

**BIOLOGICAL STUDIES OF THE PREDACEOUS MITE
COLEOSCIRUS BUARTUS WHEN FED ON THE FREE LIVING
NEMATODE RHABDITELLA SPP.**

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Abstract

Some families of Suborder Actineadida play a considerable role in biological control i.e. (Cheyletidae, Cunaxidae, Stigmaeidae, and Tyidae). Majority members are great importance to agriculture small insects, scale insects and their eggs and immature stages of some soil insects and nematodes.

This study was under taken to study the biological aspects on the common predacious Cunaxid mite species, *Coleoscius buartus*. It was reared on free living nematode (*Rhabditella muscicola* Chitwood) at 26°C±20C and 70-75 R.H. Current Studies showed that: 1-Incubation period for females was slightly higher than males averaged (6.1±0.2) and (5.7±0.2) days, respectively. 2- Life cycle for female and male was averaged (19.2±0.4) and (13.9±0.4) days, respectively. 3-The larval, protonymphal and tritonymphal stages of the female required an average of (2±0.1), (2.01±0.1), (1.7±0.2) and (3±0.1) days, respectively. 4- while the larval, protonymphal and deutonymphal stages of male required an average of (1.9±0.1), (1.91±0.2) and (1.6±0.2) days, respectively, shorter than female. 5-The total period required for longevity of female and male was (28.2±1) and (16±0.6) days, respectively. 6- The immature of female was (13.1±0.4) days, while the immature of male was (8.3±0.3) days.

Male reached adult stage earlier than female. 7- Number of deposited eggs per female averaged (40.9±1.7) egg, daily mean 1.8 egg/day. 8- Feeding capacity to *Coleoscius buartus* Consumed free living nematode *Rhabditella muscicola* Chitwood1 predator female immature greater number of prey than male immature. The total averaged (53.5±1.5) and (31.2±1.4) preys for female and male, this resulted from the absence fed on greater number of preys (318.1 ±7.6) individuals (12.8/day), than male (219±11.6) individuals (10.04/day). 9- Adult stage proved to be most effective predacious stage as fed on greater number of preys amounting more than six times of the consumed by immature. 10- Sex ratio 1:4 male/female when reared in the laboratory. 11- While the predator *C. buratus* Passes through egg, one larval and three nymphal stage before reaching adult hood female where as the male passed through egg, larva and two nymphal stages before becoming an adult do not observed tritonymph of male.

Introduction

Actinid mites are widely distributed in the world. They differ in their feeding habits and habitats. They are phytophagous, predacious, fungivorous, parasitic or saprophagous. They are also aerial, terrestrial since they prey on other mites, storage or aquatic mites. Some families of this suborder play a considerable role in biological control i.e. (Cheyletidae, Cunaxidae, Stigmaeidae, and Tyidae). Majority members are great importance to agriculture small insects, scale insects and their eggs.

Zaher et al. (1975) stated that *C. capreolus* failed to develop on diets of plant material but developed equally well on diets of book lice or citrus brown mites, *Eutetranychus odentalis* which were eaten in their active stages and not as eggs. Soliman et al. (1975) recorded *Cunaxa capreolus* Berl. on the book lice and found that it passed through a larval and three

nymphal stages before being adults. They found that the predator life span was negatively correlated with temperature. The generation period ranged from 24.8 to 84.2 days when temperature changed from 30°C to 5°C. The female predator deposited an average of 24.6, 30.7, 40.7 and 43.5 eggs at 15, 20, 25 and 30°C, respectively. The predator fed on the citrus brown mite *E. odentalis* Klein, but it refused date palm pollen grains or slides of potato free added to diluted solution of yeast. Taha et al. (1988) studied the effect of feeding by *Neocuxanoides andrel* on *Panaglimimus rigidus* and immature stages of *Caloglyphus rhizoglyphoides* on development time and fecundity of the mite in the laboratory at 30°C and 70% R.H. Predators fed on nematodes developed faster (21.2 and 18.1 days for development of immature females and males, respectively) than those fed on acarid mites (23.1 and 19.85 days). However, female longevity was 55.7 days with mites as prey and 45.8 days with nematodes. Walter and Kaplan (1991) observed that the *coleoscirine cunaxid* and *Coleoscius simplex* colonizes green house pot cultures of root knot nematodes (*Meloidogyne spp.*) in Orlando, FL, where it preys on vermiform nematodes and soil arthropods. Mating was required for oviposition in *C. simplex*. An average of 4.4 eggs was laid per day and mean generation time was 14.3 days at 28°C. A silken web was spun around the mite at the end of each active instar. *C. simplex* fed near the top of the food web that colonized root knot nematode culture but feeding relationships were complex. Size, degree of scale rotization, speed and availability of alternative prey influenced predatory success cannibalism was common, including attacks on quiescent immature in the molting web. *Coleoscius simplex* did not feed on the eggs either root knot nematodes or arthropods. The *coleoscirine Neodcirula sp.* and the *cunaxidine Pulaeus sp.* also fed on both arthropods and nematodes, while *Cunaxa sp.* fed on arthropods only. El- Khateeb (1998) reared *Coleoscius aegyptiacus* on the free-living nematode, *Rhabditella muscicola*. Results showed that both oviposition and mean egg incubation period decreased as temperature increased.

