

## EFFECT OF DIFFERENT STAGES OF THREE MITE SPECIES AS PREYS ON THE DEVELOPMENT AND FEEDING CAPACITY OF THE PREDATORY MITE *Typhlodromus pyri* SCHEUTEN (ACARI-PHYTOSEIIDAE).

Fahmy, Mona M. E.\* and Amal H.M. Romeih\*\*

\* Plant Protection Research Institute, Agric. Res. Center. Egypt.

\*\*Dept of Agricultural Zoology and Nematology, Faculty of Agriculture, Cairo University, Egypt

### ABSTRACT

The predatory mite *Typhlodromus pyri* Scheuten was collected from Mango leaves and debris under the trees associated with phytophagous mite.

The predaceous mite *Typhlodromus pyri* was fed on the two spotted spider mite *Tetranychus urticae* Koch, *Eutetranychus orientalis* (Klein) and *Oligonychus mangiferus* (Rahman & Saprà) as preys. It was found that the predatory mite *Typhlodromus pyri* passes through egg, larva, protonymph and deutonymph before reaching adult. Each active immature stage, when full-grown enters semi-quiescent stage before changing to the subsequent one. The predatory mites were reared in the laboratory at an average temperature  $25 \pm 3^\circ\text{C}$  and fed on different types of food, the different preys were highly affected the feeding capacity of immature stages and the number of eggs deposition increased when fed on egg of *Tetranychus urticae* and *Eutetranychus orientalis*.

### INTRODUCTION

The predatory mites of the family Phytoseiidae received a great attention by several acarologists. The vast majority of research workers have measured the biological aspects of mites on different type of diet (Mc Murtry & Scriven, 1964; Oatman & Mc Murtry, 1966; Swirski & Dorzia, 1969; Zaher & Shehata, 1970; Amano & Chant, 1978; Afifi. et. al., 1988 and El-Hady & Mabrouk, 1997). *Typhlodromus pyri*, was described by Scheuten it is commonly found on Mango associated with phytophagous mite *Tetranychus urticae*, *Eutetranychus orientalis* and *Oligonychus mangiferus*. Little information however, is available about its biology. The prey selection of the Phytoseiid Mite *Typhlodromus pyri* was studied by using polyacrylamide gel electrophoresis to analysis the diet of field-collected predators (Marcel & Marijcked, 1988).

Therefore, the present study aims to give some information on the relationship between the diets and efficiency of food as measured against time required for development

### MATERIALS AND METHODS

Experiments were performed under the laboratory conditions at a temperature of  $25 \pm 3^\circ\text{C}$ . A pure culture of the predatory mite *Typhlodromus pyri* Scheuten was maintained on mango leaves associated with the three phytophagous mite. Under laboratory condition Discs of mango leaves (1.0cm in diameter) were placed on cotton pad, soaked in water, in plastic rings 2.8 cm in diameter and 2 cm in height. Some drops of water were added daily.

For individual rearing, newly eggs were transferred singly to each of rearing disc. Each newly larva was supplied with known number of preys of *T. urticae* Koch, *E. orientalis* (Klein) and *Oligonychus mangiferus* (Rahman & Sapra) and devoured individuals were replaced daily by fresh ones till reaching maturity. Mites were examined twice daily emerging females were copulated and kept for oviposition. Observation concerning all biological aspects was recorded during the predator life span. Each rearing experiment was started with 50 newly hatched larvae.

## RESULTS AND DISCUSSION

*Typhlodromus pyri* Schueten developed readily and reproduced on the mite *Tetranychus urticae*, *Eutetranychus orientalis* and *Oligonychus mangiferus* as prey, which were tested as a diet for predatory mites.

Both females and males of the predatory mite *Typhlodromus pyri* were found to pass through a larval and two nymphal stages before reaching adult.

Larval stages did not affected by type of food (Table I). At 25°C this period averaged 1.77, 1.42, 1.70, 1.3, 2.11, 1.74, 1.91, 1.83 and 1.88 days when was fed on eggs, immatures and adults of *Tetranychus urticae*, *Eutetranychus orientalis* and *Oligonychus mangiferus*, respectively.

Protonymphal and deutonymphal stages were affected by type of food (Table I). Female protonymph and deutonymph were fed on different stages, of *Tetranychus urticae*, *Eutetranychus orientalis* and *Oligonychus mangiferus*, (1.89 & 1.96), (2.20 & 3.01), (2.08 & 2.66), (1.52 & 2.75), (2.37 & 3.82), (2.93 & 3.04), (2.45 & 3.55), (2.55 & 4.69) and (2.48 & 4.73) days, respectively.

