

**BIOLOGICAL CHARACTERS OF *FELTIELLA ACARISUGA*
(VALLOT) (DIPTERA: CECIDOMYIIDAE) WHEN FED ON
EGGS OF *TETRANYCHUS URTICAE* KOCH
[ACARI: TETRANYCHIDAE]**

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Abstract

This study was carried out to estimate the different biological characters and predation capacity of *F. acarisuga* when feed on *Tetranychus urticae* Koch (Acari: Tetranychidae) eggs. The mean duration of developmental stages of *F. acarisuga* was averaged 13.5 ± 2.6 at 25 ± 2 °C and 60-75% R.H. On the other hand, Pre-oviposition, Oviposition and post oviposition periods revealed an average 2.9 ± 3.9 , 6.2 ± 5.2 & 6.9 ± 4.3 , respectively. Female longevity was recorded of 15.2 ± 4.0 days and Fecundity was attained 34.9 ± 6.1 at the experimental conditions with daily rate reached 3.7 ± 1.9 . The total number of eggs of *T. urticae* consumed by the larval stages (1st, 2nd, and 3rd) of, *F. acarisuga* were 21.9 ± 1.5 , 47.1 ± 2.8 and 55.5 ± 2.9 eggs, respectively.

INTRODUCTION

The tetranychid mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) is one of the most important pests of different crops around the world. Studies of yield reduction caused by varying population levels of *T. urticae* have demonstrated its potential for damaging the different crops (Oatman *et al.*, 1982; Raworth, 1986). Pesticides are the primary method of control of *T. urticae*. A major problem in controlling this spider mite is its ability to develop rapid resistance to acaricides after only few applications. To reduce pesticide input and associated risks and costs, biological control of spider mites is widely used worldwide (Mo and Liu 2006).

The predator *Feltiella acarisuga* (Vallot) (Diptera: Cecidomyiidae), is considered one of the most important and widely distributed natural enemies of spider mites (Tetranychidae) (Gagne 1995).

F. acarisuga became an important component of the biological control of *T. urticae* and could be particularly useful for integrated pest management (Gillespie *et al.*, 1998). *F. acarisuga* adults are capable of flying and tracking colonies of *T. urticae*. In addition to its excellent flying capacity, distributing *F. acarisuga* in the crop requires very little work. *F. acarisuga* larvae fed on eggs, nymphs and adults of red spider mites at least 5 times many (per day) as *Phytoseiulus persimilis* (Acari: phytoseiidae) (Osborne *et al.* 2008).

MATERIALS AND METHODS

***Feltiella acarisuga* rearing**

Biological characters of *F. acarisuga* when fed on *T. urticae* eggs was estimated under laboratory condition at 25 ± 2 °C and 60-75% R.H. Larvae and pupae of *F. acarisuga* were received from infested bean leaflets, and stored in transparent plastic container until adults hatch. Each couple of *F. acarisuga* was allowed to mate and oviposit in glass tube (3x5 cm) covered with muslin and provided daily with *T. urticae* eggs as a prey. Leaves contained *F. acarisuga* eggs were kept separately until larvae hatch.

The newly hatched larvae were kept singly in small Petri dishes (5 cm) on their beans leaflets and provided daily with two spotted spider mite eggs until pupation. As the cecidomyiid pupa was formed, it was removed and confined individually in transparent plastic containers (2x5cm) until adult emergence. At least, 20 replicates were evaluated on each temperature. The duration of immature development, feeding capacity of the larvae and female fecundity were estimated daily.

One female and two males of *F. acarisuga* were placed per tube, males were removed 48 hr after the female had emerged. The number of eggs laid per female was monitored daily.

Rearing of *Tetranychus urticae*

A mass culture of the two-spotted mite *T. urticae* was maintained on potted bean plants under the same laboratory conditions to prepare an adequate food source for *F. acarisuga*.

RESULTS AND DISCUSSION

1. Egg stage, Larval and pupal periods

Results showed that the incubation period was averaged 1.4 ± 1.5 days under laboratory condition at 25 ± 2 °C and 60-75% R.H. While, the duration of the different larval stages fed on *T. urticae* eggs lasted 1.8 ± 1.2 for the first larval instars, 2.3 ± 2.42 days for second instars and 1.9 ± 2.2 days for the third instars (table 1). The pupal stage period lasted 6.1 ± 3.4 days. This result is found close that obtained by with Agamy and Gomaa (2002).

