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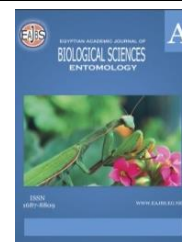
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Biological Aspects of *Typhlodromus athisae* Porath and Swirski When Fed on Red Spider Mite, *Tetranychus urtica* Koch and Brown Citrus Mite, *Eutetranychus orientalis* (klein)

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ABSTRACT

The predatory mite, *Typhlodromus athisae* is one of the most important bio-control agents. This work aims to study the efficacy of the predatory mite, *T. athisae* when fed on the phytophagous mites *Tetranychus urticae* and *Eutetranychus orientalis*. The predator mite, *T. athisae* was collected from mango and citrus trees and reared in Fruit Acarology Department. The biological aspects of predatory mite were studied in the laboratory at 25°C and R.H 70 %. The Life cycle and generation time recorded were 10.5271 & 12.802 day and 12.752 and 15.45 day when fed on *T. urticae* and *E. orientalis*.

INTRODUCTION

The *Tetranychus urticae* Koch is the most common spider mite. This species is widely spread all over the country on field crops such as vegetables, especially beans, cucumbers, eggplant and strawberry, on ornamentals especially roses, on fruit trees especially edible fig and peach, and on weeds. *T. urticae* has a very wide host range. It includes many crops grown in glasshouses such as tomatoes, cucumbers and peppers and flowers such as chrysanthemums and orchids. It is also a problem with protected and unprotected strawberries. In some areas, it is a problem on field-grown fruit crops such as apples, pears and grapevines. Other important crops that are infested include cotton, soybeans and other legumes. This mite can also live on many non-crop hosts, which can provide a source of infestation (Bolland *et al.*, 1998). The oriental red mite, *Eutetranychus orientalis* (Klein), an important pest of citrus and other crops in many parts of the world, has been known in Queensland for at least 30 years Walter *et al.* (1995). the oriental red mite, *E. orientalis* (Klein) (Acarina: Acariformes: Tetranychidae), is an important pest of citrus in the Middle East, Africa and Asia (Jeppson *et al.*, 1975). The species *E. orientalis* (Klein) usually attacks citrus and castor oil plants all over the country (Zaher, 1986).

Predacious mites of the family Phytoseiidae are cosmopolitan and important natural enemies of several phytophagous mite pests on various crops

(Bond, 1989; Fouly and El-Laithy, 1992; Fouly, 1997; Gerson *et al.*, 2003; Fouly *et al.*, 2011; Mostafa, 2012). McMurtry and Croft (1997) characterized the phytoseiid mites according to their feeding habits into four major groups, group I. including spider mites' specialists that do not feed on any other kinds of food. Group II including spider mites selective and group III of generalists that can feed on prey mites or any other food. Group IV feed only on pollens.

This predator follows the family Phytoseiidae, which is one of the most important families that include the most important predators used on a commercial scale in the field of biological control. This predator is found on fruit trees such as mangoes and citrus fruits and is widespread in many governorates (Zaher, 1986). There are 3 genera and 5 species groups in the Phytoseiinae and 6 tribes, 20 genera, 8 subgenera and 28 species groups in the Typhlodrominae (Chant & Mc Murtry, 2009).

MATERIALS AND METHODS

Collection of Mites:

Phytoseiid species *Typhlodromus atthisae* Porath and Swirski was collected from mango and citrus trees and two-spotted spider mite *Tetranychus urticae* Koch and *Eutetranychus orientalis* (Klein) were collected from leaves and twigs of castor plants *Ricinus communis* and hibiscus plants *Hibiscus mutabilis* L. (Malvaceae). Samples of plant leaves and twigs were collected in cellophane bags, with small pieces of cotton wool soaked in ether and brought to the laboratory for direct examination using a stereoscopic binocular microscope. Some adult specimens were individually mounted in Hoyer's medium on glass slides for microscopic identification. Copulated adult females were left to lay eggs on leaf discs of hibiscus plant kept on a moist cotton pad in Petri-dish (15 cm in diameter) where suitable moisture was daily supplied to keep leaf discs fresh for a longer time. The culture was provided with small pieces of glass cover slide and few cotton fibers as resting sides and to collect deposited eggs easily.

