

LIFE CYCLE OF *AMBLYSEIUS ALSTONIAE* GUPTA, AT ROOM TEMPERATURE FEEDING UPON *EOTETRANYCHUS HICORIAE* MCGREGOR ON GUAVA (*PSIDIUM GUAJAVA*)

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INTRODUCTION

The Phytoseiid mite *Amblyseius alstoniae* has the proven ability as bio-controlling agent on important mite pests of agricultural crops. Since the time this species was described from West Bengal (Gupta, 1975), it has been recorded from several other states of India (Gupta 1986, 1987) to feed upon a number of pest species (Gupta, 1985, Gupta & Gupta, 1992). In view of this importance, works on diverse aspects of this mite like feeding potentiality (Dhooria, 1981), food preference (Jose *et al.*, 1989), effects of temperature on development (Kumari & Sadana, 1990), mating behavior (Kumari & Sadana, 1990), seasonal fluctuation (Kumari & Sadana, 1995), predator prey interaction (Kumari & Sadana, 1995a) and effect on pesticides (Rai *et al.*, 1995, 1999) have been done. Since life cycle of this species at room temperature has not been worked out so far and as this species was abundantly available in Sundarban Biosphere Reserve both in mangrove and agri-horticultural crops feeding effectively upon pest mites, it was thought desirable to work out the biology of the species at room temperature and the present paper reports the duration of different developmental stages along with fecundity, longevity and sex ratio.

MATERIAL & METHODS

For mass culture of the prey mite *Eotetranychus hicoriae* on guava which was used as food of the predatory mite, *Amblyseius alstoniae*, the technique followed by Lal (1977) was adopted while the technique used for the study of life cycle of predatory mite was according to Overmeer (1985). The room temperature and relative humidity (RH), which were maintained during the period of study were 30°-32°C and 85-95%, respectively. The data collected was statistically analysed.

RESULTS AND DISCUSSION

1. *Mating* : The mating took place immediately after the emergence of the adult. The male approached to the female vibrating its palps and first pair of legs and reached the posterior end

of the female. Then it crawled beneath her and raised its posterior end so as to oppose the venter of the female. The unintended female, if any, moved away while the intending female remained still at the same spot allowing mating which continued for about an hour or so. A female once mated did not allow other males to mate with it though males mated with several females.

2. *Incubation* : The eggs were elliptical (70-100 microns in length), slightly opaque and laid singly in a scattered manner on the under surface of the leaf. The minimum incubation period was 2.0 days and maximum was 3.0 days with the mean of 2.30 ± 0.14 days. The percentage of hatching was 81.34. The incubation periods as were reported for other Phytoseiid mites from India were 1.92 days in *A. tetranychivorus* (Jagadish & Nageschandra, 1979), 44 hours 42 minutes for *A. longispinosus* (Mallik and ChannaBasavanna, 1983), 50.38 ± 5.01 hours for *A. ovalis* (Borah & Rai, 1989) feeding on castor pollen, 50.04 ± 0.91 hours in *Amblyseius concordis* (Jagadish, et al., 1990), 32.52 hours for *Amblyseius delhiensis* (Nageshchandra et al., 1998). Hence, the incubation period as observed in the present case was within the reported duration for this stage.

3. *Larva Stage* : The minimum larval period was 2 days and the mean was 2.00 ± 0.00 days. They were sluggish having three pairs of legs and mostly did not feed on prey mites. The larva passed through a brief inactive period (quiescent stage) before moulting to the next stage. In case of other species, the duration of this stage was 17.2 hours in case of *A. channabasavannai* (Daniel, 1981), 1.06 days for *A. tetranychivorus* (Jagadish & Nageschandra, 1982), 12 hours 25 min for *A. longispinosus* (Mallik and ChannaBasavanna, 1983), 1.00 ± 0.00 days for *A. finlandicus* (Sharma & Sadana 1985), 21.02 ± 3.08 hours for *A. ovalis* feeding on castor pollen (Borah & Rai, 1989), 17.68 ± 1.90 hours in *A. concordis* (Jagadish et al., 1990) and 27.2 hours in *A. delhiensis* (Nageshchandra et al., 1998). Considering all these, the larval period in the present case appears to be slightly longer than what was reported by earlier workers for other Phytoseiid mite species.