Total developmental periods

Data indicated that the total developmental duration was found to be 13.5 ± 2.6 days (table, 1). In contradictory, several authors found that, *F. acarisuga* completed its life cycle in 29 days (Sharaf 1984), in 16.4 days (Mo and Liu, 2006) and in 17.4 days (Mo and Liu, 2007). These differences in developmental times are likely

dependent on temperature and/or relative humidity differences (Opit, *et al.*, 1997; Gillespie and Raworth 1999).

2- Female development and Fecundity

Table (2) showed that maximum female longevity was 15.2 days, while female fecundity was attained to be 34.9 ± 6.1 eggs per female under the same laboratory conditions with a daily number of eggs 3.7 ± 1.9 l per female. The sex ratio was rounded off to 1:1, these results are in agreement with these of Gillespie *et al.* (1997), Agamy, and Gomaa (2002)

3- Predating capacity *F. acarisuga*.

The average number of consumed eggs by *F. acarisuga* 1st, 2nd, and 3rd instar larvae was 21.9 ± 1.5 , 47.1 ± 2.8 and 55.5 ± 2.9 eggs, respectively. Therefore, the total number of eggs of *T. urticae* consumed by the three larval instars was recorded as 124.5 ± 4.2 (Table 3). Similarly, larva of *F. acarisuga* could consume an average of 175.4 *T. cinnabarinus* eggs (Mo and Liu, 2006). Gillespie *et al.* (2000) studied life table parameters of *F. acarisuga* using the carmine spider mite, *Tetranychus cinnabarinus* eggs as prey under laboratory conditions of 26.7 ± 2 °C, $75 \pm 5\%$ R.H. The first, second, and third instars larvae of *F. acarisuga* consumed an average of 35.5, 54.0 and 86.9 *T. cinnabarinus* eggs, respectively.

From the above results, it could be concluded that the predator *F. acarisuga* predator appeared to have highly specialized abilities feeding on spider mite eggs and could be particularly useful for biological control.

Table 1. Mean duration (in days) of the female developmental stages of the predator *Feltiella acarisuga* when fed on *Tetranychus urticae* eggs under laboratory conditions.

STAGE		DURATION
EGG		1.4 ± 1.5
LARVA	1 ST INSTAR	1.8 ± 1.2
	2 ND INSTAR	2.3 ± 2.4
	3 RD INSTAR	1.9 ± 2.2
PUPAL STAGE		6.1 ± 3.4
MEAN DURATION OF DEVELOPMENT		13.5 ± 2.6

Table 2. Mean duration (in days), longevity and fecundity of the predator *Feltiella acarisuga* when fed on *Tetranychus urticae* eggs under laboratory conditions.

STAGE	DURATION
PREOVIPOSTION	2.9±3.9
OVIPOSTION	6.2±5.2
POSTOVIPOSTION	6.9±4.3
LONGEVITY	15.2±4.0
FECUDITY	34.9±6.1
DAILY EGGS/FEMALE	3.7±1.9

Table 3. Rates of consumed *Tetranychus urticae* eggs (per day) by larval instars of the predator *Feltiella acarisuga*.

LARVAL INSTARS	DURATIONS
1 ST INSTAR	21.9±1.5
2 ND INSTAR	47.1±2.8
3 RD INSTAR	55.5±2.9
TOTAL	124.5±4.2

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الصفات البيولوجية للمفترس (*Feltiella acarisuga* (VALLOT))

عند تغذية على بيض العنكبوت الأحمر العادي

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إجراء بعض الدراسات البيولوجية للمفترس *Feltiella acarisuga* عند درجة حرارة 25 ± 2 ° م ورطوبة نسبية 60-70% لمعرفة دورة حياة عند تغذية على بيض العنكبوت الأحمر العادي كأحد عناصر المكافحة الحيوية.

أوضحت نتائج الصفات البيولوجية لهذا المفترس ان فترة العمر غير الكاملة (البيض، اليرقة وعذراء) قد سجلت 13.5 يوم بينما وجد أن فترة ما قبل وضع البيض، فترة وضع البيض وفترة ما بعد وضع البيض قد سجلت 2.9 و6.2 و6.9 يوم على التوالي وعلى الجانب الآخر وجد أن كمية وضع البيض اليومي أو الكلى عند درجة حرارة 25 م سجلت 34.9 و3.7 بيضة للانثى على التوالي . فى حين سجلت القدرة على التغذية ليرقات المفترس 21.9 ، 47.1 و 55.5 بيضة على التوالي.