The present work aims to study the developmental stages of the predator mite *Coleoscius buartus* when fed on the free living nematode *rhabditella spp* at 26±2°C and about 75±5% R. H.

Materials and Methods

Coleoscius buartus, (Cunaxidae) were reared individually in plastic cells of 2.5cm in diameter with a layer of mixture of plaster of Paris and charcoal (9:1) on its bottom to depth of 3mm were used, (El-Khateeb, 1998). These rearing cells were kept in an incubator at 26±2°C and about 75±5% R.H. Droplets of water were carefully added to each cell when needed.

Obtaining a Pure Culture of the Tested Mite Species

A single adult female belonging to *Coleoscius buartus* e was placed in a rearing cell; It was supplied with its favorable food in excess, and left to lay eggs. After enough number of eggs was deposited, the adult female was mounted in the modified Berlese funnel. Thus, the eggs formed the nucleus of its pure culture.

Biological Studies

Eggs of *Coleoscius buartus* were incubated until hatching. The newly hatched larvae were kept singly in the rearing cells and supplied daily with enough food till they reached maturity. The mites were investigated twice daily. Some biological aspects (hatchability, duration of the different developmental stages, food capacity, fecundity and sex ratio) were investigated in the laboratory in an incubator under temperature of 26±2°C and controlled relative humidity of 75±5%. This data cites from 20 replicates.

Source of Food

The free-living nematode, *Rhabditella muscicola* (Chitwood) were extracted from soil and organic matter using Bearmann funnel. It was maintained on pieces of potatoes in Petri dishes under laboratory

conditions. About ten various nematode stages were added daily as prey. The consumed nematode *R. muscicola*, were recorded daily during the developmental stages of the predator mite. Thus the food consumption of or *R. muscicola* was recorded.

Results and Discussion

The adult female passed through an egg, larva, protonymph, deutonymph, and tritonymph before reaching the adult stage. The male passed through an egg larva and only two nymphal stages before becoming an adult. The male tritonymph was not observed during the present study.

Larval Stage

Table (1) showed the duration of the predator different stages. The larval female and male stages lasted for an average of 2.8 ± 0.2 and 2.7 ± 0.2 days, respectively. While the active period were 2 ± 0.1 and 1.9 ± 0.1 days, respectively.

Protonymphal Stage

The female protonymphal predator lasted for an average of 2.9 ± 0.1 days, while the active stage lasted for an average of 2.0 ± 0.1 days. The male protonymphal stage lasted for an average of 2.8 ± 0.2 days. Its active period was 1.9 ± 0.2 days.

Deutonymphal Stage

The duration of the deutonymphal female and male was 2.7 ± 0.1 and 2.8 ± 0.2 days, respectively. The active period for these stages were averaged 1.7 ± 0.2 and 1.6 ± 0.2 days for female and male, respectively.

Tritonymphal Stage

The female tritonymph lasted for an average of 4.7 ± 0.2 days. The active female tritonymph lasted for an average of 3 ± 0.1 days.

Adult Stage

Pre-oviposition, oviposition and post-oviposition periods lasted for an average of 3.4 ± 0.2 , 23.1 ± 0.9 and 1.7 ± 0.2 days, respectively.

Fecundity

When the female fed on the nematode *Rhabditella muscicola*, it deposited an average of 40.9 ± 1.7 eggs with daily rate averaged 1.8eggs.

Feeding Capacity

The predator female larva, protonymph, deutonymph and tritonymph fed on an average of (8.3 ± 0.4) , (10.9 ± 0.4) , (11.7 ± 0.8) and (22.6 ± 1.3) preys, respectively, with a daily rate of 4.2, 5.4, 6.9 and 7.6 preys, respectively. While the male larva, protonymph and deutonymph consumed an average of (8 ± 0.7) , (12.3 ± 1) and (10.8 ± 1.4) preys, respectively. The daily rate was 4.2, 6.5, and 6.1 preys, respectively. Data indicated that during the pre-oviposition, oviposition and post-oviposition periods, the female fed on (36.9 ± 2.7) , (265.5 ± 7.6) and (15.7 ± 2.0) preys, respectively. The average daily rate of prey consumption was, (10.8) , (11.5) and (9.4) , respectively.

It could be concluded that all female stages consumed a significantly higher number of preys (370.3 individuals) than all male stages, which consumed a total number of 250.5 individuals.

