

**LIFE CYCLE OF *AMBLYSEIUS MULTIDENTATUS* (SWIRSKI & SHECHTER)
AT ROOM TEMPERATURE FEEDING UPON *EOTETRANYCHUS*
FREMONTI TUTTLE & BAKER ON *AVICENNIA ALBA* BLUME**

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INTRODUCTION

Among the predatory mites which have been reported to be of potential importance in India for biocontrol of agricultural mite pests, *Amblyseius multidentatus* (Swirski & Shechter) is certainly one of those having been seen actively feeding upon mostly eriophyid mites and tetranychid mites infesting brinjal and other vegetables and help in keeping the pest mite population under control (Gupta 1985, Gupta & Gupta 1992, Gupta 2002). Unfortunately, no study has been made in India to work out its biology and duration of different developmental stages and hence an attempt has been made in this study to work out duration of different developmental stages, longevity, fecundity, sex ratio, etc. and results thereof are presented here.

MATERIAL AND METHODS

The mass culture of prey mite *Eotetranychus fremonti* Tuttle & Baker, which was found to infest fig tree severely, was used as prey of this predatory mite. This prey mite was mass cultured on fig leaf kept on wet cotton swab in a Petridish (10 cm diameter). The room temperature and humidity which were maintained were 30°–32°C and 80–85%, respectively. The mite developed fast on fig leaf and completed a generation in 7–10 days. The life cycle of this predatory mite was studied in a small Petridish on which excised leaf of *Avicennia alba* was kept on wet cotton swab. From mass culture, the different stages of *E. fremonti* were given as food. Ten adults of *Amblyseius multidentatus* were put (one on each Petridish) and were kept at room temperature and humidity allowing the adults to lay eggs. Within 24–36 hours, eggs were laid and as soon as the eggs were found, the adult was removed keeping only the eggs. Hence life cycle study of this mite was initiated with 10 freshly laid eggs almost of the same age. Precautions were taken to remove all organisms on the leaves by brushing and then examining the excised leaf under stereo-binocular microscope. Thereafter, observations were recorded after every 12 hours to find out the duration of different developmental stages. After the egg hatched, the newly emerged larva was transferred

to a freshly excised leaf of *A. alba* on which the prey mites, both adults and nymphs, were given as food for this predatory mite. Observations were recorded at every 12 hourly interval to determine duration of different developmental stages, pre-oviposition, oviposition, post-oviposition periods, fecundity, longevity and % of mortality. The data so collected were subjected to statistical analysis.

RESULTS AND DISCUSSION

1. *Mating* : As usual, the mating took place almost immediately after the emergence of the adult. Since the males emerged earlier than females it was seen that the males kept on waiting for emergence of female and impregnated it as soon as the female emerged. The male mated with several females but female was unigamous.

2. *Incubation* : The eggs were elliptical, about 84 microns in length and were laid singly on the under surface of the leaf. The mean incubation period was 1.72 ± 0.02 days having minimum of 1.0 day and maximum of 2.0 days. The percentage of hatching was 79.56 ± 0.79 . The incubation periods as were reported by other workers were 1.92 days in *A. tetranychivorus* (Jagadish & Nageshchandra, 1979), 1.86 days in *A. longispinosus* (Mallik and ChannaBasavanna, 1983), 2.09 ± 0.20 days in *A. ovalis* (Borah & Rai, 1989), 1.35 days in *Amblyseius delhiensis* (Nageshchandra *et al.* 1998), 2.30 ± 0.14 days in *A. alstoniae* (Gupta *et al.* 2003). From these, it appears that the incubation period observed in the present study was within the range reported by the previous workers.