Male, different stages, followed similar trend as those of female, but adult male longevity was shorter than that of female. However, a marked difference in the rate of development was observed between individuals developing on different of tetranychid prey. Developmental period was shorter for individuals developing on eggs of *T. urticae*, *E. orientalis* and *O. mangiferus*, (5.75, 5.44 & 7.80) days respectively than for predators developing on moving stages of tetranychid prey (Table I).

From the mentioned results it could be observed that the duration of life cycle was affected by type of food. This total period averaged 7.54, 9.46, 8.63, 7.56, 10.22, 8.99, 10.23, 11.87 & 12.22 days, respectively when fed on different stages, of *Tetranychus urticae*, *Eutetranychus orientalis* and *Oligonychus mangiferus* respectively (Table I).

Adult longevity was influenced by the type of food. Females preoviposition, oviposition and postoviposition periods (Table II) averaged 3.53, 13.35 & 15.45 days when was fed on egg of *T. urticae*; 4.12, 17.01 & 16.89 and 3.62, 18.52 & 16.77 days when was fed on Immature stages and adult females.

Data in table (II) showed that females preoviposition, oviposition and postoviposition periods average (2.33, 19.01 & 13.08), (2.41, 13.97 & 14.84) and (3.42, 16.35 & 15.65) days when was fed on *E. orientalis*; and (4.03, 10.86 & 12.62), (5.11, 12.74 & 14.01) and (4.39, 13.29 & 14.55) days when was fed on *O. mangiferus* respectively.

Table (I): Duration (in days) of life cycle and generation period of *Typhlodromus pyri* Schuoten fed on three mite species at average temperature 25°C.± 3.

Prey predator	<i>Tetranychus urticae</i>			<i>Eutetranychus orientalis</i>			<i>Oligonychus mangiferus</i>		
	Egg	Immature	Adult	Egg	Immature	Adult	Egg	Immature	Adult
Incubation	2.28 ± 0.26	2.63 ± 0.76	2.67 ± 0.66	1.83 ± 0.53	1.97 ± 0.48	1.93 ± 0.44	2.23 ± 0.64	2.01 ± 0.49	2.00 ± 0.52
Larva	1.77 ± 0.44	1.42 ± 0.52	1.70 ± 0.48	1.30 ± 0.34	2.11 ± 0.55	1.74 ± 0.61	1.91 ± 0.60	1.83 ± 0.74	1.88 ± 0.65
Pronymph	1.89 ± 0.38	2.20 ± 0.53	2.08 ± 0.68	1.52 ± 0.50	2.37 ± 0.58	2.93 ± 0.74	2.45 ± 0.80	2.55 ± 0.65	2.48 ± 0.65
Deutonymph	1.96 ± 0.54	3.01 ± 0.71	2.66 ± 0.24	2.75 ± 0.55	3.82 ± 0.60	3.04 ± 0.75	3.55 ± 0.82	4.69 ± 0.61	4.73 ± 0.75
Total Immature	5.75 ± 0.88	6.85 ± 1.12	6.13 ± 0.92	5.44 ± 0.86	8.13 ± 0.92	6.96 ± 0.84	7.80 ± 0.65	9.25 ± 0.83	10.13 ± 1.12
Life cycle	7.54 ± 1.07	9.46 ± 0.87	8.63 ± 0.95	7.56 ± 1.64	10.22 ± 1.24	8.99 ± 1.11	10.23 ± 1.50	11.87 ± 1.04	12.22 ± 1.05
Generation period	11.68 ± 1.20	13.52 ± 1.64	11.97 ± 2.10	10.02 ± 1.50	14.04 ± 1.40	13.21 ± 1.35	16.14 ± 1.55	17.87 ± 1.86	16.33 ± 2.22

Table (II): Duration (in days) of longevity and life span of *Typhlodromus pyri* Schuoten fed on three mite species at average temperature 25°C.± 3.

Prey predator	<i>Tetranychus urticae</i>			<i>Eutetranychus orientalis</i>			<i>Oligonychus mangiferus</i>		
	Egg	Immature	Adult	Egg	Immature	Adult	Egg	Immature	Adult
Preoviposition	3.53 ± 1.11	4.12 ± 0.64	3.62 ± 0.45	2.33 ± 0.64	2.41 ± 0.38	3.42 ± 0.85	4.03 ± 0.75	5.11 ± 0.68	4.39 ± 1.03
Oviposition	13.35 ± 1.46	17.01 ± 1.73	18.52 ± 1.55	19.01 ± 1.47	13.97 ± 1.66	16.35 ± 1.48	10.86 ± 1.65	12.74 ± 1.38	13.29 ± 1.33
Postoviposition	15.45 ± 1.05	16.89 ± 1.06	16.77 ± 0.96	13.08 ± 1.45	14.84 ± 1.27	15.65 ± 1.08	12.62 ± 1.50	14.01 ± 1.95	14.55 ± 1.82
Longevity	32.06 ± 1.94	38.11 ± 1.38	37.01 ± 1.75	33.31 ± 2.03	30.79 ± 2.12	35.96 ± 1.92	27.65 ± 2.20	32.05 ± 1.84	32.32 ± 2.21
Life span	39.13 ± 1.39	47.42 ± 1.58	45.78 ± 2.33	41.06 ± 1.85	40.44 ± 1.95	45.22 ± 1.77	37.35 ± 2.35	43.55 ± 3.04	44.66 ± 3.11