The feeding capacity of the adult male (219 ± 11.6 preys) seemed to be less than of the adult female (318.1 ± 7.6). The male consumed an average of 10.4 preys I day. While the female devoured an average of 12.8 prey I day. The female consumed a highly number of prey during the oviposition period followed by the pre-oviposition and the post-oviposition periods. (Table 3).

Moulting

Molting took place with in a silken web spun over the surface and corners of rearing cell. The immature stage becomes quiescent, with legs I-II extended anteriorly and legs III-IV posteriorly. Immediately before molting a dorsal transverse rupture occurred in the skin between the propodosoma and hysterosoma. The mite then tries to disengage itself from the old skin by twisting movements and subsequently withdrawn the fore legs and the anterior part of the body outside, then it crawls forward to get rid of the posterior part of the exuvia. The newly emerged individual color is white then changes gradually too creamy.

Mating

Adult male emerged earlier than the female. It guarded quiescent female tritonymph, which occurred inside web spun by the active tritonymphal stage. Copulation is essential for oviposition, as unmated female do not lay any eggs. In mating process the male crawls under neath the female from the rear, his posterior and upwards and forwards to meet that of female. Copulation took short time (55-60 sc.). Male could copulate more than one female. But the female accepted only one male.

References

- EI-Khateeb, H.M. (1998): Life tables of some predacious mites and their importance in biological control. Ph.D. thesis, Fac. Agric., Cairo Univ., II9pp.
- Soliman, Z.R.; M. A. Zaher and S.M. El-Bishlawy (1975): Studies on the biology of the predacious mite *Cunaxa capreolus* Bed. (Acari: prostigmata: Cunaxidae). Anz. Schadling-skde. Pflanzenschutz, Umweltschutz, 48:124-126.
- Taha, H. A.; M. E. El-Naggar; M.M. Abou-El-Naga and S.M. Soliman (1988): Effect of different prey species on the development and fecundity of the predacious mite, *Neocunaxoides andrei* Baker and Hoff. (Acari: Cunaxidae). Agr. Res. Rev., 66:129-135.
- Walter, D. E. and D.T. Kaplan (1991): Observations on *Coleosirus simplex* (Acarina: Prostigmata) a predatory mite that colonizes greenhouse cultures of root knot nematode (*Meloidogyne spp.*) and a review of feeding behavior in the Cunaxidae. Experimental and Applied Acarology, 12: 47-59.
- Zaher, M. A.; Z. R. Soliman and S.M. El-Bishlawy (1975): Feeding habits of predacious mites, *Cunaka capreolus* Bed. (Acarina:Cunaxidae). Entomophaga, 25: 209-212.

Table 1. Life cycle of *Coleosirus buartus* fed on *Rhabditella muscicola* at $26 \pm 2^\circ\text{C}$ and 70 to 75 % R. H.

Stage	Female		Male	
	Days	SD	Days	SD
Eggs	6.1	0.2	5.7	0.2
Active larva	2	0.1	1.9	0.1
Q. Larva	0.8	0.1	0.8	0.1
Total	2.8	0.2	2.7	0.2
Active Protonymph	2	0.1	1.9	0.2
Q. Protonymph	0.9	0.03	0.9	0.1
Total	2.9	0.1	2.8	0.2
Active Deutonymph	1.7	0.2	1.6	0.2
Q. Deutonymph	1	0.04	1.2	0.2
Total	2.7	0.1	2.8	0.2
Active Tritonymph	3	0.1		
Q. Tritonymph	1.7	0.1		
Total Tritonymph	4.7	0.2		
Total immature	13.1	0.4	8.3	0.3
Life Cycle	19.2	0.4	13.9	0.4

Table 2. Average duration of female (pre-oviposition, oviposition and post-oviposition periods) and males of *C. buratus* fed on immature stages of *R. muscicola* at 26 ±2°C and 70 to 75% R.H.

Sex	Pre-oviposition period	oviposition period	Post-Oviposition period	Longevity	Life span
Female	3.4	23.1	1.7	28.2	47.7
SD	0.2	0.9	0.2	1	2.2
Male				16	30
SD				0.6	1.1

Table 3. Average number of the free living *R. muscicola* consumed by different stages of *C. buratus* at 26 ±2°C and 70 to 75% R.H.

Stage	Average number of prey consumed by female and male predator			
	Female		Male	
	Total	SD	Total	SD
Larva	8.3	0.4	8	0.7
Protonymph	10.9	0.4	12.3	1
Deutonymph	11.7	0.8	10.8	1.4
Tritonymph	22.6	1.3		
Total (immature)	53.5	1.5	31.2	1.4
Pre-oviposition	36.9	2.7		
Oviposition	265.5	7.6		
Post-oviposition	15.7	2		
Total (Adult)	318.1	7.6	219	11.6