

**BIOLOGICAL ASPECTS OF THE TRUE SPIDER *THOMISUS*
SPINIFER CAMBRIDGE
(THOMISIDAE: ARANEA).**

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(Manuscript received July 2003)

Abstract

Biological studies on the spider *Thomisus spinifer* were carried out. Adult stage of the two spotted spider mite *Tetranychus urticae* and the fruit fly insect *Ceratitis capitata* were used as main sources of food. The first three - spiderling stages of male and female consumed an average of 320.5 & 382.5 individuals of the first prey, respectively, while the fourth to sixth stages of male and the fourth to seventh stages of female fed on 161.0 and 263.5 individuals of the second prey *C. capitata*, respectively.

The biological aspects including : 1-mating : 2-oviposition, 3-development, 4-adult longevity 5-generation period, , 6-sex ratio, 7-moulting, and 8-predation capacity were carried out. Male and female pass through six and seven immature stages (spiderlings), respectively before reaching adult with the life cycle averaged 99.0 & 123.0 days, respectively at 25 °C.

INTRODUCTION

Spiders are considered an important natural control agent to a wide range of economically injurious pests. Jeppson *et al.* (1975), recorded that more than 30 spider species are known to feed on phytophagous mites in apple orchards in Canada and added that many species were known in Japan to be mite predators. In 1983,, mentioned that spiders might contribute to the reduction of insect pests. In 1984. summarized the work of different archeologists in field crops and orchards and mentioned that spiders are important enemies of aphids, mites and lepidopterous larvae and eggs. El- Hennawy (1985) plotted the distribution of *Stegodyphus dufouri* (Audouin) in Egypt on a map and added new locality records of the same species in (1987). Rahil (1988) collected the clubionid species *Cheiracanthium jovium* Denis from cotton and cucurbit fields at El-Fayoum Governorate by using sweepin net method.

Nuffeler & Breene (1990) evaluated the dwelling spiders in hay meadows at central Europe and recorded that the abundance ratio of the family Thomisidae (85%).

Therefore, this study aimed to throw some light upon the biological aspects of the thomisid spider species, *Thomisus spinifer* Cambridge as one of the aspects important and common to determinate its role as biocontrol against harmful pests.

MATERIALS AND METHODS

Members of *T. spinifer* were found on apple trees, grape, olive and orange orchards at Beni- Suef, Fayoum and Qalyobia Governorates. They were collected from these habitats by a method of branch shaking.

Individuals of the thomisid spider, *T. spinifer* were found to occur in great numbers on apple trees at Sharkia Governorate and in grape orchards at Beni-Suef and Qalyubia Governorates. On the opposite, it was found in few numbers on olive and orange orchards at Fayoum Governorate. In its habitats, the species individuals were noticed to inhabit the middle of trees and live in aggregation.

This species does not make any webbing on plants as nests for living, thus female preferred to deposit its egg sac in hidden places. In the laboratory, it was fed and reared on adults of the two spotted spider mite *T. urticae* Koch and the fruit fly *C. capitata*.

For rearing this species, several collected adult females were placed in a translucent plastic container cells (3 cm. in diameter and 5 cm. Length). Females were supplied with prey and kept in an incubator at $25 \pm 1^{\circ}\text{C}$ and 60-70% R.H. to deposit their eggs.

For individual rearing, newly hatched spiderlings were kept solitarily to rearing plastic containers. Each one was supplied with a known number of the two spotted spider mite *T. urticae* Koch adults as a prey for the first to the third spiderling and adults of fruit fly *Ceratitis capitata* for the fourth spiderling till rest stages.

Spider individual were examined daily and the consumed prey individuals were replaced by fresh ones. Emerging females were allowed to mate and left singly for oviposition. Experiments were conducted at 25°C and 60-70 %R.H.

RESULTS AND DISCUSSION

Habitat and Behaviour: Individuals of the thomisid spider *T. spinifer* were found to occur in great numbers on apple trees at Sharkia Governorat and in grape orchards at Beni-Suef and Qalyubia Governorates. On the opposite, it was found in few numbers on olive and orange orchards at Fayoum Governorate. In these habitats, the species individuals were noticed to inhabit the middle of trees and live in groups.

This species did not make any webbings on plants as nests for living, thus female preferred to deposit its egg-sac in hidden places. In the laboratory, it was fed and reared on adults of the two spotted spider mite *T. urticae* and the fruit fly *C. capitata*.

