

**BIOLOGICAL STUDIES ON THE TRUE SPIDER, *THYENE IMPERIALIS* (ROSSI) (ARANEIDA : SALTICIDAE) WHEN FED ON DIFFERENT PREY SPECIES IN EGYPT**

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**Abstract**

Biological aspects of the spider species, *Thyene imperialis* (Rossi, 1846) was studied at constant conditions in laboratory (25±2°C and 60-70% R.H.) when fed on three pests; mobile stages of the two-spotted spider mite, *Tetranychus urticae* Koch were introduced to the first and second spiderlings, the European red mite, *Panonychus ulmi* (Koch) introduced to the third and fourth spiderlings and the first instar of cotton leafworm, *Spodoptera littoralis* Boisd introduced to the fifth and sixth spiderlings of male as prey. Incubation period averaged 16.0 ± 1.42 days. The pre-oviposition period was 18.06 days before laying eggs, while the oviposition period averaged 36.75 ± 1.45 days; the post-oviposition period averaged 22.24 ± 1.18 days, the number of egg sacs averaged 3.94 ± 1.44. The number of consumed *T. urticae* by the first and second spiderlings averaged 136.12 ± 8.24 and 248.56 ± 12.80 individuals for female, while for male they averaged 123.88 ± 6.34 and 226.13 individuals. On the other hand, the consumed *P. ulmi* by the third and fourth spiderlings reached 277.81 & 292.25, 251.11 & 267.33 individuals for female and male, respectively. The fifth, sixth and seventh spiderlings consumed 103.12, 122.56, and 136.31 individuals when fed on *S. littoralis* for female, while reached to 87.67 and 101.67 for male (fifth and sixths, spiderlings). Moulting, copulation and feeding behaviour were also studied.

**INTRODUCTION**

Spiders are distributed all over the world and have conquered all ecological environments with perhaps the exception of the air and the open sea. All spiders are carnivorous; many are specialized as snare builders, whereas others hunt their victims. They consume great number of insect and mite pests so that they are considered one of the biocontrol agents in the ecosystem (Clark and Grant 1968). True spiders hardly play a major role in controlling insect pests; also, most spiders are generalists with respect to their diet but for efficient pest control. Furthermore, spiders generally don't form social colonies, so their population cannot become very dense. Spiders may have an important buffer effect for insects, during the early development of an insect population, when growth is exponential (Clark and Grant, 1968). Many spiders adapted to the available food supply by eating more prey when it is abundant; this

maximal energy up take allows the spiders not only grow but also to mature more quickly (Miyoshita, 1968 and Word & Lubin, 1993). Some spiders produce relatively more eggs when food supply is abundant, while there are some ability of spiders to survive several months with food is primarily (Anderson, 1970). At present, about 34,000 spider species belonging to 100 families were recognized involving family Salticidae. The present work concerned with biological aspects of the spider species, *Thyene imperialis* (Rossi, 1846) (Family : Salticidae) when fed on different types of prey; mobile stages of *Tetranychus urticae* Koch, *Panonychus ulmi* (Koch) and first instars of larval stage of cotton leafworm, *Spodoptera littoralis* Boisd . In order to throw the light on the role of this spider species as a biocontrol agent on different plants to produce plants free from the residue of pesticides.

## MATERIALS AND METHODS

Individuals and egg sacs of the spider species, *Thyene imperialis* (Rossi, 1846) were collected from apple orchard at Badr district, El-Behaira Governorate and kept in glass tubes then transferred to the laboratory. The 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> spiderling individuals were singly placed inside translucent plastic cylinder containers of 3 cm in diameter and 15 cm in depths. The spider individuals were reared singly during the first and second spiderlings on the mobile stages of *T. urticae*, while the third and fourth spiderlings were reared on the mobile stages of European red mite, *P. ulmi*, whereas the fifth, sixth and seventh spiderlings were reared on the first instar of larval stage of the cotton leafworm, *S. littoralis*. Females and males were placed each pair inside a jar of 15 cm length and 10 cm width to copulate and deposit their egg sacs. All experiments were conducted at 25±2°C and 60-70% R.H. putting each one in a jar (15 cm length and 10 cm width) which was covered with a piece of muslin. Every tube was supplied with known number of the former prey and inspected twice daily. The numbers of replicates were 50 tubes and jars until the end of the experiment. Biological aspects and number of consumed prey were recorded.

