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Biological studies on the true spider, *artema atlanta* walckenaer, 1837 (Araneida: Pholcidae) when fed on different prey species

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Abstract
Biological aspects of the spider species, *Artema Atlanta* Walckenaer, 1837 was studied at constant conditions in laboratory (25±2°C and 60-70% R.H.) when fed on four prey. Larva of the vinegar fly, *Dorsophila melanogaster* and the fruit fly, *Ceratitis capitata*.were introduced to the first and second spiderlings, stored grain worm moth, *Ephestia kuehniella* and the vinegar fly, *Dorsophila melanogaster* introduced to the third and fourth spiderlings and house flies, *Musca domestica*, stored grain worm moth, *Ephestia kuehniella* and the vinegar fly, *Dorsophila melanogaster* introduced to the fifth and sixth spiderlings. Incubation period averaged 11.5 ± 1.20 days. The pre- oviposition period was 19.81 days before laying eggs, while the oviposition period averaged 32.8 ± 3.77days; the post- oviposition period averaged 134.9 ± 3.72 days.

Keywords: *artema atlanta, dorsophila melanogaster,* spider

1. 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 [1]. 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 consider one of the biocontrol agents in the ecosystem [1]. 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 [2]. Furthermore, spiders generally don't form social colonies, so their population cannot become very dense [3].Spiders may have an important buffer effect for insects, during the early development of an insect population, when growth is exponential [1]. 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 [4, 5]. 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 [6]. Most spiders of the family Pholcidae are small or medium in size, usually between two and ten mm. Artema including 4 species was erected by Walckenaer in 1837 [7]. The genus can be distinguished from its family relatives Physocyclus by conical projections on chelicerae are modified hairs. Chelicerae with four or more pairs sclerotized apophyses frontally in Physocyclus [8, 9]. Artema atlanta may be the biggest species of pholcid, and usually be discovered in Pantropical zone.The present work concerned with biological aspects of the spider species, *Artema atlanta* Walckenaer, 1837 (Family: Pholcidae) when fed on different types of prey. Larva of the vinegar fly, *Dorsophila melanogaster*, the fruit fly, *Ceratitis capitata*. House flies, *Musca domestica*, stored grain worm moth, *Ephestia kuehniella* and the vinegar fly, *Dorsophila melanogaster* 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. Therefore the aim this research was to examine the effect of pests on some biological developmental stages, feeding capacity and fecundity of the spider *Artema atlanta* in order to better understand its role, as a natural enemy of insect pests fields

2. Materials and Methods
Individuals of the spider species, *Artema Atlanta* were collected from pomegranate orchard (7 May - 26 Oct 2015) at Abnob destrict, Assiut Governorate and kept in glass tubes then transferred to the laboratory. The 1st, 2nd, 3rd and 4th spiderling individuals were singly placed inside translucent plastic cylinder containers of 5 cm in diameter and 15 cm in depths. The spider individuals were reared singly during the first and second spiderlings on Larva of *D. melanogaster* and *C. capitata*. while the third and fourth spiderlings were reared on the mobile stages of *E. kuehniella*, and *D. melanogaster*, whereas the fifth and sixth spiderlings were reared on the the mobile stages of *M. domestica*, *E. kuehniella* and *D. melanogaster* 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.

3. Statistical analysis
The biological aspects data of the true spider were subjected to means and standard deviation (SD), using SAS program [10].

4. Results and Discussion
4.1 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 itself 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.

4.2 Mating behaviour

Spiders copulated readily in the laboratory.In one case, a single male (78.9 days old, reared in the laboratory) copulated successfully with three females during a nine day period. The first time was observed immediately after the male was introduced into the cage of a female. The pair remained in copula for 40 minutes, with the female oriented ventral side up and the male facing her posterior The mechanics of the copulatory organs were already briefly explained earlier. During copulation the palpal organ of the male was inserted into the female's genital opening and the sperm was deposited in her seminal receptacles.

4.3 Feeding behaviour

the spider species, *Artema atlanta* catch prey between its palpe by helping of the first pair of legs, making a split in the cuticle of the prey and sucking the body fluid taking about one minute, The spiders 'principal means of capturing prey was to throw silk with the aid of the hind legs. Spiders used this method to immobilize mosquitoes which were entangled in the standing web or to catch prey. Was not bitten until the time of feeding, up to six days after capture. Feeding occurred on only 34–48% of the days, and spiders ate about one mosquito per day. Cannibalism was a significant mortality factor.