4. *Protonymph Stage* : The mean duration of protonymphal stage was 2.30 ± 0.15 days. It was more active than the larva and had four pairs of legs. Its body coloration was creamish and was found to capture the larvae and nymphs of *E. hicoriae* for feeding. It passed through a quiescent stage before moulting to the deutonymph. The duration of this stage in case of other phytoseiid species was 22.2 hours in *A. channabasavannai* (Daniel, 1981), 1.06 days in *A. tetranychivorus* (Jagadish & Nageschandra, 1982), 20 hours 53 minutes for *A. longispinosus* (Mallik and ChannaBasavanna, 1983), 1.2 ± 0.40 days at 30°C in *A. finlandicus* (Sharma & Sadana 1985), 27.15 ± 2.96 hours feeding on castor pollen in *A. ovalis* (Borah & Rai, 1989), 24.49 ± 2.51 hours in *A. concordis* (Jagadish, et al., 1990), and 46.93 hours feeding on castor pollen for *A. delhiensis* (Nageshchandra et al., 1998). Therefore, protonymphal period as observed in the present case is longer than those reported by the earlier workers.

5. *Deutonymph Stage* : The mean duration of deutonymphal stage was 3.25 ± 0.45 days. It was found to be very active and fed on all the stages of the prey mite. The duration of this stage in case of other phytoseiid species was 23.8 hours in *A. channabasavannai* (Daniel, 1981), 0.92 days in *A. tetranychivorus* (Jagadish & Nageshchandra, 1982). 21 hours 51 minutes in *A. longispinosus*

(Mallik & ChannaBasavana, 1983), 2.4 ± 0.48 days in *A. finlandicus* (Sharma & Sadana 1985), 28.99 ± 5.63 hours feeding on castor pollen in *A. ovalis* (Borah & Rai, 1989), 29.80 ± 2.01 hours in *A. concordis* (Jagadish *et al.*, 1990) and 53.87 hours in *A. delhiensis* (Nageshchandra *et al.*, 1998). However, the duration of 3.25 ± 0.45 days as recorded in this study is much longer as compared to observations made by other workers.

6. *Egg to Adult Period* : The mean egg to adult period was 9.50 ± 0.39 days. It was also observed that the percentage of mortality was 22. In case of other Phytoseiid species this period (egg-adult) was 140 ± 7.51 hours in *A. tetranychivorus* (Puttaswamy, 1978), 85.10 hours in *A. channabasavannai* (Daniel, 1981), 5.8 ± 0.40 days at 30°C in *A. finlandicus* (Sharma & Sadana, 1985), 127.10 hours in *A. ovalis* feeding on castor pollen (Borah & Rai, 1989), 15.8 ± 2.00 days in *A. longispinosus* (Nangia *et al.*, 1990), 66.80 ± 1.14 hours at $35 \pm 1^{\circ}\text{C}$ and 55.3% RH and longest 120.48 hrs at $20 \pm 1^{\circ}\text{C}$ and $60 \pm 3\%$ RH in *A. concordis* (Jagadish *et al.*, 1995, 1999) and 4.83 ± 0.22 days at 30°C in *A. coccocius* (Saha *et al.*, 1998). Therefore the total life cycle in the present case which was 9.50 ± 0.39 days is relatively longer than those observed by other workers excepting *A. longispinosus* which took longer period (Nangia *et al.*, 1990).

7. *Pre-oviposition period* : The mean pre-oviposition period was 3.72 ± 0.15 days. However, this period is near to the duration observed where it was reported to be 4.50 ± 1.93 days in *A. channabasavannai* (Daniel, 1981), 3.63 days in case of *A. tetranychivorus* (Jagadish & Nageschandra, 1982) and longer than other cases like 1.8 ± 0.40 days at 30°C in *A. finlandicus* (Sharma & Sadana 1985), 1.48 ± 0.02 days in *Phytoseiulus persimilis* (Krishnamoorthy, 1989), 2.43 hours in *A. delhiensis* (Nageshchandra *et al.*, 1998) and 0.3 ± 0.08 days at 30°C in *A. coccocius* (Saha *et al.*, 1998).

