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EFFECT OF FOOD ON DEVELOPMENT, REPRODUCTION AND SURVIVAL OF *CHIROPTUROPODA BAKERI* (ACARINA : UROPODIDAE)

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Abstract

Chiropturopoda bakeri Zaher and Afifi was found in organic manure in the farm of the Faculty of Agriculture, Cairo University at Giza.The duration of its developmental stages, feeding habits and reproduction were determined. Food type greatly affected female fecundity and rate of reproduction. Statistical analysis showed that animal nourishment (larvae of house and vinegar flies) was the most suitable diet (compared with fungus nourishment) for increasing the reproductive potential at 30°C.

INTRODUCTION

Uropodids are free- living mites inhabiting soil, organic manures and debris. Hughes (1959) suggested that their long poorly developed chelicera are well adapted for feeding on fungal mycelia and spores or moss. Moreover, Radinovsky and Krantz (1961) and Radinovsky (1965) stated that some uropodids are fungivorous. On the other hand, Willis and Axtell (1968) recorded some uropodids as predators on house fly larvae.

In Egypt, some work had been done on the biology and feeding habits of some uropodids (Afifi 1980; El-Bishlawy and Afifi 1982; Ahmed 1984; Shereef *et al.*, 1991). The present study deals with the biology of the uropodid mite *Chiropturopoda*

bakeri Zaher & Afifi (Zaher 1986).

MATERIALS AND METHODS

Chiropturopoda bakeri was collected from organic manure in the farm of the Faculty of Agriculture, Cairo University at Giza. For rearing the mite, plastic rings 2.8cm in diameter and 2.0 cm in depth, with a layer of mixture of plaster of paris and charcoal at its bottom were used. The mite was fed on larvae of house fly *Musca domestica* L., larvae of vinegar fly *Drosophila melanogaster* Morgan, and seven soil fungi *Fusarium oxysporum, Mucor pusillus , Helminthosporium* sp., *Penicillium crysogenum, Penicillium notatum, Macrophomina phaseoli* , and *Aspergillus terreus* at 30 ± 1^{o}C. For determining the rate of reproduction, five newly emerged females and two males were confined together with surplus amount of each of the aformentioned diets to a large rearing cell for two nonths, then the resultant individuals were counted. The fungal cultures were obtained from the Botany Department of the Faculty of Science, Banha, Zagazig University.

RESULTS AND DISCUSSION

C. bakeri was fed and developed on the larvae of house and vinegar flies, and the seven soil fungi *F. oxysporum, M. pusillus, Helminthosporium* sp., *P. Crysogenum, P. notatum, M. phaseoli* and *A. terreus.* Female laid its eggs singly and immersed them deeply in the agar of the fungal cultures or in the cracks or holes of the bottom layer of the cages. Statistical analysis showed that larvae of both house and vinegar flies significantly accelerated the development time , followed in a descending order by two groups of soil fungi; the first group included *F. oxysporum, M. pusillus, Helminthoporium* sp., and *P. crysogenum* while the second group comprised *P. notatum, M. phaseoli,* and *A. terreus.* Thus female life cycle averaged 14.1 , 14.6, 19.0, 19.2 , 20.1, 22.7, 24.8, 26.4 and 29.8 days when fed on the aforementioned diets , respectively (Table 1).

Table 1. Effect of food type on development of *Chiropturopoda bakeri*

Diet	Sex	Developmental stages in days				
		Egg	Larva	Protonymph	Deutonymph	Life cycle
House fly larvae	o	2.7 ± 0.2	3.0 ± 0.3	3.7 ± 0.5	4.8 ± 0.4	14.1 ± 0.4
	o		2.7 ± 0.2	3.2 ± 0.4	4.1 ± 0.5	12.5 ± 0.3
Vinegar fly larvae	o	2.9 ± 0.3	3.2 ± 0.5	4.0 ± 0.2	4.8 ± 0.2	14.6 ± 0.3
	o		2.7 ± 0.3	3.5 ± 0.4	4.0 ± 0.5	13.1 ± 0.5
Fusarium oxysporum	o	3.6 ± 0.2	3.9 ± 0.4	4.5 ± 0.3	7.2 ± 0.4	19.0 ± 0.3
	o		3.3 ± 0.6	4.1 ± 0.3	5.9 ± 0.6	16.8 ± 0.5
Mucor pusillus	o	3.4 ± 0.5	3.8 ± 0.4	4.8 ± 0.2	7.4 ± 0.2	19.2 ± 0.3
	o		3.3 ± 0.3	4.2 ± 0.1	6.1 ± 0.3	17.0 ± 0.5
Helmintosporium sp.	o	3.2 ± 0.4	4.2 ± 0.5	4.8 ± 0.3	8.0 ± 0.2	20.1 ± 0.6
	o		3.8 ± 0.4	4.4 ± 0.5	6.0 ± 0.4	17.9 ± 0.3
Penicillium crysogenum	o	3.3 ± 0.2	5.3 ± 0.2	5.8 ± 0.4	8.5 ± 0.4	22.7 ± 0.7
	o		5.0 ± 0.1	5.1 ± 0.3	7.7 ± 0.5	21.0 ± 0.5
P. notatum	o	3.5 ± 0.3	6.0 ± 0.4	6.1 ± 0.2	9.2 ± 0.5	24.8 ± 0.8
	o		5.1 ± 0.3	5.5 ± 0.1	8.3 ± 0.4	22.2 ± 0.3
Macrophomina phaseoli	o	3.6 ± 0.4	6.2 ± 0.3	6.6 ± 0.2	10.2 ± 0.6	26.4 ± 0.6
	o		5.0 ± 0.5	5.4 ± 0.5	9.1 ± 0.3	23.0 ± 0.5
Aspergillus terreus	o	3.2 ± 0.5	7.0 ± 0.4	8.5 ± 0.2	11.4 ± 0.5	29.8 ± 0.4
	o		6.4 ± 0.4	8.0 ± 0.4	9.9 ± 0.3	27.2 ± 0.4

L.S.D.0.05 (Life cycle) = 3.8

Adult female longevity was nearly similar when feeding was carried out on the larvae of house and vinegar flies, but was significantly shorter on soil fungi. This period averaged 73.8, 70.9 , 55.1, 54.6, 54.9, 50.2, 45.7, 46.6, and 45.4 in respect (Table 2).

