch and that of Metwally *et al*., (1984) who reared the predator on the citrus brown mite *Eutetranychus orientalis* Klien.

It is worth noting that feeding the predator on each of the four prey did not result in a significant effect on the rate of development of the different stages (Tables 1 & 2).

In the feeding activity experiment, it was noted that the eriophyid mite *A. mangiferae* was the most favourable prey to the predator followed by the other two eriophyid prey species. On the other hand, the tetranychid prey *O. mangiferus* was the least suitable prey compared with the other aforementioned prey (Tables 3–7).

The preference of the eriophyid mites as prey for the phytoseiid mites compared to the tetranychid prey was reported by several workers (Abou–Awad *et .al*., 1989; Momen and El-Sawy, 1993; Momen, 1999, Rasmy *et al*., 2002) and Abou–Awad *et al*., 2005.

In addition, the daily rate of feeding capacity of the predatory females positively increased with increasing temperature degree joint with decreasing humidity, whereas the predatory immatures displayed opposite trend.

Life table parameters presented in table 7 are in harmony with the aforementioned findings. The population of *T. swirskii* could multiply with (23.82, 24.94 and 32.81), (19.58, 22.51 and 25.71), (22.26, 23.10 and 27.47) and (14.62, 14.34 and 18.47) net reproduction rate within a generation time of (20.10, 18.31 and 16.16 days), (20.52, 17.90 and 16.01), (21.20, 17.29 and 16.92) and (20.14, 17.05 and 15.87) when the predator fed on *A. mangiferae*, *M. mangiferae*, *C. kenyae* and *O.mangiferus* at 25 & 60; 30 & 55 and 35 °C & 50% R.H., respectively. Under these conditions, feeding *T. swirskii* on *A. mangiferae* led to the highest reproduction rate (rm = 0.157, 0.175 and 0.216 females/female/day), while feeding on *O. mangiferus* resulted in the lowest reproduction rate (0.133, 0.156 and 0.183). It is worth noting that the sex ratio of the progeny of females fed on motile stages of different eriophyid preys favoured females compared with feeding on *O. mangiferus*.

Comparing the life table parameters of *T. swirskii* with those of other workers carried out under almost similar conditions showed that the net reproduction rate (Ro) and the mean generation time (T) were 13, 17 on *T. urticae* (El-Laithy and Fouly, 1992) and 16, 17 on *E. orientalis* (Aly, 1994), respectively; but on the fig bud mite *A. ficus*, the predator population could multiply 21 times in a generation time of 20 days (Abou-Awad *et al*., 1999). Here again, eriophyid mites proved to be more suitable prey for phytoseiid mites than tetranychids.

This study provides a basic biological

Table (1): Average of developmental durations in days of the immature stages of the predatory phytoseiid mite *Typhlodromips swirskii* fed on four mite species at different temperatures and relative humidities.