## RESULTS AND DISCUSSION

### Moulting

The prosoma provided with hard cuticle so that it must be make a changing for the skin to adopt the growth of body. Before the spider individual moults to the next stage, it stopped building up a resting cell, where it rested in this cell on its back and killed any prey coming close to without feeding. Its mechanism began by splitting the old integument, along, the two lateral sides of the body. Then the spider got rid of its old skin through twisting movements. This was followed by withdrawing of its

mouthparts from the old exuvia legs followed outside before crawling forward to disengage it self from the exuvia. After moulting the individual stopped moving for about 20-40 minutes for draying its new skin, then move searching for its prey.

### **Mating behaviour**

The male of *Thyene imperialis* display its specific courtship movements in front of the female. These movements range from the simple lifting of a leg to the complex, sequential movements of several extremities. Usually, those extremities which are mostly used in the courtship display are also conspicuously colored. When a male notices a female it approaches her in a zigzagging the bulbous.

The mechanics of the copulatory organs were already briefly explained earlier. During copulation the palpal organ of the male is inserted into the female's genital opening and the sperm is deposited in her seminal receptacles.

### **Feeding behaviour**

Adult and immature stages of the spider species, *Thyene imperialis* catch the prey between it's palpe by helping of the first pair of legs, making a split in the cuticle of the prey (moving stages of *T. urticae* and *P. ulmi*) and sucking the body fluid taking about one minute, while in case of larvae of cotton leafworm prey the spider caught it in the membrane area between the thorax and the head taking about 2-3 minutes for sucking the body fluid.

### **Developmental stages**

The spider, *Thyene imperialis* females and males have seven and six spiderlings, respectively before reaching adult stage. Data tabulated in Table (1) summarized the duration of these different spiderlings.

All female spiderlings have higher duration compared with those of male. Spiderlings of both female and male are white brown in color, and gradually changed during their development to darkness and dark brown in adult stages. When the 1<sup>st</sup> and 2<sup>nd</sup> spiderlings fed on mobile stages of *T. urticae*, the duration were averaged 28.74 and 36.78 for female and 25.25 and 32.45 for male, respectively. These values averaged 31.78 and 25.88 for female and 28.44 and 22.78 for male, respectively when the 3<sup>rd</sup> and 4<sup>th</sup> spiderlings were fed on the mobile stages of *P. ulmi*. On the other hand, when feding on the first larval instar of *S. littoralis* the 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> female spiderlings, durated 21.50, 18.33 and 15.56 days, respectively, while male 5<sup>th</sup> and 6<sup>th</sup> spiderlings averaged 18.44 and 15.94 days, respectively (Table, 1).

Table 1. Duration of *Thyene imperialis* (Rossi) developmental stages when fed on mobile stages of three prey species at 25±2°C and 60-70% R.H.

Developmental stages	Prey species	Duration in days	
		Female	Male
Egg	-	16.00±1.42	16.00±1.42
1 <sup>st</sup> spiderling	<i>Tetranychus urticae</i>	28.74±0.5	25.25±1.13
2 <sup>nd</sup> spiderling		36.78±1.09	32.45±1.34
3 <sup>rd</sup> spiderling	<i>Panonychus ulmi</i>	31.78±0.83	28.44±0.96
4 <sup>th</sup> spiderling		25.88±1.13	22.78±0.44
5 <sup>th</sup> spiderling	<i>Spodoptera littoralis</i> (1 <sup>st</sup> larval instar)	21.50±0.89	18.44±0.53
6 <sup>th</sup> spiderling		18.33±0.68	15.94±0.68
7 <sup>th</sup> spiderling		15.56±1.03	-

### Oviposition and egg incubation

Data in Table (2) showed that, the adult spider female, stayed 18.06 days at pre-oviposition period, 36.75 days at oviposition periods and 22.24 days at post-oviposition periods when was fed on the 1<sup>st</sup> instar of *S. littoralis*. The whole longevity averaged 77.05 days, and 32.17 days for adult female male, respectively. The female life span lasted 270 days, while it was only 190 days for male.