Biological Studies:

The culture of *Typhlodromus atthisae* predator cultures was divided into two major groups according to the type of food. The first group was provided with *T. urticae*, which are previously collected from leaves of castor bean plant *Ricinus communis* L. and a rearing plot of soybeans in the laboratory as a food source.

All groups were incubated at $25\pm 2^{\circ}\text{C}$ and $70\%\pm 5$ R. H. where all cultures were noticed daily to obtain the newly deposited eggs. Rearing of *Typhlodromus atthisae*: Leaf discs of *Hibiscus mutabilis* L. (Malvaceae) one square inch each was used for rearing *T. atthisae* during its whole life span.

Newly deposited eggs were singly transferred from the culture to the aforementioned leaf discs which were kept on a moist cotton pad in Petri dishes (15 cm in diameter). The incubation period was recorded and the newly hatched larvae were confined singly to the leaf discs and fed on the immatures of the two-spotted spider mites *T. urticae* and brown citrus mite *E. orientalis* (Klein).

RESULTS AND DISCUSSION

The data obtained from this study (Table 1) noted that the incubation period was 2.177 ± 0.315 and 3.301 ± 0.257 days for female predator mite *T. atthisae* while they were 1.532 ± 0.127 and 2.341 ± 0.0612 days for the male when fed on two preys *T. urticae* Koch

and *E. orientalis* at 25°C respectively. The total immature stages were 8.35±0.229 and 6.593±0.207 days for female predator mite *T. atthisae* while they were 8.125±0.296 and 6.81±0.412 days for male when fed on two preys *Tetranychus urticae* Koch and *E. orientalis* (Klein) at 25°C respectively. The Life cycle was 10.527±0.401 and 12.802±0.287 days for female predator mite *T. atthisae* while they were 8.125±0.296 and 9.151±0.412 days for male when it was fed on two preys *T. urticae* Koch and *E. orientalis* (Klein) at 25°C respectively.

Table 1: Biological aspects of immature stages of female and male of predator *Typhlodromus atthisae* when fed on two preys *Tetranychus urticae* Koch and *Eutetranychus orientalis* (Klein) at 25°C±2 and 70%±5 R. H.

Preys	<i>T. urticae</i>				<i>Eutetranychus orientalis</i>			
	Female		Male		Female		Male	
	Average	SD	Average	SD	Average	SD	Average	SD
Incubation period	2.177	±0.315	1.532	±0.127	3.301	±0.257	2.341	±0.0612
Active larvae	2.294	±0.147	1.473	±0.077	3.42	±0.210	2.34	±0.184
Protonymph	2.555	±0.168	2.3	±0.183	3.42	±0.155	2.15	±0.369
Deutonymph	3.501	±0.162	2.82	±0.126	2.661	±0.066	2.32	±0.155
Total immature	8.35	±0.229	6.593	±0.207	9.501	±0.298	6.81	±0.404
Life cycle	10.527	±0.401	8.125	±0.296	12.802	±0.287	9.151	±0.412

The generation period was 12.752±0.393 and 15.45±0.362 days for female predator mite, *T. atthisae* while it was 8.125±0.296 and 9.151±0.412 days for male when fed on two preys, *T. urticae* Koch and *E. orientalis* at 25°C respectively, (Table 2).

The longevity was 23.46±1.292 and 24.246±0.486 days for female predator mite *T. atthisae* while it was 18.236±0.610 and 18.236±0.610 days for the male when fed on two preys *T. urticae* Koch and *E. orientalis* (Klein) at 25°C respectively.

