

CONTROL OF ACARINE PESTS

BIONOMICS OF THE PREDACEOUS MITE *AMBLYSEIUS CHANNABASAVANNI* (ACARI: PHYTOSEIIDAE), PREDACEOUS ON THE PALM MITE*

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ABSTRACT

The life-cycle of *Amblyseius channabasavanni* Gupta was studied in the laboratory. The incubation time was 32.3 h for females and 30.2 h for males. The male and female larval stages lasted 22.2 h and 21.9 h respectively and deutonymphal stage lasted 23.8 h for male and 23.4 h for females. Total developmental period varied from 84-113 h (average 98 h) for females and 85-107 h (average 93.3 h) for males, on the eggs of *Raoiella indica*, and 15-38 host eggs were consumed during this period by females and 14-19 eggs by males. Some of the male larvae (66.7%) did feed in the larval period. The females lived on an average for 15.7 days and laid 23.7 eggs (ave.) during their life period. Ovipositing females consumed 11-40 host eggs or 6-13 female host mites in a day and laid 1-5 eggs a day. All stages of the prey are attacked by all the feeding stages of the predator. Alternate food sources in the field include *Tetranychus fijiensis*, eggs and crawlers of scale insects and mealy bugs which infest arecanut leaves. The

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field population of the predator was maximum during May to June when the prey was also at its peak.

INTRODUCTION

Predaceous mites of the family Phytoseiidae are used all over the world for biological control of phytophagous mites (Huffaker *et al.*, 1970; Mori, 1967). In India ten species have been reported as predaceous on phytophagous mites of fruit crops, vegetables, and sugarcane (Prasad, 1974; Satpathy and Mania, 1969). The false spider mite *Raoiella indica* Hirst (Acari: Tenuipalpidae) is a serious pest of areca palms (*Areca catechu* L.) mainly during summer months (March-June). In 1974, during a survey for the indigenous predators of this pest, a new species of *Amblyseius* was found predaceous on it. This is the first record of mite predaceous on *R. indica* from India. This mite has been described as *Amblyseius channabasavanni* by Gupta (1978). It is the second major predator of *R. indica*, the first being *Stethorus keralicus* Kapur (Coleoptera: Coccinellidae). This mite has been recorded also from *Chrysanthemum* sp. and *Dahlia* (Gupta, 1978). Moutia (1958) recorded *Typhlodromus (A.) caudatus* (Berl.) as predaceous on *R. indica* of coconut from Mauritius. In this paper the biology, the predaceous habits and ecology of this mite are described.

MATERIALS AND METHODS

The biology and predaceous habits of *A. channabasavanni* were studied in the laboratory at 27-35°C and 52-75% R. H. using *R. indica* as prey. Petri dishes were used as rearing cages. Areca leaves infested with *R. indica* and maintained over a thin layer of wet cotton were used (about 5 × 3 cm² size) as host material and a barrier was made on all sides of the leaf bit with wet cotton to prevent the predaceous mites from escaping. The cages were kept moist at all times. An adult female predator was enclosed on known number host eggs in each cage. Observations were taken every half an hour during day time (ie 8 am to 6 pm) and at 10 pm. When a single egg was laid, the adult mite was removed and the observations on the life history up to the adult stage were completed in the same cage. The host eggs consumed in each stage of development were counted. Feeding rate of the predator was studied in the same type of cages with *R. indica* egg/adults.

RESULTS

Egg: Freshly laid eggs are pearly white, translucent and oval, later turning opaque and pale white. Usually the eggs are laid in the midrib region of the leaf. Egg size varies from 0.191-0.207 mm (0.198 ± 0.008 mm). The incubation period varies from 19-42 h (32.3 ± 1.66 h) for females and 22-38 h (30.2 ± 3.09 h) for males.

Larva: From the egg, the pearly white larva emerges with three pairs of legs. After rupturing the chorion it requires about 2-2.5 min to free itself from the egg shell. Just after emergence the larva begins to feed and after the consumption of the first prey, the alimentary canal turns red. The larval period is completed within 14-27 h

(20.4 ± 0.89 h) for females and 13-21 h (17.2 ± 1.47 h) for males. A quiescent stage can be seen (3-14 h) but is not very pronounced, the resting larva (and also the nymphal stages) moves about at the slightest disturbance but for the last few minutes before moulting. Larval moulting lasts 5-6 min. In the larval period 2-5 host eggs are consumed. The time required to consume an egg is 1.2 min. Some male larvae do not feed but others feed. The shortest larval period of 13 h is observed in the case of male and the longest period of 26 h in the case of female larvae.