1. Mating: Mating is very important for *T. spinifer* reproduction. Unmated female did not lay any eggs. Copulation took place after ten to fifteen days of both males or females emergence. During this period, they fed vigorously on fruit fly adults. After that, the female ceased feeding and moving to allow the male to ride on her back in the same direction, then the male turned around to let his anterior to face the posterior of the female. In this position, the male caught the female with his legs, then moved his anterior region to face the ventral surface of the female and inserted this right palpal organ in her genital opening and copulation occurred.

Copulation period lasted about 30 minutes. The male cleaned his right palpal organ for about one minute then repeated the copulation with the same female using the left palpal organ.

2. Oviposition: Adult female of *T. spinifer* required a pre-oviposition period before depositing eggs. This period ranged from 14.0 to 18.0 days with an average of 15.2 days at 25 °C. It usually stopped feeding for a day before starting oviposition and devoted her effort to web a silky webbing by her spinnerets.

The female preferred to deposit her eggs in groups inside an egg-sac. Number of deposited egg-sacs per mated female ranged from three to five, with an average of 4.2 egg-sacs during whole oviposition period, which averaged 67.8 days at 25 °C. The period between deposited egg-sac and another ranged from 14.0 to 25.0 days with an average of 19.8 days. The female covered each egg-sac with another layer of dense silky webbing and seemed to be semispherical. The post-oviposition

Table 1. *T. spinifer* adult female longevity and number of deposited egg- sacs at 25°C and 60-70% R.H

	Period in days				No. of deposited egg- sacs per female
	Pre-oviposition	Oviposition	Post-oviposition	Longevity	
Range	14.0 - 18.0	42.0 - 100.0	35.0 - 80.0	91.0 - 198.0	3.0 - 5.0
Average	15.2 ± 1.4	67.8 ± 20.8	52.2 ± 17.6	135.2 ± 20.2	4.2 ± 1.0

period ranged from 35.0 to 80.0 days with an average of 52.2 days at 25 °C & 60-70% R.H., Table 1.

Number of eggs in each egg-sac ranged from 73.0 to 77.0 eggs with an average of 74.6 eggs. The egg is spherical, white when newly deposited then changed gradually to light yellow before hatching. The female was observed to embrace and guard her eggs during the incubation period except during feeding periods.

3. Development: After an incubation period, which lasted for 15.0 days in average, hatching occurred, then spiderlings crawled outside leaving behind the transparent egg shell inside the webbed egg-sac. Males and females of *T. spinifer* passed through six and seven spiderling stages, respectively before reaching adult.

Each of these spiderlings (when full-grown and before changing to the subsequent one) passed through a resting period for about one to two hours during which the individual ceased feeding then moulting occurred.

The first, second and third spiderling stage lasted 17.0 & 19.0; 14.0&16.5; 11.0&13.5 days for male and female, respectively when fed on adult of the spider mite *T. urticae*.

Similar trend occurred in the following spiderling developmental stages from the 4th to the 6th for male or to the 7th for female which was fed on adults of fruit fly, *C. capitata*. Their durations are recorded in Table 2. The total period of spiderlings development (immatures) differed according to sex which being shorter for males (84.0 days) than females (108.0 days).

Thus, the life cycle at 25 °C averaged 99.0 & 123.0 days for males and females, respectively.

4. Adult Longevity: Adult longevity also differed according to sex. Generally, males lived for a shorter period than females. Adult male longevity ranged from 39.0 to 45.0 days with an average of 42.0 days; while that of female ranged from 91.0 to 198.0 days with an average of 135.2 days, Table 1.

5. Generation Period: The generation period (from 1st egg-sac to 1st egg-sac) of *T. spinifer* ranged from 114.0 to 164.0 days with an average of 138.2 days at 25 °C and 60-70% R.H..

Table 2. Duration of different immature stages (spiderlings) of *T. spinifer* reared on *T. urticae* and *C. capitata* at 25 °C and 60- 70 % R.H.

		Mean duration in days										
		fed on <i>T. urticae</i>						fed on <i>C. capitata</i>				
Sex	Eggs	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	stage 7	Total immature	Life cycle		
Female	15.0 ± 3.1	19.0 ± 1.0	16.5 ± 4.5	13.5 ± 3.5	14.5 ± 4.5	13.0 ± 2.0	15.5 ± 2.5	16.0 ± 2.0	108.0 ± 20.0	123.0 ± 23.0		
Male	13.5 ± 1.5	17.0 ± 1.0	14.0 ± 2.1	11.0 ± 2.1	12.5 ± 2.6	14.0 ± 2.1	15.5 ± 2.5	-	84.0 ± 12.0	99.0 ± 15.0		

Number of eggs and adult stages = not less than 20

6. Sex Ratio: During one generation of *T. spinifer* a mated female deposited eggs which gave males and females in a ratio of 1:1 for both sexes.

