

Life history of *Argiope trifasciata* (Savigny, 1825) (Araneae: Araneidae) reared and food consumption under laboratory condition

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ABSTRACT

Argiope trifasciata (Savigny, 1825) is a large orb-weaving spider that was raised on various prey species in a laboratory setting with a temperature degree of $28\pm 2^{\circ}\text{C}$ and a relative humidity of 70–80%. Before becoming an adult, this spider went through seven spiderling instars for females (140.98 days) and six for males (87.89 days). The study also showed that first spiderling instar consumed a large number of the two-spotted red spider mite while the second through fourth instars were fed on *Drosophila melanogaster* and *Spodoptera littoralis* but all individuals of the fifth instar were fed on the larvae and adults of the fruit fly *Drosophila melanogaster*, *Acrotylus*, *Aiolopus* and house fly *Musca domestica*. During the sixth and seventh spiderling instars, the adult females were exclusively fed on the larvae and adults of *Acrotylus*, *Aiolopus*, and *Spodoptera littoralis*. The spider's life cycle lasted 162.64 days for the female and 109.89 days for the male. The egg mass contains 140 hundred and forty spiderlings.

Keywords: Spiders; *Argiope trifasciata*; orb-weaving spider; life history; raised and food consumption.

INTRODUCTION

Rather of being significant enemies of other soil residents, spiders are purely predatory creatures that contribute significantly to the production of soil (Kuhnelt, 1976). Spiders are found practically everywhere on Earth, but only a small percentage of them reside in freshwater environments and along the coast, according to Hassan *et al.* (1951). The majority of them consume insect bodily secretions, and many species create webs that trap their prey. Some pose a threat to both humans and other creatures. One of the most varied animal families, spiders can be found in almost every terrestrial ecosystem. These predatory arthropods may stabilize arthropod populations and typically target insects in a non-specific manner (Wise, 1995). Their primary food source is insects, though they may also consume woodlice and centipedes. Orb-weaving spiders have gained popularity recently as model systems to answer issues in a variety of biological domains, including ecology, ethology, neuroscience, physiology, evolutionary biology, and even the chemistry of silk and venom. (e.g., Craig. 1994, Elgar *et al.*, 2000, Herberstein *et al.*, 2005, Blackledge & Hayashi, 2006, Schneider *et al.*, 2005, Blamires *et al.*, 2007, Brooks *et al.*, 2008 and Foellmer, 2008), which necessitates keeping or breeding these spiders in a lab setting (Zschokke & Herberstein, 2005). Designing feeding regimens in the lab may benefit from starting with natural prey catch rates. (Herberstein & Zschokke, 2005). Additionally, in order to assess the spiders, it is necessary to know their natural prey capture rates. Spiders are thought to be useful as natural insect pest control agents since

they can be found in some agricultural fields at quite high population densities. Nevertheless, little is now understood about spiders' function in agroecosystems as insect predators (Nyffeler & Benz, 1979, 1987). This publication presents observational data on the life cycle of *Argiope* (Savigny, 1825) and food consumptions.

MATERIALS AND METHODS

At August, four spiders were gathered from the rice fields above the grass at a village in Sinbillawin city, Dakahlia Governorate. Egg sacs were also discovered dangling on one side of the web. They were transported to the laboratory setting with a temperature degree of $28\pm 2^{\circ}\text{C}$ and a relative humidity of 70–80% and placed in glass tanks, size 50 * 40, and a height of 60 cm. Nyffele and Benz, 1979. The female began to make her own weaving inside the glass aquarium. The females were fed with the adults of *Spodoptera littoralis*, *Acrotylus* and *Aiolopus*. The female laid an egg sac three days after collection. The egg sacs then hatched after 22 days. The individuals were counted and there were 640 individuals fed collectively during the period. After seven days of upbringing, each spiderling was raised separately from the egg sacs in plastic vials measuring 1.5 cm in diameter by 4 cm in height, all in identical lab settings. For the first instar, each spiderling was given a known number of adults of the two-spotted red spider mite *Tetranychusurticae* C.L. Koch, 1836. For the second through fourth instars, they were given a known number of different stages of the *Spodoptera littoralis* and fruit fly *Drosophila melanogaster* Meigen, 1830. Based on their size, the sixth and seventh instar and adults were given a mixture of the *Spodoptera littoralis*; *Acrotylus* and *Aiolopus* (Wiedemann, 1824) (Linnaeus, 1758). After their third moult, the hatched spiderlings were moved to larger vials (10 x 15 cm) and raised until they reached adulthood. Adults were raised to investigate other facets of the species' life cycle and to see how they mated.