As duration of the predatory mite *Typhlodromus pyri* immature and adult stages differed according to variation of type of food (Table II), Life span was also affected by the type of food, this period averaged 39.13, 47.42, 45.78, 41.06, 40.44, 45.22, 37.35, 43.55 & 44.66 days, respectively when fed on different stages, of *T.urticae*, *E. orientalis* and *O. mangiferus* respectively (Table II). This agrees with findings of McMurty & Scriven (1964).

Table (III): Average no. and Daily rate of eggs deposited by *Typhlodromus pyri* Schueten fed on three mite species at average temperature 25°C.± 3.

Prey predator	<i>Tetranychus urticae</i>			<i>Eutetranychus orientalis</i>			<i>Oligonychus mangiferus</i>		
	Egg	Immature	Adult	Egg	Immature	Adult	Egg	Immature	Adult
No. of eggs / female	40.53 ± 2.11	29.12 ± 3.74	33.62 ± 2.95	42.33 ± 2.88	31.33 ± 2.69	30.42 ± 3.25	31.03 ± 2.76	26.11 ± 3.25	25.39 ± 3.75
Daily rate	3.05	1.70	1.80	2.20	2.40	1.90	2.80	2.01	1.90

Total number of the deposited eggs / female averaged 40.53, 29.12, 33.62, 42.33, 31.33, 30.42, 31.03, 26.11 & 25.39 days, respectively when female fed on egg, immature stages and adult of *T. urticae*, *E. orientalis* and *O. mangiferus* respectively (Table III).

The daily rate of deposited eggs was 1.05, 1.70, 1.80, 2.20, 2.40, 1.90, 2.80, 2.01 & 1.90 eggs / female on previously mentioned fed on egg, immature stages and adult of *T. urticae*, *E. orientalis* and *O. mangiferus* respectively (Table III). The previous results clearly indicated that the speed of development as well as feeding capacity and egg production of *Typhlodromus pyri* were highly affected by type of food.

The adult predator consumed a great number of prey eggs followed by immatures and adults table (IV). Thus number of consumed prey stages had a negative relationship with its size. The predator consumed 583, 632 & 431 of prey eggs with daily rate 18.3, 19.1 & 15.6 when fed on *T. urticae*, *E. orientalis* and *O. mangiferus* respectively.

Table (IV): Feeding capacity during Longevity of *Typhlodromus pyri* Schueten fed on three mite species at average temperature 25°C.± 3.

Prey predator	<i>Tetranychus urticae</i>			<i>Eutetranychus orientalis</i>			<i>Oligonychus mangiferus</i>		
	Egg	Immature	Adult	Egg	Immature	Adult	Egg	Immature	Adult
Total	583.50 ±22.15	400.68 ±18.55	318.55 ±19.48	632.85 ±30.06	390.24 ±22.05	329.85 ±18.19	431.64 ±32.45	339.92 ±25.77	224.66 ±16.95
Daily rate	18.3	10.5	8.6	19.1	13.1	9.4	15.6	10.60	6.8

The previous results clearly indicated that the speed of development as well as feeding capacity and egg production was affected by type of food. This agreed with the finding of Mc Murtry & Scriven, 1964; Oatman & Mc Murtry, 1966; Swirski & Dorzia, 1969; Zaher & Shehata, 1970; Amano & Chant, 1978; Afifi. *et. al.*, 1988 and El-Hady & Mabrouk, 1997.

