

LIFE HISTORY OF THE PREDATORY MITE *CHEYLETUS MALACCENSIS* (OUDEMANS)

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DEVELOPMENT
BY STAGES
OF MALE
AND FEMALE
LIFE SPAN
PREDATION
CHEYLETIDAE
ON ACARIDAE

ABSTRACT : A Strain of the predatory mite *C. malaccensis* was isolated from a colony of the grain mite *Aleuroglyphus ovatus*, and has been furtherly cultured on it as a host in the laboratory.

Arrhenotokous parthenogenesis is assessed in the species. The females were found to pass the five stages, egg, larva, protonymph, deutonymph and adults ; while in males the deutonymphal stage was absent.

Under the same conditions of $25^{\circ} \pm 0.1^{\circ}$ and $75 \pm 2\%$ R. H., the females' total life from egg to adult took a longer period (20-23 days) than males' (15-17 days).

DÉVELOPPEMENT
PAR STAGES
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DURÉE DE VIE
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RÉSUMÉ : Une souche de l'Acarien prédateur *C. malaccensis* a été isolée à partir d'une colonie de l'acarien des grains *Aleuroglyphus ovatus*, et a été ensuite élevée sur cet hôte en laboratoire.

La parthénogenèse arrhénotoque est établie dans l'espèce.

Les femelles ont un développement à cinq stases, l'œuf, la larve, la protonympe, la deutonymphe et les adultes ; tandis que chez les mâles la stase deutonymphaire est absente.

Dans des conditions identiques de $25^{\circ} \pm 0.1$ et de $75\% \pm 2$ de RH, la vie totale des femelles, de l'œuf jusqu'à l'adulte, dure plus longtemps (20-23 jours) que celle des mâles (15-17 jours).

INTRODUCTION

Cheyletus malaccensis (Oud.) is found on many different kinds of dried foodstuffs in association with the acarid mites on which it feeds. OUDEMANS (1906) recorded it from wheat screening and on *Ephestia*. NAKADA (1972) isolated *Cheyletus* sp. from a colony of *Tyrophagus putrescentiae* and found the egg-adult period ranged from 9 to 13 and 11 to 15 days for males and females, re-

spectively. SHEN (1976) recorded that although no hypopus stage was occurred, and a resting period occurred between two stages. When the Cheyletid was provided with tyroglyphid mites and maintained at 25° C and 75 % R.H., the complete life cycle averaged 19.5 days.

In Egypt, ZAHER & SOLIMAN (1971) emphasized that both sexes of this species passed through egg, larva, protonymph, deutonymph and adult stages. Its main diet consist of larvae of *Caloglyphus* sp.

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MATERIALS & METHODS

All present experiments on *C. malaccensis* were carried out in an incubator adjusted at a constant temperature of $25^{\circ} \pm 0.1^{\circ}$ and inside dissectors adjusted at $75 \pm 2\%$ R.H. The mites were reared in micro rearing cells of cubic plastic blocks ($7 \times 7 \times 0.3$ cm each). In the center of each block conical shaped hole is present. A piece of black thin paper (7×7 cm) was stuck to the lower surface of the cell with a suitable glass cover placed on its upper surface, and fixed to the plastic cell by a rubber band. Ten pairs of newly emerged male and female adults were placed into ten micro cells, one pair each, with known enough numbers of the prey (*A. ovatus*). A stock culture of *A. ovatus* was maintained by introducing newly emerged tritonymphal stages into well dried and cleaned jars (100 mites/each) filled to its half with wheat bran as a feeding medium. The jars were then kept in the laboratory at $25.3^{\circ} \pm 1.5^{\circ}$ & 76.3 ± 2.4 R.H. %. About five months later great numbers of different instars of *A. ovatus* were obtained.

Micro cells of all experiments were examined twice daily; and dead prey individuals were counted and replaced by living ones. The newly hatched larvae were placed singly and they were provided with the required numbers of the prey.

Durations of the different instars from egg to adult were determined. Oviposition rates of

either copulated or virgin females were daily checked.

Furthermore the biology of either individually isolated virgin adult females or male was investigated.

RESULTS & DISCUSSION

The obtained results proved that the male life history differs from that of the female; three immature stages (egg, larva, and protonymph) in contrast to four immature stages (egg, larva, protonymph, and deutonymph) in the female.

Existence of the deutonymphal stage among the other developmental stages in female' life cycle differently from male' life cycle was also observed by NAKADA (1972) which disagreed with that of ZAHER & SOLIMAN (1971) who reported that both sexes have had the same four immature stages. Furthermore, male and female life cycles comprised both the known so called "Epimorphosis" phenomenon; and the arrhenotokous type of parthenogenesis.