Temperature (°C) & R .H.	Sex	Egg	Larva	Protonymph	Deutonymph	Life cycle
A. mangiferae						
25±1 and 60%	♀	.08±0.39	.85 ±0.12	2.43 ±0.24	2.51 ±0.24	9.87±0.60a
	♂	.76±0.24	.45 ±0.09	2.07 ±0.23	2.09 ±0.20	8.37±0.54a
30±1 and 55%	♀	.92±0.01	.26 ±0.21	2.03 ±0.24	2.03 ±0.20	8.24±0.24b
	♂	.50±0.20	.26 ±0.24	1.84 ±0.17	1.57 ±0.18	7.17±0.39b
35±1 and 50%	♀	.36±0.35	.15 ±0.00	1.34 ±0.09	1.35 ±0.02	6.20±0.53c
	♂	.16±0.24	.13 ±0.00	1.14 ±0.00	1.12 ±0.0	5.55±0.20c
M. mangiferae						
25±1 and 60%	♀	.09±0.35	.52 ±0.24	2.42 ±0.20	2.59 ±0.09	9.62±0.23a
	♂	.93±0.27	.34 ±0.20	2.28 ±0.24	2.42 ±0.20	8.97±0.20a
30±1 and 55%	♀	3.0±0.24	.50 ±0.07	1.63 ±0.17	1.87 ±0.09	8.00±0.17b
	♂	.69±0.20	.42 ±0.19	1.88 ±0.20	1.80 ±0.08	7.79±0.19b
35±1 and 50%	♀	.50±0.19	.25 ±0.01	1.25 ±0.03	1.18 ±0.00	6.18±0.29c
	♂	.46±0.23	.15 ±0.00	1.14 ±0.00	1.15 ±0.00	5.90±0.33c
C. kenyae						
25±1 and 60%	♀	3±0.01	.32 ±0.02	2.23 ±0.00	2.24 ±0.00	8.79±0.67a
	♂	.86±0.24	.22 ±0.00	2.15 ±0.19	2.22 ±0.00	8.45±0.44a
30±1 and 55%	♀	.60±0.18	.41 ±0.07	2.01 ±0.02	2.11 ±0.18	8.13±0.39b
	♂	.57±0.27	.25 ±0.09	1.75 ±0.20	1.75 ±0.20	7.30±0.41b
35±1 and 50%	♀	.41±0.20	.24 ±0.08	1.32 ±0.20	1.42 ±0.17	6.39±0.56c
	♂	.25±0.24	1.13 ±0.0	1.21 ±0.17	1.21 ±0.07	5.80±0.49c
O. mangiferus						
25±1 and 60%	♀	.30±0.11	.36 ±0.07	2.27 ±0.00	2.46 ±0.20	9.39±0.74a
	♂	.16±0.20	30 ±0.019	2.23 ±0.00	2.31 ±0.36	9.00±0.44a
30±1 and 55%	♀	.83±0.24	.26 ±0.00	2.08 ±0.01	2.16 ±0.09	8.33±0.33b
	♂	.60±0.24	.21 ±0.00	1.86 ±0.02	2.13 ±0.20	7.80±0.65b
35±1 and 50%	♀	.40±0.20	.17 ±0.00	1.27 ±0.01	1.27 ±0.03	6.11±0.27c
	♂	.27±0.17	.14 ±0.00	1.14 ±0.00	1.14 ±0.00	5.69±0.33c

Mean±SD: Different letters in vertical columns denote significant difference (F- test, P < 0.05, P < 0.01).

Table (2): Average durations in days of the phytoseiid mite *Typhlodromips swirskii* adults fed on different mite prey at different temperatures and relative humidities.

Temperature (°C) & R.H.	Pre – Oviposition	Generation	Oviposition	Post-Oviposition	Longevity, mean±SD		Life span mean±SD	
					♀	♂	♀	♂
A. mangiferae								
25±1 and 60%	2.41±0.18	12.28±0.57a	17.75±0.40	3.16±0.19	23.32±0.35a	22.15±0.27a	33.19±0.29a	30.52±0.90a
30±1 and 55%	2.00±0.11	10.27±0.40b	16.6±0.51	3.15±0.24	21.75±0.45b	20.00±0.43b	30.00±0.20b	27.2±0.83b
35±1 and 50%	1.63±0.07	7.80±0.43c	17.30±0.24	2.60±0.23	21.53±0.56b	17.75±0.53c	27.73±0.43c	23.32±0.20c
M. mangiferae								
25±1 and 60%	2.90±0.20	12.50±0.24a	17.20±0.23	3.80±0.20	23.90±0.47a	22.20±0.43a	33.50±0.35a	31.20±0.85a
30±1 and 55%	2.08±0.23	10.13±0.37b	15.58±0.24	2.83±0.20	20.50±0.33b	16.7±0.20b	28.50±0.47b	24.50±0.33b
35±1 and 50%	1.41±0.09	7.60±0.54c	16.58±0.32	2.16±0.24	20.16±0.39b	17.77±.24c	26.35±0.20c	23.67±0.36b
C. kenyae								
25±1 and 60%	3.30±0.08	12.09±0.63a	18.60±0.24	4.20±0.31	26.10±0.56a	22.60±0.45a	34.89±0.83a	31.5±0.47a
30±1 and 55%	2.40±0.20	10.55±0.20b	14.30±0.32	2.80±0.24	19.50±0.27b	17.42±0.33b	27.50±0.23b	24.70±0.56b
35±1 and 50%	2.25±0.17	8.64±0.20c	16.90±0.24	3.00±0.01	22.16±0.23b	18.60±0.57c	28.55±0.40b	24.48±0.63b
O. mangiferus								
25±1 and 60%	4.10±0.24	13.49±0.24a	16.80±0.53	3.60±0.13	24.5±0.35a	23.60±0.39a	33.90±0.95a	32.0±1.12a
30±1 and 55%	2.58±0.20	10.90±0.30b	12.60±0.49	2.91±0.17	18.10±0.53b	15.73±0.45b	26.50±0.59b	23.55±0.97b
35±1 and 50%	2.10±0.31	8.21±0.41c	15.6±0.53	2.40±0.09	20.10±0.74b	18.63±0.24c	26.20±0.20b	24.33±0.83b