4.4 Developmental stages

The spider, *Artema atlanta* females and males have 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 1st and 2nd spiderlings fed on Larva *D. melanogaster* and *C. capitata,* the duration were averaged 8.0 and 10.3 for female and 5.0 and 9.3 for male, respectively. These values averaged 10.8 and 11.8 for female and 9.8 and 10.8 for male, respectively when the 3rd and 4th spiderlings were fed on the mobile stages of *E. kuehniella,* and *D. melanogaster* On the other hand, when feding on *M. domestica, E. kuehniella* and *D. melanogaster* the 5th and 6th female spiderlings, durated 12.4 and 14.3 days, respectively, while male 5th and 6th spiderlings averaged 8.0 and 11.5 days, respectively (Table- 1).

Table 1: Duration of *Artema atlanta* developmental stages when fed on mobile stages of different prey species at 25 ± 2°C and 60-70% R.H.

Stages	Prey species	Duration in days	
		Female	Male
Incubation period	.	11.5 ± 1.42	11.3 ± 1.42
1st spiderlinq	*Ceratitis capitata*	8.0 ± 1.31	5.0 ± 0.8
2nd spiderlinq	*Dorsophila melanogaster* (1st larval instar)	10.3 ± 1.67	9.3 ± 1.0
3rd spiderlinq	*Ephestia kuehniella*	10.8 ± 1.28	9.8 ± 1.9
4th spiderlinq	*Dorsophila melanogaster*	11.8 ± 1.28	10.8 ± 1.0
5th spiderlinq	*Musca domestica*	12.4 ± 2.07	8.0 ± 0.8
6th spiderlinq	*Ephestia kuehniella* *Dorsophila melanogaster*	14.3 ± 1.67	11.5 ± 1.3_
Life cycle		78.9± 3.40	65.5± 3.3
Life span		265.6± 9.68	142.0± 5.4

4.5 Oviposition and egg incubation

Data in Table (2) showed that, the adult spider female stayed 19.1 days at pre-oviposition period, 32.8 days at oviposition periods and 134.9 days at post- oviposition period. The whole longevity averaged 186.8 days, and 76.5 days for adult female male, respectively. The female life span lasted 265.6 days, while it was only 142 days for male.

Adult females laid their eggs in colour sacs, Oviposition was not observed directly, but resulted in an egg sac held in the mouthparts of the female. The number of egg-sacs per female averaged 3.2 egg-sacs and the total numbers of eggs per sac averaged 40.8 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: Female longevity and fecundity of *Artema atlanta* when fed on different prey under laboratory conditions 25±2 °C and 60-70% R.H.

Biological aspects	In days	Fecundity	Numbers
Pre-oviposition period	19.1 ± 1.81	Egg sac	3.2 ± 1.1
Oviposition period	32.8 ± 3.77	Total average of eggs	40.8 ± 3.3
Post-oviposition period	134.9 ± 3.72		
Longevity	186.8 ± 8.12		

4.6. Food consumption

The 1st to 2nd spiderlings of female stage of spider, *Artema atlanta* consumed an average of 24.4 and 32.9 individuals of *larva D. melanogaster and C. capitata,* respectively, while those of the male stage were 19.5 and 22.5 individuals, respectively (Table, 3).

When feeding on mobile stages of *E. kuehniella,* and *D. melanogaster* during the 3rd, the 4th spiderlings consumed and

average of 47.9 and 63.5 individuals for female, while the male consumed an average of 31.8 and 51.0 individuals, respectively. Data presented in table 3 cleared that when feeding on *M. domestica*, *E. kuehniella* and *D. melanogaster* the 5th, 6th spiderlings consumed and average 73.0 and 84.1 individuals for female, and an average 62.8 and 72.0 individuals for male fifth and sixth spiderlings respectively. This study agrees with that of [11-22].

Table 3: Food consumption of *Artema atlanta* when fed on different prey under laboratory conditions 25±2°C and 60-70% R.H.

Stages	Prey	Female	Male
		Mean±SE	Mean ±SE
1st spiderling	*Ceratitis capitata*	24.4 ± 1.69	19.5±1.9
2nd spiderling	*Dorsophila melanogaster* (1st larval instar)	32.9±2.03	22.8±1.7
3rd spiderling	*Ephestia kuehniella*	47.9±2.59	31.8±2.1
4th spiderling	*Dorsophila melanogaster*	63.5±2.07	51.0±1.2
5th spiderling	*Musca domestica*	73.0±3.21	62.8±2.2
6th spiderling	*Ephestia kuehniella* *Dorsophila melanogaster*	84.1±1.64	72.0±1.6

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