RESULTS AND DISCUSSION

a-Life history of *Argiope trifasciata* (Savigny, 1825)

Eggs, the incubation period, and the egg sac:

Argiope trifasciata round, slightly expanded egg sacs (8–9 mm in diameter) were light yellow in hue, turning pale yellow shortly before hatching. The eggs were creamy in tone, round in shape, and darkened before hatching. Each of the 600, 700, and 800 spiderlings hatched and came out of the egg sacs through a little hole. The average incubation period for both sexes was 22 days, according to the results collected.

Spiderlings:

Up until their first moult, all spiderlings were raised together, fed, checked every day, and had their eaten prey replaced by new ones. The experiment started with 50 spiderlings out of the 640 spiders that were left behind after cannibalism after seven days. Every spiderling was raised separately in plastic vials measuring 1.5 by 4 cm.

The life cycle:

Of the fifty *Argiope* spiderlings raised, seven escaped before they reached adulthood, fifteen perished before they did, and twenty-eight reached adulthood. Throughout their growth, the spiderlings went through six instars for males and seven for females (Table 1). For both males and females, the longest length was almost 25 days. The second instar was the shortest, lasting 15.64–14.13 days for males and 17.55–16.88 days for females (Table 1). When it comes to the predator of the common red spider mite, *T. cinnabarinus* and *Pardosacrassipalpis* Purcell, 1903 of South Africa, "the males pass through seven instars before reaching maturity and the females through eight" (Dippenaar-Schoeman, 1977).

Adult:

After roughly 140.98 days for males and 87.89 days for females, *Argiope trifasciata* immatures reached maturity (Table 1). There were 20 females (71.4%) and 7 males (28.57%) among the 8 adults. There were also differences in adult longevity by sex. When both sexes consumed adults of the *Acrotyl* and *Aiolopus* as well as various stages of larvae and adults of the *Spodoptera littoralis*, adult females of *Argiope* typically outlived males. The duration of this time was around 25 days for males and 35 days for females, as indicated in Table (1).

Life span was likewise longer in females than in males (about 135 and 198 days, respectively) (Table 1). Although some spiders in temperate locations live for two years, the majority only live for one year, according to Foelix (2011). The majority of male spiders die soon after mating, although females typically live longer.

Table (1): shows how long each stage of *Argiope trifasciata* spent feeding on various prey species. (a temperature degree of $28\pm 2^{\circ}\text{C}$ and a relative humidity of 70–80%).

Stage	Prey species	Mean duration of different stages	
		Female	Male
Incubation period		22	22
1st spiderling	<i>Tetranychusurticae</i>	20.64	18.63
2nd spiderling	<i>Drosophila melanogaster</i> and <i>Spodoptera littoralis</i>	15.64	14.13
3rd spiderling		17.55	16.88
4th spiderling		20.27	20.75
5th spiderling	Mix from <i>Spodoptera littoralis</i> <i>Acrotyl</i> and <i>Aiolopus</i>	18.27	17.50
6th spiderling		25.27	25.14
7th spiderling		23.34	----
Total immature		140.98	87.89
Life cycle		162.64	109.89
Longevity		35	25
Life span		197.64	134.89

The female generated three egg sacs with approximately 1800 eggs (600 eggs per sac), as indicated in Table (2). This is nearly identical to the South African *Pardosacrassipalpis* case, according to Dippenaar-Schoeman (1977). "During the reproductive phase the female spider produces an average of three egg sacs, with an average number of 23.3 eggs per sac".

Table (2): Fecundity of female *Argiope trifasciata* on different prey species under laboratory conditions. (a temperature degree of $28\pm 2^{\circ}\text{C}$ and a relative humidity of 70–80%).