8. *Oviposition Period* : The mean oviposition period was found to be very brief (4.75 ± 0.15 days). Excepting Nageshchandra *et al.*, (1998) who reported this period to be 2.46 days in *A. delhiensis* while in all other cases the oviposition period was much longer for example 15.7 ± 1.71 days in *A. channabasavannai* (Daniel, 1981) 15.8 ± 1.32 days in *A. finlandicus* (Sharma & Sadana 1985), 14.01 ± 2.05 days in *A. ovalis* (Borah & Rai, 1989).

9. *Postoviposition Period* : The mean Postoviposition period in the present study was 8.0 ± 0.25 days which appeared to be much longer as compared to the duration observed by other workers, viz., 5.12 days in *A. tetranychivorus* (Jagadish & Nageschandra, 1982), 1.2 ± 0.40 days in *A. finlandicus* (Sharma & Sadana 1985) and 0.63 days feeding on castor pollen in *A. delhiensis* (Nageshchandra *et al.*, 1998) but came closer to 10.00 ± 1.76 days in *Phytoseiulus persimilis* (Krishnamoorthy, 1989).

10. *Adult Longevity* : The average adult longevity in female was found to be 17.25 ± 0.39 days which came closer to observations made by other workers like 18.6 ± 1.49 days in female of *A. finlandicus* (Sharma & Sadana, 1985), 16.21 ± 2.03 days in *A. ovalis* (Borah & Rai, 1989), but was much shorter as compared to 31.88 ± 3.63 days in *Phytoseiulus persimilis* (Krishnamoorthy, 1989).

11. *Fecundity* : The average fecundity was rather poor which was 11.87 ± 0.67 eggs while in other Phytoseiid species this was reasonably higher as 27.3 in *A. channabasavannai* (Daniel, 1981), 26.8 eggs in *A. tetranychivorus* (Jagadish & Nageschandra, 1982), 15.6 ± 1.20 eggs in *A. finlandicus* (Sharma & Sadana 1985), 39.2 ± 0.49 eggs in *A. ovalis* (Borah & Rai, 1989) and 17.40 in *Phytoseiulus persimilis* feeding on *Tetranychus urticae* (Krishnamoorthy, 1989).

12. *Sex Ratio* : The Male : Female ratio was found to be 1 : 1.25 but for other species it was reported to be 1 : 3.30 in *A. finlandicus* (Sharma & Sadana, 1985) and 1 : 4.87 in *Phytoseiulus persimilis* (Krishnamoorthy, 1989). So, the sex ratio was relatively less female biased as compared to observations made by the other workers.

Table-1. Life cycle of *Amblyseius alstoniae* Gupta on Guava (*Psidium guajava*) under laboratory condition at room temperature.

Stage	Range	Average	Mean \pm S.E.
Egg	2–3 days	2.3 days	2.3 ± 0.14 days
Larva	2 days	2 days	2.0 ± 00 days
Protonymph	2–3 days	2.3 days	2.3 ± 0.15 days
Deutonymph	3–4 days	3.25 days	3.25 ± 0.45 days
Egg to Adult	9–10 days	9.5 days	9.5 ± 0.39 days
Pre-oviposition	3–4 days	3.72 days	3.72 ± 0.15 days
Oviposition	4–5 days	4.75 days	4.75 ± 0.15 days
Post-Oviposition	7–9 days	8.0 days	8.0 ± 0.25 days
Adult Longevity	16–18 days	17.25 days	17.25 ± 0.39 days
Fecundity	10–15	11.87 eggs	11.87 ± 0.67 eggs
% of Hatching :-	81–82%	81.34%	$81.34 \pm 0.54\%$
% of Mortality :- 22%			
<i>Sex Ratio</i> :- Male : Female = 1 : 1.25			

SUMMARY

The present paper reports the duration of different developmental stages of *Amblyseius alstoniae* Gupta along with fecundity, longevity and sex ratio. The life cycle (egg to adult) took 9.50 ± 0.39 days. The fecundity, longevity and Male : Female sex ratio were 11.87 ± 0.67 eggs, 17.25 ± 0.39 days and 1 : 1.25, respectively.

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