7. Moulting: After the end of a resting period, which lasted for one to two hours during which the individual ceased feeding, the moulting occurred. Its mechanism began by splitting the old integument, along the two lateral sides of the body. The spider then got rid of its old skin through twisting movements. This was followed by withdrawal of its mouthparts and the legs outside before crawling forward to disengage itself from the exuvia. This moulting process lasted about 50 minutes

After moulting, the individual stopped moving for about 30 to 50 minutes and this may be due to take some time for drying its new integument, then moving and feeding occurred.

8. Predation Capacity: During the biological studies of the true spider *T. spinifer*, adults of the spider mite *T. urticae* and fruit fly insect *C. capitata* were used as a main source of food. The first prey was offered for feeding the first three-spiderling stages, while the second was used for the other stages from the fourth immature stage till the rest of life.

The spider attacks the mite from the anterior part of the body and turns the prey more than once before sucking its contents, while attacks the fruit fly from the junction between head and thorax, then sucked its contents. The first male and female three-spiderling stages consumed an average of 320.5 & 382.5 spider mite individuals, respectively, Table 3. The fourth, fifth and sixth male spiderling stages, fed on 108.0 to 214.0 stages of fruit fly adults, with an average of 161.0 individuals. On the other hand, the four female spiderlings (from 4th to 7th) devoured an average of 263.5 prey individual, Table 3.

The adult proved to be the most efficient stage and this might be due to its larger size and longer longevity. Generally, the whole number of consumed fruit fly by the spider male was proportionally smaller when compared with that attacked by female. This could be also attributed to its small size, shorter duration and not producing eggs. During longevity adult male consumed a number of fruit fly ranged from 120.0 to 200.0 individuals with an average of 146.8 individuals, while that of female ranged from 490.0 to 680.0 with an average of 591.8 individuals, Table 4.

Table 3. Number of consumed *T. urticae* adults and *C. capitata* devoured by *T. spinifer* spiderling stages.

Prey	Predator	No. of prey individuals of predators stage							Total
		1st stage	2nd stage	3rd stage	4th stage	5th stage	6th stage	7th stage	
<i>T. urticae</i>	♀	105.0 ± 15.0	130.5 ± 58.5	147.0 ± 57.0	-	-	-	-	385.5 ± 133.8
	♂	94.0 ± 14.4	108.0 ± 36.0	118.5 ± 38.5	-	-	-	-	320.5 ± 89.5
<i>C. capitata</i>	♀	-	-	-	48.0 ± 28.7	46.5 ± 13.8	71.0 ± 19.5	98.0 ± 28.7	263.5 ± 90.8
	♂	-	-	-	40.0 ± 20.5	50.0 ± 14.4	71.0 ± 19.5	-	161.0 ± 54.4

No. of tested individuals = 40 ♀♀ & 33 ♂♂

Table 4. Number of consumed fruit fly adults per *T. spinifer* adult stage throughout longevity.

Period	Male	Female
Pre-oviposition	-	79 ± 10.3
Oviposition	-	289.4 ± 73.3
Post-oviposition	-	223.4 ± 66.2
Longevity	146.8 ± 18.4	591.8 ± 72.3

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النواحي البيولوجية للعنكبوت الحقيقي
***Thomisus spinifer* (Thomisidae:Araneae)**

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تم دراسة النواحي البيولوجية للعنكبوت *Thomisus spinifer* Cambridge والتي تشمل فترة التزاوج ووضع البيض والنمو ومدة وفترة حياة الطور الكامل والانسلاخ وكذلك الكفاءة الافتراضية. وجد أن كل من الذكر والأنثى يمر بستة إلى سبعة أطوار غير كاملة قبل الوصول للطور البالغ على الترتيب. وتتراوح طول فترة حياة كل من الذكر والأنثى ٩٩ إلى ١٢٣ يوما على الترتيب على درجة حرارة ٢٥ درجة مئوية. استخدم الطور البالغ من العنكبوت *T. urticae* وذبابة الفاكهة *C. capitata* كمصدر رئيسي للتغذية أثناء التربية حيث تستهلك الأطوار الثلاث الأولى لكل من الذكر والأنثى ٣٢٠,٥ و ٣٨٢,٥ فردا من الفريسة الأولى في المتوسط بينما الأطوار الرابع والخامس والسادس للذكر تستهلك ١٦١ فردا من الفريسة الثانية ومن الرابع للسابع للأنثى ٢٦٣,٥ فردا خلال دورة الحياة.