The life span was 36.212±1.3636 and 37.048±0.517 days for female predator mite *T. atthisae* while it was 26.361±0.697 and 27.267±0.675 days for the male when fed on two preys *T. urticae* Koch and *E. orientalis* (Klein) at 25°C respectively. The average Fecundity was 51.2±2.440 and 36.8±1.549 eggs in the oviposition period for predator mite *Typhlodromus atthisae* when fed on two preys *T. urticae* Koch and *orientalis* (Klein) at 25°C respectively. The average daily rate was 2.625±0.098 and 1.94 ±0.108 eggs/day for predator mite *T. atthisae* when fed on two preys *T. urticae* Koch and *E. orientalis* (Klein) at 25°C respectively. The food consumption was 149.1 and 146.6 prey for female predator while it was 72.1 and 68.7 prey for male predator when fed on two preys *Tetranychus urticae* Koch and *Eutetranychus orientalis* (Klein) at 25°C respectively.

This trend has been observed in several species of Phytoseiidae. Generalist predators can feed on various species of Tetranychidae, Tarsonemidae, pollen, fungi, and other mites (McMurtry and Croft, 1997; Luh and Croft, 2001).

Table 2: Biological aspects of adult female and male of predator mite *Typhlodromus athisae* when fed on two preys *Tetranychus urticae* Koch and *Eutetranychus orientalis* (Klein) at 25°C±2 and 70%±5 R. H.

Preys <i>T. athisae</i>	<i>Tetranychus urticae</i>				<i>Eutetranychus orientalis</i>			
	Female		Male		Female		Male	
	Average	SD	Average	SD	Average	SD	Average	SD
Generation	12.752	±0.393	8.125	±0.296	15.45	±0.362	9.151	±0.412
Preoviposition	2.225	±0.035			2.648	±0.227		
Oviposition	19.513	±0.751			19.043	±0.669		
Postoviposition	1.722	±0.600			2.555	±0.105		
Longevity	23.46	±1.292	18.236	±0.610	24.246	±0.486	18.236	±0.610
Fecundity	51.2	±2.440			36.8	±1.549		
Daily rat	2.625	±0.098			1.94	±0.108		
Live Span	36.212	±1.3636	26.361	±0.697	37.048	±0.517	27.267	±0.675
Food consumption	149.1	±6.118	72.1	±3.725	146.6	±2.875	68.7	±3.302

Conclusion

According to the acquired data, the life cycle of the predator mite was shorter when fed on *T. urticae* than when fed on *E. orientalis* in addition to the longevity and live span too.

In addition, the fecundity of the female predator mite was higher when fed on *T. urticae* than when fed on *E. orientalis* and the daily rate of laying eggs of the female predator mite was higher when fed on *T. urticae* than when fed on *E. orientalis*.

In addition, food consumption of predator mite was higher when fed on *T. urticae* than when fed on *E. orientalis*.

From the previous results obtained, it can be recommended that the predator *T. (A.) athisae* is capable to control both red spider mite *T. urticae* and brown citrus mite *E. orientalis*.

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ARABIC SUMMARY

الجوانب الأحيائية للمفترس الأكاروسى *Typhlodromus athisae* عند تغذيته على كل من الأكاروس الأحمر العادى *Tetranychus urticae* وأكاروس الموالح البنى *Eutetranychus orientalis*

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1-قسم اكاروس القطن والمحاصيل معهد بحوث وقاية النباتات
2-قسم اكاروس الفاكهة معهد بحوث وقاية النباتات

يعتبر المفترس الأكاروسى *Typhlodromus athisae* من عوامل المكافحة الحيوية. استهدف هذا البحث الدراسة الأحيائية لهذا المفترس الأكاروسى عند تغذيته على كل من الأكاروس الأحمر العادى ل *Tetranychus urticae* وأكاروس الموالح البنى *Eutetranychus orientalis* وقد تمت دراسة الجوانب الأحيائية تحت الظروف المعملية تحت درجة حرارة 25 درجة مئوية ورطوبة نسبية 70%. تم تسجيل دورة الحياة و مدة الجيل 10.5271 و 12.802 يوم و 12.752 و 15.45 يوم عند تغذيتها على *T. urticae* و *E. orientalis*.