Adult females laid their eggs in colour sacs, spherical in shape and yellowish. The number of egg-sacs per female averaged 3.94 egg-sacs and the total numbers of eggs per sac averaged 234.25 eggs (Table, 2).

Eggs were yellowish in colour, almost spherical then become darker before hatching. Spiderlings stayed together before getting out from the egg sac where the eggs silted translocation in mid region.

Table 2. Longevity and fecundity of *Thyene imperialis* (Rossi) when fed on 1st larval instar of *S. littoralis* at 25±2°C and 60-70% R.H.

Biological aspects	In days	Fecundity	Numbers
Pre-oviposition period	18.06±0.85	Egg sac	3.94±1.44
Oviposition period	36.75±1.45	Total average of eggs	234.25±12.85
Post-oviposition period	22.24±1.18	Daily rate	6.37±0.76
Longevity	77.05±1.98		

### Food consumption of *Th. imperialis* spiderlings

The 1<sup>st</sup> to 2<sup>nd</sup> spiderlings of female stage of spider, *Th. imperialis* consumed an average of 136.12 and 248.56 individuals of *T. urticae*, respectively, while those of the male stage were 123.88 and 226.13 individuals, respectively (Table, 3).

When feeding on mobile stages of *P. ulmi* during the 3<sup>rd</sup> and the 4<sup>th</sup> spiderlings consumed and average of 277.81 and 292.25 individuals for female, while the male consumed an average of 251.11 and 267.33 individuals, respectively.

Data presented in table 3 cleared that when feeding on 1<sup>st</sup> instar of larval stages of *S. littoralis* the 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> spiderlings consumed and average 103.12, 122.56 and 136.31 individuals for female, and an average 87.67 and 101.67 individuals for male (fifth and sixth spiderlings only); respectively.

Data also showed that the 1<sup>st</sup> and 2<sup>nd</sup> spiderlings consumed 384.68 individuals of mobile stages of *T. urticae* during their duration, while the 3<sup>rd</sup> and 4<sup>th</sup> spiderlings consumed 570.06 individuals of *P. ulmi*, and the 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> spiderlings consumed 361.99 individuals of *S. littoralis*. When the adult female fed on the 1<sup>st</sup> larval instar of *S. littoralis*, it layed approximately of 4 egg sacs, each sac contains an average of 240 eggs. It expected that when releasing one egg sac (240 eggs) just before hatching on every on a certain fruit tree it may reduce more than 46000, 59500 and 28800 individuals of *T. urticae*, *P. ulmi*, and *S. littoralis*, respectively. The first instars of *S. littoralis* can be tested for rearing and mass producing the true spiders because they are it is easy to obtain and consumed as a prey.

This study agrees with that of Foelix (1986), Sallam (1996), El-Erksousy 2000 & 2002, El-Erksousy *et al.*, 2002, Abdel-khalek *et al.* (2003); El-Hennawy and Mohafez (2003), El-Sebaay (2003) and Mohafez (2004).

Table 3. Food consumption of *Thyene imperialis* (Rossi) when fed on different type of prey: *T. urticae*, *P. ulmi* and *S. littoralis* under laboratory conditions at 25±2°C and 60-70% RH.

