

Observations on the Biology of *Oxyopes ratnae* Tikadar (Arachnida : Oxyopidae) Occurring on Cotton

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ABSTRACT

Studies on the biology of *Oxyopes ratnae* Tikadar showed that the spider laid on an average 2.8 egg masses during the life span. The average incubation period was 10.1 ± 0.74 days and number of spiderlings emerging per egg mass varied from 30-42, with an average of 35.6 ± 3.82 . Males and females passed through 10 and 11 instars, respectively to reach maturity. Male and female spiderlings took an average of 187.20 ± 4.87 and 259.50 ± 4.18 days, respectively to complete the development from egg to adult. The total average life span of adult in case of male and female was 305.8 and 358.80 days, respectively. The males and females mated readily under laboratory conditions, the mating lasted for a few seconds. Mortality during different instars varied from 4.00 to 70.64%. The females spun silken cocoons before laying eggs and covered them with silken threads. It was also found to take care of the eggs by sitting over them.

KEY WORDS : *Oxyopes ratnae*, biology, cotton

Cotton is an important cash crop which is cultivated almost all over the world. In India, it is cultivated over 74 million hectares mainly in Maharashtra, Gujarat, Andhra Pradesh, Tamil Nadu, Punjab, Karnataka, Madhya Pradesh and Rajasthan. Chemical insecticides are one of the effective tools available for combatting the pest problems. But, over reliance on such chemicals has caused many problems such as environmental pollution, destruction of natural enemies, development of resistance and resurgence of pests. Biological methods of pest control offer great scope in this regard.

Riley (1885) reported several species of spiders occurring on cotton and predaceous on the cotton pests. Fletcher and Thomas (1943) also reported spiders as predators of *Heliothis* larvae in cotton. Patel *et al.* (1986) studied spiders in cotton fields in Gujarat and reported 13 families of spiders on cotton. Nyffeler *et al.* (1987) reported *Oxyopes salticus* Hentz as the most abundant spider species on cotton in East Texas (the USA). It was about 68 per cent spiders collected from the cotton field. *Oxyopes ratnae* Tikadar was the most abundant species found on cotton during the present

study. In order to study the biology of this predominant species a study was carried out and the results are presented in this paper.

MATERIALS AND METHODS

The present study was carried out at the Anand Campus of Gujarat Agricultural University during 1986-87. The females of *O. ratnae* were collected from the cotton fields and kept in one litre glass jars. The mouth of the jar was covered with a fine nylon cloth held in place by a rubber band. The females were fed with laboratory-reared larvae of *Corcyra cephalonica* Staint. and *Spodoptera litura* Fab. throughout the course of study. The eggs laid by such females were used for studying its incubation period and other biological characters. The studies were carried out at varying temperature of 25-30°C and 60-80% relative humidity.

To study the incubation period of the eggs, the egg masses with females were kept in one litre capacity glass jars. The mouth of the jars was covered with a piece of fine nylon cloth. The egg masses were examined daily and the

duration of hatching as well as number of spiderlings hatched were recorded.

The newly hatched spiderlings were transferred into a clean glass vial (10.0 x 2.5 cm) using a fine camel hair brush and the mouth of the glass vial was plugged with a cotton plug. A cotton swab soaked in water was placed inside glass vial to maintain humidity. The spiderlings were fed with nymphs of aphids collected from the field for first few days. They were then given 4-6 newly hatched larvae of *C.cephalonica* regularly until they reached the second instar. Thereafter, 4-5 day-old larvae of *C.cephalonica* (4 to 5/individual) were given. Slightly grown up larvae were given as the development of spiderlings advanced. The larvae of *C.cephalonica* were obtained from the parasite breeding laboratory of Anand Campus. The food remains and excreta were removed everyday and cotton swab was replaced every alternate day. The glass vials were also cleaned periodically in order to keep them clean. The development of the spiderlings was closely observed. Measurements of male and female spider were recorded using ordinary

scale. Extent of mortality amongst the spiderlings at each instar was also recorded.

To Study the mating behaviour, pairs of *O.ratnae* were released in one litre glass jars. A small twig of cotton plant was also placed in the jar in order to provide natural substrate. The adults were fed with larvae of *C.cephalonica*. A cotton swab soaked in water was also kept in the jar for maintaining humidity. Mating behaviour and cocoon spinning were closely observed. Since parental care is often seen in spiders, close observations were made to observe this behaviour of *O. ratnae* in the laboratory.

In order to study the host range, field-collected *O.ratnae* were held in glass jars and provided with different insect pests collected from the field and their predation was recorded.

RESULTS AND DISCUSSION

Eclosion of the eggs took place in 9 to 11 days, the average being 10.1 ± 0.74 days (Table 1). The number of spiderlings emerged varied from 30 to 42 with an average of 35.6 ± 3.82 spiderlings per egg mass. Males and females

Table 1. Duration of instars and total life-span of *O.ratnae*.