The obtained data proved the significant positive and nearly doubling effect of copulation on the female fecundity, as the females deposited throughout their life spans significantly more eggs (50.6 ± 1.2 eggs/female), than the uncopulated virgin females ($25. \pm 0.2$ eggs/female).

Table 1 shows the durations of the different developmental stages as well as the adult longevity

TABLE 1 : Duration of immature and adult stages of copulated and uncopulated female of *Cheyletus malaccensis*.

Sex	Average duration in days'							
	Egg	Larva		Protonymph		Deutonymph		Egg-adult
		Mov.	Qui	Mov.	Qui	Mov.	Qui	
Normal female	3.3 ± 0.4	5.2 ± 0.1	1.2 ± 0.03	4.5 ± 0.1	1.4 ± 0.4	3.5 ± 0.02	1.6 ± 0.03	20.8 ± 0.13
Normal male	3.3 ± 0.04	5.3 ± 0.04	1.3 ± 0.1	4.4 ± 0.1	1.6 ± 0.2	"		15.9 ± 0.15
Virgin male	3 ± 0.0	4.7 ± 0.03	1 ± 0.0	4.2 ± 0.3	1.3 ± 0.04	"		14.2 ± 0.1

' Mean \pm standard error

" Deutonymphal is absent in male

of *Cheyletus malaccensis* in both sexual and parthenogenetic reproduction.

All previously mentioned averages of all tested biological aspects were nearly close to those noticed by either ZAHER & SOLIMAN (1971), NAKADA (1972), or SHEN (1976), despite of different preys used in such studies.

Moreover the present study clarified that there was no effect or influence for copulation on the biological aspects of *C. malaccensis*.

Similar results have been published by NAKADA (1972), especially if the durations of the total life cycles were taken into consideration (20.8 ± 0.1 , 15.9 ± 0.2 and 14.2 ± 0.1 days) for sexually produced females and males and the parthenogenetically produced males, in respect.

The obtained data also proved that the average durations of pre-oviposition, oviposition and post-oviposition periods were 2.6 ± 0.2 , 10.1 ± 0.3 and 4.9 ± 0.3 days for copulated females in comparison with 4.5 ± 0.2 , 8.5 ± 0.2 and 3.7 ± 0.2 days, for copulated and virgin females, respectively (Table II).

The aforementioned data emphasized that copulation shortened the female pre-oviposition and on the contrary prolonged both the oviposition and postoviposition periods.

Present results revealed that copulated females and males lived for periods averaged 17.6 ± 0.3 and 9.1 ± 0.3 days, respectively ; in comparison with only 16.7 ± 0.2 and 7.6 ± 0.2 days for the uncopulated female and male adult in respect.

The data proved that females lived always significantly longer periods than males despite of the effect of copulation.

TABLE II : Biological behaviour of *Cheyletus malaccensis* female adults.

	Average duration in days '		
	Preoviposition	Oviposition	Post-ovi-position
Copulated	2.6 ± 0.2	10.1 ± 0.3	4.9 ± 0.3
Uncopulated	4.5 ± 0.2	8.5 ± 0.2	3.7 ± 0.2

Table III shows the number of adults of *Aleuroglyphus ovatus* consumed by *Cheyletus malaccensis* during different periods of life span.

During the total developmental period from larva to adult the female predator consumed an average of 44 ± 0.3 *Aleuroglyphus* adults in comparison with only 21.4 ± 0.2 and 16.6 ± 0.2 *Aleuroglyphus* adults for each of the sexually and asexually produced male predator in respect.

The obtained data showed the more efficient significant influence of sexually produced females, followed by sexually produced male and asexually produced males which consumed during their total life span averages of 237.7 ± 0.1 , only 37.9 ± 0.3 and 34.1 ± 0.3 *Aleuroglyphus* adults, respectively.

In other word this emphasized the more predatory potency of the female *Cheyletus malaccensis* adult than that of the male as the former consumed nearly 6.2 times the numbers of *A. ovatus* adults consumed by the male.

TABLE III : Average numbers of adults of *A. ovatus* (adults) consumed by different stages of predatory mite through its life cycle.

Sex	Larval stage	Protonymphal stage	Deutonymphal stage	From Larva to adult	Adult stage
Normal female	10.4 ± 0.1	12.9 ± 0.1	20.8 ± 0.14	44 ± 0.3	237.7 ± 0.03
Normal male	9.7 ± 0.1	11.7 ± 0.1	"	21.4 ± 0.2	37.9 ± 0.2
Virgin male	6.9 ± 0.1	9.7 ± 0.1	"	16.6 ± 0.2	34.1 ± 0.1

" Deutonymphal is absent in males.

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