The developmental stages	Prey species	Female		Male	
		Total (mean)	Daily rate (mean)	Total (mean)	Daily rate (mean)
1 <sup>st</sup> spiderling	<i>Tetranychus urticae</i>	136.12±8.24	4.73±0.72	123.88±6.34	4.90±0.54
2 <sup>nd</sup> spiderling		248.56±12.80	6.75±0.86	226.13±9.72	7.01±0.88
3 <sup>rd</sup> spiderling	<i>Panonychus ulmi</i>	277.81±10.35	8.74±1.22	251.11±20.62	8.82±0.93
4 <sup>th</sup> spiderling		292.25±14.11	11.29±1.87	267.33±32.76	11.73±1.16
5 <sup>th</sup> spiderling	<i>Spodoptera* littoralis</i>	103.12±3.7	4.79±0.84	87.67±4.5	4.75±0.47
6 <sup>th</sup> spiderling		122.56±14.6	6.68±0.91	101.67±6.3	6.37±0.82
7 <sup>th</sup> spiderling		136.31±16.61	8.76±1.17	-	-

\* The first instar of *spodoptera littoralis* introduced as prey.

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## دراسات بيولوجية علي العنكبوت *Thyene imperialis* (ARANEIDA : SALTICIDAE) في مصر

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تم عمل دراسة بيولوجية للعنكبوت *Thyene imperialis* تحت الظروف المعملية علي درجة حرارة  $25 \pm 2^\circ\text{C}$  ورطوبة نسبية من 60-70% وقد تمت تغذية العنكبوت في الطور الأول والثاني علي الأطوار المتحركة للعنكبوت الأحمر العادي بينما في الطور الثالث والرابع فقد تم تغذيته علي الأطوار المتحركة للأكاروس الأحمر الأوربي أما في الطور الخامس والسادس والسابع فقد تم تغذية العنكبوت علي العمر الأول ليرقات دودة ورق القطن وتشير النتائج المتحصل عليها أن فترة حضانه البيض قد استغرقت  $16 \pm 1.42$  يوما وكان للأفراد الإناث 7 أطوار غير كاملة قبل البلوغ في حين كان للذكر 6 أطوار فقط وقد استغرقت دورة حياة الأنثي الكاملة  $194.07 \pm 4.07$  يوما بينما دورة الحياة للذكر  $159.1 \pm 3.11$  يوما، استغرقت الأنثي  $18.6 \pm 0.85$  يوما قبل أن تبدأ قي وضع البيض في حين استغرقت  $36.75 \pm 1.45$  يوما أثناء فترة وضع البيض وكان عدد أكياس البيض  $3.94 \pm 1.44$  بينما استغرقت الأنثي  $22.24 \pm 1.18$  يوما كفترة ما بعد وضع البيض وكانت فترة الحياة الكاملة للعنكبوت من البيضة حتي موت الفرد البالغ  $271.62 \pm 4.85$  يوما للأنثي بينما كان للذكر  $191.27 \pm 2.85$  يوما. وكان معدل استهلاك الطور الأول والثاني عند تغذيته علي العنكبوت الأحمر العادي  $136.12 \pm 8.24$ ،  $248.56 \pm 12.80$  فرد، علي التوالي للأنثي بينما استهلك الذكر  $123.88 \pm 26.34$ ،  $226.13 \pm 9.72$  فردا، علي التوالي.

بينما استهلك الطور الثالث والرابع للعنكبوت عند تغذيته علي الأكاروس الأحمر الأوربي  $278.81 \pm 10.35$ ،  $292.25 \pm 14.11$ ،  $251.11 \pm 20.62$ ،  $267.33 \pm 32.76$  للأنثي والذكر، علي التوالي. في حين استهلك الطور الخامس والسادس والسابع للأنثي العنكبوت عند تغذيتها علي العمر الأول من دودة ورق القطن  $103.12 \pm 3.7$ ،  $122.56 \pm 14.6$ ،  $136.31 \pm 16.61$  فردا، علي التوالي بينما استهلك الذكر في الطور الخامس والسادس  $87.67 \pm 4.5$ ،  $101.67 \pm 6.3$  فردا، علي التوالي.