## REFERENCES

- Afifi, A. M; Potts, M. F. and Patterson, C. G. (1988). Pollen Diet of some Predator Mites Trank. Ky. Acad. Sci., 49 (3-4), 96-100.
- Amano, H. and Chant, D. A. (1978). Mating behaviour and reproductive mechanisms of two species of predacious mites *Phytoseiulus persmilis* Athias and *Amblyseius andersoni* (Chant), (Acarina: Phytoseiidae). *Acarologia*, t. xx, fasc. 2, 196 - 213.
- El-Hady, M. M. and Mabrouk, A. M. (1997). Effect of non-prey food, mainly pollen, on the development of the predacious mites, *Neoindoseiulus denmarki* (Zaher & El-Borollosy). The seventh national conference of pests and diseases of vegetables and fruits in Egypt. 838-844.
- Marcel Dicke and Marijke Dejong (1988). Prey preference of the Phytoseiid Mite *Typhlodromus pyri* using polyacrylamide gel electrophoresis to analyse. *Experimental & Applied Acarology*, 4 (1988) 15-25.
- McMurtry, J. A. and Scriven, G. T. (1964). Studies on the feeding, reproduction and development of *Amblyseius hibisci* (Acarina: Phytoseiidae) on various food substance. *Ann. Ent. Soc. Am.* 57: 649-655.
- Oatman, E. R. , and McMurtry, J. A. (1966). Biological control of the two-spotted mite on strawberry in southern California. *J. Econ. Entomol.* 59, 433-439.
- Shin, G. I; Poe, S. L. and Gromory, H. L. (1979). Biology and predation of *Phytoseiulus macropilis* on *Tetranychus urticae*. *Flo. Ent.*, 62 (1): 48-53.
- Swirski, E. and N. Dorzia. (1969). Laboratory studies on the feeding, development and fecundity of the predaceous mite *Typhlodromus occidentalis* Nesbitt (Acarina: Phytoseiidae) on various kinds of food substances. *Israel. J. Agr. Res.* 19: 143- 145.
- Zaher, M. A. and Shehata, K. K., (1970). Biological studies on the predatory mite *Typhlodromus pyri* Sch. (Acarina: Phytoseiidae) with the effect of prey substances. *Sonderuck aus Bd.*, 4: 389- 394.

تأثير التغذية بالأكاروسات النباتية التغذية وكذلك الأطوار المختلفة لكل فريسة على مدة حياة الأطوار الكاملة و مدة الجيل و الكفاءة الجنسية و كذلك القدرة الأفتراسية للمفترس الأكاروسى تفلودروس بيراي .

منى محمد الهادي فهمي\* و أمل حسن معاذ رميح\*\*

\* معهد بحوث وقاية النبات- مركز البحوث الزراعية

\*\* قسم الحيوان والنيماتولوجيا الزراعية-كلية الزراعة-جامعة القاهرة

بالنسبة لتربية المفترس تفلودروس بيراي على الأكاروسات النباتية تترنكس اورتكسا، يوتترنكس اورينتلز، اوليجونكس منجفرا على درجة حرارة 25°م كانت النتائج المتحصل عليها كما يلي :-  
(أ) تختلف مدة الأطوار الغير كاملة باختلاف نوع الغذاء حيث تقل عند التغذية على طور البيضة وسجلت 7.80 & 5.44, 5.75 يوم عند التغذية على الأكاروسات النباتية تترنكس اورتكسا، يوتترنكس اورينتلز، اوليجونكس منجفرا على التوالي بينما سجلت 10.13 يوم عند التغذية على الأطوار الكاملة للامليجونكس منجفرا.

(ب) تتأثر دورة الحياة حيث سجلت 7.54, 9.46, 8.63, 7.56, 10.22, 8.99, 10.23, 11.87 & 12.22 يوم عند التغذية على بيض و الأطوار الغير كاملة و الأطوار الكاملة للاكاروسات النباتية تترنكس اورتكسا، يوتترنكس اورينتلز، اوليجونكس منجفرا على التوالي .

(ج) كذلك كانت فترة حياة الأنثى البالغة 32,38 و 37 يوم كذلك بلغت 33,30 و 36 يوم بينما سجلت 27,32 و 32 يوم عند التغذية للاكاروسات النباتية تترنكس اورتكسا، يوتترنكس اورينتلز، اوليجونكس منجفرا على التوالي

(د) تأثر عند البيض الموضوع للأنثى وكذلك المتوسط اليومي لوضع البيض حيث وصل الي 40,53 بيضة بمتوسط يومي 3,05 بيضة يوميا و 2,33 بيضة بمتوسط يومي 2,2 بيضة يوميا عند التغذية على بيض تترنكس اورتكسا، يوتترنكس اورينتلز على التوالي فحين سجلت اقل عدد من البيض الموضوع عند التغذية على الأطوار الكاملة لاوليجونكس منجفرا حيث بلغت 25,39 بيضة بمتوسط يومي 1,9 بيضة يوميا.

(هـ) كذلك تأثرت عملية الأفتراس في الاطوار الكاملة للمفترس بنوع الغذاء حيث بلغت جملة ما يفترس من البيض خلال فتره الأطوار الكاملة للأنثى 583,632 و 431 من البيض بمعدل يسومي 18,3 ، 19,1 و 15,6 بيضة يوميا.