Mean±SD: Different letters in vertical columns denote significant difference (F-test, P< 0.05, P<0.01).

Table (3): Female fecundity of *Typhlodromips swirskii*, fed on different mite prey species at different temperatures and relative humidities.

Temperature (°C) & R.H	Number of eggs laid by *T. swirskii* female fed on different prey species							
	A. mangiferae		*M. mangiferae*		*C. kenyae*		*O. mangiferus*	
	Mean ± SD	Daily rate	Mean ± SD	Daily rate	Mean ± SD	Daily rate	Mean ± SD	Daily rate
25°C & 60%	34.08±1.81[a]	1.92	29.72±0.98[a]	1.72	30.3±1.19[a]	1.62	20.9±1.91[a]	1.20
30°C &55%	35.69±1.72[a]	2.15	32±1.16[b]	2.60	33.1±1.15[b]	2.31	20.50±2.70[a]	1.62
35°C &50%	45.36±2.11[b]	2.62	37.00±2.17[c]	2.23	39.75±2.89[c]	2.35	28.60±2.39[b]	1.83

Different letters in vertical columns denote a significant difference (F-test, P< 0.05, P< 0.01)

Table (4): Feeding capacity of *Typhlodromips swirskii* fed on different mite prey species at 25°C and 60% R.H.

Predator	Sex	No. of consumed prey							
		A. mangiferae	Daily rate	*M. mangiferae*	Daily rate	*C. Kenyae*	Daily rate	*O. mangiferus*	Daily rate
Protonymph	♀	44.91±1.17	20.79	24.9±0.87	11.42	34.8±0.97	17.4	8±0.66	4.00
	♂	37.7±2.11	20.48	28.8±0.79	13.98	22.4±1.02		7.20±0.68	3.61
Deutonymph	♀	84.9±1.19	37.7	67.3±1.02	28.5	71.8±1.11	35.9	12.7±0.97	5.70
	♂	67.2±1.47	36.5	69.8±0.97	31.75	53.4±2.3	26.7	13.1±0.24	6.35
Total	♀	129.81±1.57[a]	29.43	92.2±1.93[b]	20.33	106.6±1.14[c]	26.65	20.70±1.02[d]	4.90
	♂	104.9±2.14[a]	28.50	98.6±1.01[a]	23.14	75.8±2.13[b]	19.28	20.30±1.01[c]	4.89
Pre- ovipositiom	♀	254.5±3.11	118.9	201.4±3.12	69.4	234.5±3.1	71.06	48±2.1	11.70
Generation	♀	384.3±6.71[a]	31.29	293.6±2.92[b]	23.4	341.1±2.09[c]	28.21	68.70±1.98[d]	5.09
Oviposition	♀	2058.7±85.31[a]	115.98	1837.09±43.39[b]	106.8	2175.4±4.1[a]	116.9	233.1±8.12[c]	13.87
Post- oviposition	♀	85.83±2.79	27.16	123.2±2.19	32.4	111.1±3.21	26.4	21.50±2.1	5.90
Longevity	♀	2399.03±74.11[a]	102.8	2161.69±39.15[b]	90.44	2521±77 31[c]	96.59	302.60±7.19[d]	12.35
	♂	1958.3±44.8[a]	88.4	1804.3±44.18[b]	81.27	2112.5±48.01c	93.47	268.80±6.13[d]	11.38
Life span	♀	2528.8±66.71[a]	76.16	2220.1±40.11[b]	66.27	2627.6±53.01[c]	75.3	323.3±8.71[d]	9.53
	♂	2063.2±57.11[a]	67.51	1902.9±51.9[b]	60.99	2188.3±93.11[c]	70.43	289.1±9.11[d]	8.86