Male different stages followed a similar trend. but with slightly shorter periods. The oviposition period differed according to diets as being significantly longer when fed on larvae of both flies than on soil fungi. This period averaged 55.8, 52.6 , 35.9, 32.2, 30.0, 28.6, 23.2, 214.0 and 2.2 days when feeding was carried out on house fly larvae , vinegar fly larvae, *F. oxysporum, M. Pusillus, Helminthosporium* sp., *P. crysogenum, P. notatum, M. phaseoli*, and *A. terreus*, respectively (Table 2).

With regard to female fecundity, larvae of the two flies significantly increased the number of deposited eggs than with soil fungi . An average female deposited 128.3, 105.2, 53.8, 41.9, 29.9, 20.0, 11.6, 7.2, and 4.2 eggs with a daily rate of 2.3, 2.0, 1.5, 1.3, 1.0, 0.7, 0.5, 0.3 and 0.2 in respect (Table 2).

The effect of food type on reproduction is shown in Table 3. Mite populations after two months assured the previous data of female fecundity that both fly larvae were the suitable diet as they gave the greatest rate of reproduction followed in a descending order by *F. oxysporum, M.Pusillus, Helminthosprium* sp., *P. crysogenum, P. notatum, M. phaseoli*, and *A. terreus*. The average number of individuals after two months was 650, 536, 372.5, 300.5, 198.5, 161, 147, 135.5, and 127.5 when fed on the aforementioned diets, respectively.

It could be concluded that this species is feeding and developing on a wide range of diets as a predator and a fungivore. Food type greatly affected the duration of different mite stages and fecundity. However, animal nourishment proved to be the most suitable diet for increasing the reproductive potential. Zaher (1986) found that *C. bakeri* was omnivorous as larva and the protonymph was feeding on fungus, while the deutonymph and the adult preferred to feed on house fly larvae.

From the mite feeding habit and other biological traits this mite could be useful in decreasing house and vinegar flies populations as well as pathogenetic soil fungi.

Table 2. Effect of different diets on female fecundity and longevity of *Chiropturopda bakeri.*

Diet	Developmental stages in days				
	Pre-ovi-position	Ovi-position	Longevity	Total average	Daily rate
House fly larvae	2.0 ± 0.2	55.8 ± 2.6	73.8 ± 2.4	128.3±4.7	2.3
Vinegar fly larvae	2.2 ± 0.4	52.6 ± 3.3	70.9 ± 3.7	105.2±2.8	2.0
F. oxysporum	4.0 ± 0.3	35.9 ± 2.6	55.1 ± 2.1	53.8±2.5	1.5
M. pusillus	4.5 ± 0.2	32.2 ± 2.5	54.6 ± 2.3	41.9±1.7	1.3
Helmintosporium sp.	5.0 ± 0.3	30.0 ± 3.6	54.9 ± 1.9	29.9±1.6	1.0
P. crysogenum	5.4 ± 0.5	28.6 ± 3.5	50.2 ± 3.1	20.0±1.3	0.7
P. notatum	6.1 ± 0.4	23.2 ± 1.9	45.7 ± 1.2	11.6±1.8	0.56
M. phaseoli	6.5 ± 0.4	24.0 ± 2.4	46.6 ± 2.7	7.2±0.4	0.3
A. terreus	7.0 ± 0.3	21.2 ± 2.9	45.1 ± 1.6	4.2±0.8	0.2

L.S.D.0.05 (Oviposition) = 12.1

(Longevity) = 10.8

(Total number) = 26.7

Table 3. Effect of food type on reproduction of *Chiropturopoda bakeri*

Diet	No. of mite individuals after two months	
	Average	Range
House fly larvae	650.0	620 - 680
Vinegar fly larvae	536.0	551 - 561
F. oxysporum	372.0	350 - 395
M. pusillus	300.0	290 - 311
Helmintosporium sp.	198.5	182 - 215
P. crysogenum	161.0	151 - 171
P. notatum	147.0	139 - 155
M. phaseoli	135.4	127 - 144
A. terreus	127.4	120 - 135

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تأثير الغذاء علي تاريخ حياة وأعداد النوع
Chiropturopoda bakeri

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يتواجد هذا النوع من الحلم في أكوام السباخ بمزرعه كلية الزراعة – جامعة القاهرة . وقد تم تربيته بنجاح علي مدي واسع من الغذاء كميفترس علي يرقات الذباب المنزلي وذبابة الخل (الدروسوفيلا) وكفطري التغذية علي سبعة فطريات من فطريات التربه الممرضة. وبالتحليل الأحصائى للمظاهر البيولوجيه المختلفه وجد أن التغذية الحيوانية لهذا النوع كميفترس أحسن معنويا من التغذية الفطرية وذلك لتقليلها لفترة الأطوار غير الكاملة واطالة فترة الطور البالغ وكذلك زياده خصوبه الأنثي بزياده عدد البيض الذي تضعه . وعموما فسرعة التطور وزيادة مدة حياة الأنثي وخصوبتها عن طريق التغذية الحيوانية بالافتراس تؤدي الي زيادة أعداد هذا النوع .