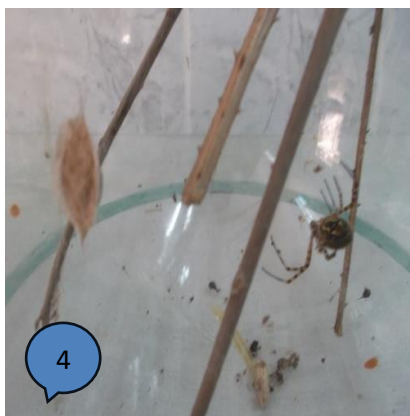
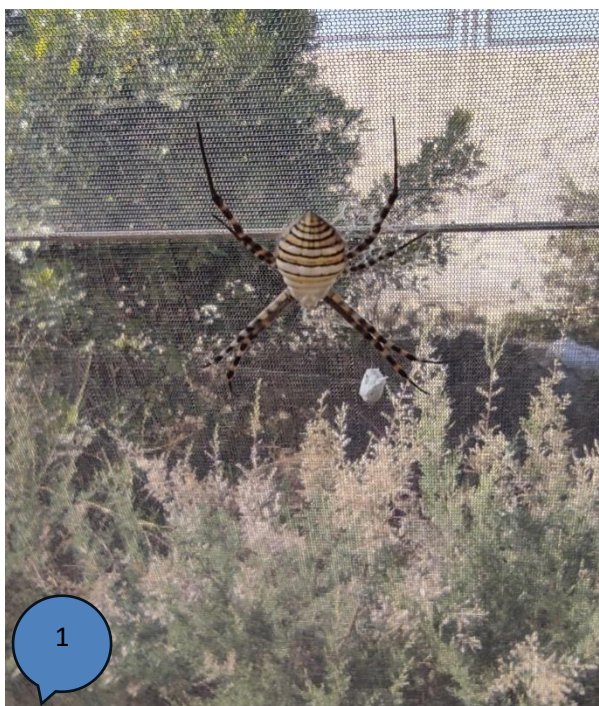
Stages	Days
Pre-oviposition	7.5
Oviposition	20
Post-oviposition	7.4
Average egg sac / female	2.8
Total number of egg/ female	1800

b- Food consumption of *Argiope trifasciata* reared under laboratory conditions (a temperature degree of $28\pm 2^{\circ}\text{C}$ and a relative humidity of 70–80%).

Various spiderling instars and adults were fed *T. urticae*, as well as various instars of *D. melanogaster*; *Drosophila* sp., and *Spodoptera littoralis* larvae and adults, in order to evaluate *Argiope* food consumption. *T. urticae* was given to both first instars. Spiderlings in their second, third, and fourth instar were fed a combination of *Drosophila* sp. and *Spodoptera littoralis* larvae and adults, while the fifth instar was fed a combination of adults from *Spodoptera littoralis*, *Acrotyl*, and *Aiolopus* for the remainder of its life cycle. Table (3) lists the number of prey species that each spiderling instar has consumed.

Table (3): Food consumption of *Argiope trifasciata* under laboratory conditions on different prey species (a temperature degree of $28\pm 2^{\circ}\text{C}$ and a relative humidity of 70–80%).

Developmental Stage	Prey species	Mean food intake/prey	
		Female	Male
1st spiderling instar	<i>Tetranychusurticae</i>	5.7	4.6
2nd spiderling instar	<i>Drosophila melanogaster</i> .and <i>Spodoptera littoralis</i>	3.2	3.1
3rd spiderling instar		4.9	4.6
4th spiderling instar		6.2	5.5
5th spiderling instar	Mix from <i>Spodoptera littoralis</i> <i>Acrotyl</i> and <i>Aiolopus</i>	2.36	2.2
6th spiderling instar		3.2	2.3
7th spiderling instar		4.1	-



Figers(1 to 8): *Argiope trifasciata* (Savigny, 1825) alive under laboratory conditions; (Figers1,3 from adult Female and Figer2 from adult male and Female on orb-weaving); (Figer3 from Female with her eggs.) and Figers 5. 6.7.8 from hatched spiderlings third, fourth instar spiderlings when feeding.

Conclusion:

The spider's *Argiope trifasciata* life cycle lasted 162.64 days for the female and 109.89 days for the male. The egg mass contains six hundred and forty spiderlings. After roughly 140.98 days for males and 87.89 days for females, *Argiope trifasciata* immatures reached maturity. There were 20 females (71.4%) and 7 males (28.57%) among the 8 adults. The spiderlings went through six instars for males and seven for females. For both males and females, the longest length was almost 25 days. The second instar was the shortest, lasting 15.64–14.13 days for males and 17.55–16.88 days for females.

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