Mean± SD: Different letters in horizontal columns denote significant difference (F- test, P < 0.01).

Table (5): Feeding capacity of *Typhlodromips swirskii* fed on different mit prey species at 30°C and 55% R.H.

Predator	Sex	No. of consumed prey							
		A. mangiferae	Daily rate	*M. mangiferae*	Daily rate	*C. Kenyae*	Daily rate	*O. mangiferus*	Daily rate
Protonymph	♀	24.3±0.77	13.2	11.58±0.91	8.21	29.7±1.12	16.5	6.5±0.24	3.55
	♂	23.9±0.63	14.59	15.1±0.87	8.96	18.2±1.23		8.2±0.33	4.9
Deutonymph	♀	48.92±0.59	26.6	28.83±0.62	17.36	50.2±1.91	26.4	11.08±1.6	5.80
	♂	37.92±1.12	28.09	30.8±1.2	18.22	37.7±3.11		12.06±0.97	6.2
Total	♀	73.22±0.99a	19.89	40.41±1.07b	13.16	79.9±2.04c	19.97	17.58±1.77d	4.70
	♂	61.82±1.29a	20.67	45.9±1.19b	13.90	55.9±3.19c	17.80	20.26±1.88d	5.64
Pre-ovipositiom	♀	141.07±2.13	70.5	125.25±3.2	60.21	164.3±3.15	68.45	23.5±4.1	9.1
Generation	♀	214.29±2.19a	20.8	165.66±4.7b	16.08	244.2±2.97c	23.1	41.08±3.12d	3.83
Oviposition	♀	2222.1±85.12a	133.9	1624.3±29.81b	104.25	1964.6±53.79c	137.3	168.08±11.13d	13.33
Post-oviposition	♀	97.3±9.11	3.9	103.25±5.39	36.48	106.6±11.06	38.07	21.9±3.2	7.53
Longevity	♀	2460.47±75.21a	113.3	1852.8±54.80b	90.38	2235.5±59.21c	114.6	213.48±14.7d	11.79
	♂	1908±27.1a	95.4	14.64±53.19b	87.7	1897.5±64.15a	108.9	213.16±11.39	11.77
Life span	♀	2533.7±45.11a	84.3	1898.7±66.71b	66.52	2315.4±63.71a	83.73	231.06±8.91c	8.71
	♂	1969.8±23.12a	72.4	1509.9±54.12b	61.62	1953.4±72.81a	79.08	233.3±12.17c	8.8

Mean±SD: Different letters in horizontal columns denote significant difference (F- test, P < 0.01)

Table (6): Feeding capacity of the *Typhlodromips swirskii* fed on different mite prey species at 35°C and 50% R.H.