Instars*	Duration (in days) of			
	Male		Female	
	Range	Mean	Range	Mean
II	8-20	16.20	8 - 25	17.25
III	7-30	18.00	10 - 30	21.00
IV	9-20	17.60	12 - 31	26.25
V	8-23	15.40	9 - 36	23.75
VI	11-25	18.00	18 - 35	26.37
VII	15-28	22.00	9 - 32	26.62
VIII	9-30	23.00	10 - 35	27.00
IX	18-30	26.00	11 - 33	27.75
X	28-35	31.00	15 - 35	29.37
XI	- -	-	24 - 40	33.25
Total	157 - 215	187.20	221 - 295	259.50
Total life span	260 - 349	305.80	323 - 418	358.80
S.D		4.87		4.18

* Since the first moult occurs in the egg sac, the duration of first instar could not be recorded

passed through 10 and 11 instars respectively to reach maturity when fed on the larvae of *C. cephalonica* (Table 1). Male spiderlings of *O. ratnae* took 157-215 days with an average of 187.20 ± 4.87 days whereas, the female took 221-295 days with an average of 259.50 ± 4.18 days to complete the development. The total life span from the emergence of the spiderlings to the death of adult varied from 260- 349 days in case of males (average being 305.8 days) whereas it varied from 323-418 in case of females (average being 358.80 days). The average length of adult male was 7.95 mm while it was 9.15 mm in case of female.

Patel (1987) reported almost identical developmental periods for *O. chittrae*. According to him male and female spiderlings of *O. chittrae* passed through 9 and 10 instars and took an average of 193.37 and 269.63 days, respectively. The total life span of male and female varied from 254 to 311 and 327 to 405 days, respectively.

It was seen that out of the 25 spiderlings reared in the laboratory, only 14 developed into adults. The per cent mortality during different instars varied from 4.00 to 17.64. The highest mortality (17.64 per cent) was recorded in the 12th instar spiderlings. On examining the dead spiderlings, it was found that spiderlings could not cast their exuviae and died. Peck and Whitcomb (1970) reported that moulting period is very critical time in the life of spiders and great numbers do not successfully complete moulting. They also reported that if the spider failed to withdraw its legs from the old exuviae, it struggles for hours and finally dies. This could be due to a premature loss of moulting fluid.

The male raised his cephalothorax and beat his palps before performing mating and moved around the female beating his palps alternatively. Then it came in front of the female. If the female accepted him, she also beat her palps up and down alternatively. Otherwise she ran away from the male. The male made contact with the female by using his anterior legs. Then, he mounted her from the

front, turned his cephalothorax to the side and stretched the palps to reach the epigynal orifice. Mating lasted for only a few seconds. The male remained stationary for about 5 - 6 minutes and then started moving his palps and tried to mount over the female once again. However, the sperm induction and palps charging in the sperm could not be observed in the laboratory.

The abdomen of the female started swelling after successful mating and she started constructing the cocoon within 5-7 days after mating. In the field, the cocoons were found on the leaves of cotton plant, but in laboratory the cocoons were constructed on the wall of the container. She started spinning a soft disc consisting of soft silk measuring 8-12 mm in diameter. Silk thread was found coming out from the spinnerets and the spinning was done by the movement of abdomen without the help of legs or palps. When the disc was completed (half cocoon), she started to force her eggs against the disc by sitting on the disc. The process of egg laying took 5-6 minutes and the whole egg-mass was found covered with some yellowish film. Then, she started spinning across the eggs and covered them with silk. The entire process of cocoon spinning took 90-100 minutes. The process of cocoon spinning was not continuous. The female took rest during the spinning of the cocoon and 2 to 4 cocoons were produced by one female (the average being 2.8 cocoons). After the completion of cocoon spinning, the female sat over the cocoon by keeping her abdomen in contact with cocoon.

The female was observed to take care of the eggs. She was always found sitting close to egg sac. However, when a prey was offered, she left the egg sac and caught the prey. But immediately after catching the prey she returned to the egg sac and fed on the prey. Similar behaviour was also observed in the field. This parental care was observed until the eggs hatched out. Spiderlings were left alone, after they hatched out from the egg sac.

In order to know the host range of *O.ratnae*, different insect pests were offered to the spider in the laboratory and the predation was recorded. It was found that the spider fed on all the insect pests offered. The host insects fed by the spider were *S.litura*, *Helicoverpa armigera* Hbn., *C.cephalonica*, *Catopsilia pyranthe* Linn. *Anomis flava* Fab., *Phycita infusella* Meyr., *Earias vittella* F., *Dysderus cingulatus* Fab. and *Achaea janata* Linn. The young spiderlings also fed on the eggs of *S.litura*, *H.armigera* and *C.cephalonica*.

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