3. *Larva stage* : The larva was light creamish colour having three pairs of legs and moved very slowly and most probably it did not feed. The mean larval period was 1.56 ± 0.08 days with the minimum of 1 day and maximum of 2 days. The earlier workers like Daniel (1981) in case of *A. channabasavannai*, Mallik and ChannaBasavanna (1983) in case of *A. longispinosus*, Borah & Rai (1989) in case of *A. ovalis*, Jagadish *et al.* (1990) in case of *A. concordis*, reported larval periods being less than 1 day *i.e.*, 0.71, 0.51, 0.87 ± 0.12 , 0.73 ± 0.07 days, respectively. However, Jagadish & Nageshchandra, 1982 in case of *A. tetranychivorus*, Sharma & Sadana (1985) in case of *A. finlandicus* and Gupta *et al.* (2003) in case of *A. alstoniae* reported this period as one day and above being respectively 1.06 days, 1.00 day and 2.00 days. Therefore, the results of the present investigation is within the range of the second group of workers.

4. *Protonymph stage* : The protonymph is more active and unlike the larvae it fed on the nymphs of the prey mite *E. fremonti*. It is creamish white in colour. The mean protonymphal period was 1.60 ± 0.25 days with the minimum of 1 day and the maximum of 2 days while Daniel (1981) in case of *A. channabasavannai*, reported this period to be only 0.92 days and Mallik and ChannaBassavana (1983) in case of *A. longispinosus* reported this as 0.87 days. But there are reports wherein this duration has been reported to be almost double in case of *A. delhiensis*, where it was 1.95 days Nageshchandra *et al.* (1998) and 2.30 ± 0.15 days in *A. alstoniae* (Gupta *et al.* 2003). However, Sharma & Sadana (1985) and Jagadish *et al.* (1990) reported this period to be 1.2 ± 0.40 days in *A. finlandicus* and 1.02 ± 0.10 days in case of *A. concordis*.

5. *Deutonymph stage* : The deutonymphs were bigger than the protonymphs and were more active, found feeding on nymphs of the prey mite. The mean duration of this period was 2.30 ± 0.36 days. Some of the workers like Daniel (1981) in *A. channabasavannai*, and Mallik and ChannaBasavanna (1983) in *A. longispinosus* reported this period to be less than 1 day, mean 0.99 day and 0.91 day respectively which appeared to be somewhat unusual. However, the other workers like Sharma & Sadana (1985) in case of *A. finlandicus*, Nageshchandra *et al.* (1998) in case of *A. delhiensis* and Gupta *et al.* (2003) in case of *A. alstoniae* reported this period as 2.4 ± 0.48 days, 2.24 days and 3.25 ± 0.15 days, respectively. Therefore, the duration as recorded in the present study tallies with the observations made by the latter workers.

6. *Egg to Adult Period* : The mean egg to adult period was 7.35 ± 0.15 days with the minimum of 6.00 days and maximum of 7.00 days. The percentage of mortality was found to be reasonably high being 28%. This duration appears to be on the much higher side as compared to 5.83 ± 0.31 days in *A. tetranychivorus* (Puttaswamy, 1978), 5.29 days in *A. ovalis* (Borah & Rai, 1989), 5.02 days in *A. concordis* (Jagadish *et al.* 1995, 1999) and 4.83 ± 0.22 days in *A. coccosocius* (Saha *et al.* 1998). On the contrary, Gupta *et al.* (2003) found this period to be as high as 9.50 ± 0.39 days in *A. alstoniae*. May be, the condition of temperature and humidity differed in the experiments conducted by the different workers which caused this differences.

7. *Pre-oviposition Period* : The mean pre-oviposition period was 1.43 ± 0.49 days. The observations reported by other workers were 0.18 ± 0.08 days in *A. channabasavannai* (Daniel, 1981), 0.1 day in *A. delhiensis* (Nageshchandra *et al.* 1998), 0.3 ± 0.08 day in *A. coccosocius* (Saha *et al.* 1998). On the contrary, there are reports where the duration has been shown to be as high as 3.63 days in case of *A. tetranychivorus* (Jagadish & Nageshchandra, 1982) and 3.72 ± 0.15 days in *A. alstoniae* (Gupta *et al.* 2003). Therefore, the present duration is in mid way between the two extreme reports.