Protonymph: The protonymphal period lasts for about 15-26 h (21.9 ± 0.77 h) for females and 18-27 h (22.2 ± 1.49 h) for males. A resting stage of 3-13 h for females and 3-7 h for males is seen during this period. In this stage 3-10 eggs are consumed, the highest number of 10 being consumed by the protonymph of a male where there was no larval feeding.

Deutonymph: This stage can be easily distinguished in both sexes, the male is small and the body is flattened. This period lasts about 18-35h (23.4 ± 0.86h) for females and 20-27h (23.8 ± 0.94h) for males. The quiescent stage for females is 4-13h and for males 4-10h. The duration of various stages and the number of eggs consumed in the developmental period are given in Tables I and II respectively.

TABLE I

Duration of the immature stages of *A. channabasavanni* (in h)

Sex	Number Observed	Maximum	Minimum	Average	Standard Error
Egg					
Male	6	38	22	30.2	3.09
Female	20	42	19	32.3	1.66
Larvae					
Male	6	21	13	14.2	1.47
Female	20	27	14	20.4	0.89
Protonymph					
Male	6	27	18	22.2	1.49
Female	20	26	15	21.9	0.77
Deutonymph					
Male	6	27	20	23.8	0.94
Female	20	35	18	23.4	0.86
All stages combined					
Male	6	107	78	93.3	4.34
Female	20	113	84	98.0	1.99

TABLE II
Number of *R. indica* eggs eaten during the development of the immature stages of *A. channabasavanni*.

Sex	Number Observed	Number of eggs			Standard Error
		Maximum	Minimum	Average	
		Larva			
Male	6	4	2	2.2	0.48
Female	20	6	2	3.5	0.26
		Protonymph			
Male	6	10	5	7.7	0.71
Female	20	13	3	9.0	0.50
		Deutonymph			
Male	6	8	5	6.7	0.42
Female	20	23	7	13.9	0.69
		All stages combined			
Male	6	19	14	16.5	0.84
Female	20	38	15	26.3	0.13

Adult stage: Adult mites of both sexes can be easily distinguished as males are smaller with a somewhat flat and elongated body. The female mite is flat and broad in shape before mating, but the body becomes oval with pear shaped abdomen within a day after mating. The females measure 0.560 ± 0.0258 mm in length and 0.287 ± 0.0169 mm in breadth. The males measure 0.392 ± 0.0207 mm in length and 0.184 ± 0.011 mm in breadth. Both are fast moving. The life period from egg to adult is about 84-113h (98 ± 1.9 h) for females and 78-107h (93.3 ± 4.34 h) for males. A total of 15-38 eggs are consumed in the total developmental period of females and 14-19 eggs in the case of males. Males are observed to live for 4-15 days. The adult females lived for 11-24 days (15.6 ± 1.51 days).

Mating: When the female deutonymph is in the quiescent stage, the male is usually seen clinging to the posterior end of the female. Just after moulting, mating occurs. Mating is erratic taking 1.0-4 h. The moulted female moves very fast till a male is encountered and no feeding is observed in this pre-mating period. The aged female did not respond to mating. Mating was also observed in ovipositive female (second time). Unmated females did not oviposit.

The preoviposition period averaged 45h for 19 individuals. The maximum number of eggs laid by any female in a day was 5. Nineteen females laid an average of 23.7 eggs during their life time. The maximum number of eggs laid by one female is 40, the minimum 15, with an average of 2.7 eggs per day (Table III). The eggs are laid singly, but, usually 3.6 eggs are seen in the same place. The eggs are laid

either among the host's colony or in the grooves of the midribs of the leaves, the latter being common.