Predator	Sex	No. of consumed prey							
		A. mangiferae	ily rate	*M. mangiferae*	Daily rate	*C. Kenyae*	ily rate	*O. mangiferus*	Daily rate
Protonymph	♀	15.36±0.8	13.01	16.3±0.9	15.1	16.58±1.21	14.29	6.2±0.21	5.6
	♂	9.25±0.97	9.25	12.53±0.78	12.53	9±0.92	8.33	4.63±0.24	4.63
Deutonymph	♀	22.27±1.31	19.23	18.9±1.2	18.9	26.33±1.2	21.06	7.9±0.04	7.18
	♂	17±1.08	17	19.53±1.3	19.53	20.5±1.3	18.98	6.09±0.07	6.09
Total	♀	37.63±2.11	15.94	35.2±2.01[a]	16.92	42.91±2.42[b]	17.80	14.1±0.88[c]	6.40
	♂	26.25±1.92[a]	13.12	32.06±1.09[b]	16.03	29.5±2.91[a]	13.65	10.72±0.9[c]	5.36
Pre- ovipositiom	♀	88.09±2.19	54.04	71.2±3.11	50.53	162.7±4.15	72.3	23.1±1.11	11
Generation	♀	125.72±3.61[a]	16.11	1006.4±8.91[b]	14	205.6±3.19[c]	23.8	37.2±2.00[d]	4.53
Oviposition	♀	2312.27±55.47[a]	133.6	1744.66±67.1[b]	105.2	2237.9±87.11[a]	132.4	258.4±3.91[c]	16.56
Post-oviposition	♀	144.3±13.79	55.52	88.4±2.31	40.9	129.58±13.1	43.19	11.6±0.9	4.8
Longevity	♀	2544.6±64.17[a]	117.8	1904.2±45.9[b]	94.4	2530.18±63.1[a]	114.18	293.1±6.11[c]	14.58
	♂	1885.2±52.19[a]	106.2	1384.8±63.4[b]	68.7	1751.9±64.2[a]	94.19	218.3±8.7[c]	11.72
Life span	♀	2582.3±43.91[a]	92.88	1939.4±63.7[b]	73.6	2573.09±83.1[a]	90.1	307.2±12.3[c]	11.72
	♂	1911.45±45.19[a]	81.9	1416.8±34.11[b]	59.8	1781.4±71.1[c]	72.76	229.02±9.12[d]	9.41

Mean± SD; Different letters in horizontal columns denote significant different (F- test, P < 0.01).

Table (7): Effect of different prey species on life table parameters of *Typhlodromips swirskii* at different temperatures and R.H.

Life table parameters	25±1 and 60%				30±1 and 55%				35±1 and 50%			
	A. mangiferae	*M. mangiferae*	*C. kenyae*	*O. mangiferus*	*A. mangiferae*	*M. mangiferae*	*C. kenyae*	*O. mangiferus*	*A. mangiferae*	*M. mangiferae*	*C. kenyae*	*O. mangiferus*
Net reproduction rate (Ro)	23.82	19.58	22.26	14.62	24.94	22.51	23.1	14.34	32.81	25.71	27.47	18.47
Mean generation time (T.)	20.1	20.52	21.20	20.14	18.31	17.9	17.29	17.05	16.16	16.01	16.92	15.87
Intrinsic rate of increase (rm)	0.157	0.144	0.146	0.133	0.175	0.173	0.181	0.156	0.216	0.20	0.195	0.183
Finite rate of increase (e^{rm})	1.17	1.155	1.157	1.142	1.192	1.190	1.199	1.168	1.241	1.22	1.215	1.200
50% mortality (in days)	33	34	35	34	30	28	27	26	28	26	28	26
Sex ratio (Female/total)	19/30	19/30	21/30	19/30	21/30	21/30	21/30	21/30	22/30	21/30	21/30	19/30
Sex ratio (female : male)	2.3:1	1.72:1	2.3:1	1.72:1	2.3:1	2.3:1	2.3:1	2.3:1	2.75:1	2.3:1	2.3:1	1.72:1

background about the prospects of using the phytoseiid predatory mite *T. swirskii*, as a biocontrol agent against the eriophyid mites infesting mango trees**.**

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