8. *Oviposition Period* : The mean oviposition period was 14.52 ± 0.54 days. The earlier reports which were found to be more nearer to the present observations were Daniel (1981), who reported 15.7 ± 1.71 days in *A. channabasavannai*, Sharma & Sadana (1985) who reported 15 ± 1.32 days in *A. finlandicus* and Borah & Rai (1989) who reported 14.01 ± 2.05 days in *A. ovalis*. On the contrary, Nageshchandra *et al.* (1998) and Gupta *et al.* (2003) reported 2.46 days in *A. delhiensis* and 4.75 ± 0.15 days in *A. alstoniae*, respectively.

9. *Postoviposition Period* : The mean postoviposition period in the present study was 6.62 ± 0.63 days. Excepting Sharma & Sadana (1985) in case of *A. finlandicus* and Nageshchandra *et al.* (1998) in case of *A. delhiensis* who reported this duration to be 1.2 ± 0.40 days and 0.63 days, respectively, the present observation tallies with Jagadish & Nageshchandra (1982) who reported 5.12 days in *A. tetranychivorus*, Krishnamoorthy (1989) who reported 10.00 ± 1.76 days in *Phytoseiulus persimilis* and Gupta *et al.* (2003) reported 8.0 ± 0.25 days in *A. alstoniae*.

10. *Adult Longevity* : The average adult longevity in female was found to be 12.01 ± 0.71 days which came closer to observations made by other workers like Sharma & Sadama, 1985 (18.6 ± 1.49 days) in *A. finlandicus*, Borah & Rai (1989) (16.21 ± 2.03 days) in *A. ovalis*, Gupta *et al.* (2003) (17.25 ± 0.39 days) in *A. alstoniae* but was much shorter as compared to Krishnamoorthy (1989) (31.88 ± 3.63 days) in *Phytoseiulus persimilis*.

11. *Fecundity* : The average fecundity appeared to be very poor as evident from the fact that it was 18.01 ± 0.56 eggs but it was close to Gupta *et al.* (2003) who reported 11.87 ± 0.67 eggs in *A. alstoniae* and Sharma & Sadana (1985) who reported 15.6 ± 1.20 eggs in *A. finlandicus*. Whereas in most of the other earlier reports it was reasonably higher as 27.3 in *A. channabasavannai* (Daniel, 1981), 26.8 eggs in *A. tetranychivorus* (Jagdish & Nageshchandra, 1982), 39.2 ± 0.49 eggs in *A. ovalis* (Borah & Rai, 1989) and 17.40 in *Phytoseiulus persimilis* (Krishnamoorthy, 1989).

12. *Sex Ratio* : The Male : Female sex ratio was found to be 1 : 3.5 and was quite close to 1 : 3.30 in *A. finlandicus* (Sharma & Sadana, 1985) and 1 : 1.25 in *A. alstoniae* (Gupta *et al.* 2003). So, the sex ratio appears to be female biased.

Table 1 : Life cycle of *Amblyseius multidentatus* (Swirski & Shechter), Under Laboratory condition at room temperature.

Stage	Range (in days)	Average (in days)	Duration (in days)
Egg	1-2	1.72	1.72 ± 0.02
Larva	1-2	1.56	1.56 ± 0.08
Protonymph	1-2	1.60	1.60 ± 0.25
Deutonymph	2-3	2.30	2.30 ± 0.36
Egg to Adult	6-7	7.35	7.35 ± 0.15
Pre-oviposition	1-2	1.43	1.43 ± 0.49
Oviposition	11-14	14.52	14.52 ± 0.54
Post-Oviposition	5-6	6.62	6.62 ± 0.63
Adult Longevity	8-17	12.01	12.01 ± 0.71
Fecundity	16-20 eggs	18.01 eggs	18.01 ± 0.56 eggs
% of Hatching :-	75-80%	79.56%	$79.56 \pm 0.79\%$
% of Mortality :- 28%			
Sex Ratio :- Male : Female = 1 : 3.5			

SUMMARY

The present paper reports the duration of different developmental stages of *Amblyseius multidentatus* (Swirski & Shechter) along with fecundity, longevity and sex ratio. The life cycle (egg to adult) took 7.35 ± 0.15 days. The fecundity, longevity and Male : Female sex ratio were 18.01 ± 0.56 eggs, 12.01 ± 0.71 days and 1 : 3.5, respectively.

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