TABLE III

Duration of various periods and fecundity of adult females of *A. channabasavanni*

Period	Number		Duration		Standard Error
	Observed	Maximum	Minimum	Average	
Preoviposition (h)	19	67	30	45	1.93
Oviposition (days)	19	15	5	8.8	0.60
Post oviposition (days)	15	12	1	3.2	0.77
Total (days)	12	24	11	15.7	1.51
Total No. of eggs per female	19	40	15	23.7	1.56
No. of eggs per female/day	19	3.3	1.9	2.7	0.60

Feeding: Larvae, protonymphs, deutonymphs and adults of *A. channabasavanni* feed actively on *R. indica* although some of the male larvae did not feed. All stages of the host are attacked by all feeding stages of the predator. When the predator is feeding on host eggs the alimentary canal is bright red, but on other stages of the host and on scale insects and mealy bugs it changes to dark red, brown or light orange. The predator suck out the internal body fluid from any part of the host and the outer covering/egg shell is left behind. All feeding stages of the predator prefer the immobile stages of the host like eggs and quiescent larvae and nymphs to the active stages.

The ovipositing adult feeds on 8-12 eggs at a time, less than one minute is required to prey upon one egg. Two females consumed 145 and 165 host eggs in their life time. The feeding rate of the adult ovipositing female was studied with host eggs as food. The female feeds on 11-42 egg per day (32 observations) or on 6-13 adult female mites a day. Adult female required $1\frac{1}{2}$ min. to feed on a protonymph, $1-1\frac{1}{2}$ min to feed on a larva, 5 min. to attack and feed (partially) on a male or female prey.

Alternate food: All stages of the predator were found dead within 3-4 days in the absence of prey. *A. channabasavanni* is present in the field throughout the year on *A. catechu* and *A. macrocalyx* associated with *R. indica*, *Tetranychus fijiensis*, scale insects, and mealy bugs. In the laboratory they were found to feed on eggs and other stages of *T. fijiensis* and *Oligonychus indicus* Hirst when no other animal food was provided. They are found to feed on eggs and crawlers of the scale insects mainly of the genus *Chionaspis*. The eggs and other stages of the predator were collected from the egg masses and crawlers of the mealy bug *Pseudococcus* sp. infesting areca leaves. From its abundance in the field (unpublished data) during the build up of

R. indica, its specificity as a major predator of this mite is proved. Cannibalism was never observed in this species. *A. channabasavanni* was never observed to feed on any of the stages of *S. keralicus*.

DISCUSSION

The host mite *R. indica* completes its life cycle from egg to adult in 11-15 days during April-May (summer months) (Unpublished data). *A. channabasavanni* has a very short life cycle and high rate of reproduction when compared to its prey. This is a potentially effective predator of *R. indica* because the generation time of the predator is very much shorter than that of the prey. During the absence of its major host in the field during rainy season, the predator thrives in the field on alternate sources of food which are found during this season. *T. fijiensis*, scale insects and mealy bugs are present in the field throughout the year. *R. indica* also thrives in low population in shaded areas of the garden (Annual Report, CPCRI, 1975). This predator shows good searching ability since it is found among mealy bug colonies which are sparse in nature.

The larvae of this predator feed on eggs and other stages of the host. The larvae of *Phytoseiulus persimilis* Athias-Henriot (Laing, 1966) and *P. macropilis* (Banks) (Prasad, 1967) did not feed during the developmental period. Satpathy and Mania (1970) reported that the larvae of *Amblyseius finlandicus* Oudem. did not feed on host eggs.

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BIOLOGY OF *TYPHLODROMIPS TETRANYCHIVORUS* (ACARI : PHYTOSEIIDAE) ON RED PALM MITE *RAOIELLA INDICA* (ACARI : TENUIPALPIDAE)

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ABSTRACT

The life history of *Typhlodromips tetranychivorus* Gupta was studied in the laboratory using red palm mite *Raoiella indica* Hirst as host.

The average developmental periods for incubation, larva, protonymph and deutonymph were 1.92, 1.06, 1.06, 0.92 and 1.92, 1.14, 1.42 days in the case of females and males, respectively. Preoviposition period occupied 3.63 days and females laid an average of 25.8 eggs during their average ovipositional period of 17.1 days. The adults lived on an average for 20.62 days. Incidentally, the observation of the predator *T. tetranychivorus* on *R. indica* is a new record.

EFFECT OF POLLEN AND PREY DENSITY ON PREY CONSUMPTION AND OVIPOSITION OF *TYPHLODROMIPS TETRANYCHIVORUS* (ACARI : PHYTOSEIIDAE)

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ABSTRACT

Experiments conducted in the laboratory at temperatures of 21° to 27°C and 68 to 69 per cent relative humidity to determine the effects of pollen feeding on the