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PREDATION BY THE MITE *MACROCHELES GLABER* (MÜLLER) (ACARINA: MACROCHELIDAE) ON THE HOUSE FLY *MUSCA DOMESTICA* L. WITH SOME NOTES ON ITS BIOLOGY

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ABSTRACT

Macrocheles glaber (Müller) is one of several mites that feeds on eggs, newly hatched & small larvae of house fly *Musca domestica* L. This mite was reared in the laboratory on house fly frozen eggs at constant conditions of 28°C±1 and 90% relative humidity using sterilized horse dung substrate. The predation rate of adult female and male on frozen eggs was (18, 3) eggs/mite/day respectively, the number of frozen eggs destroyed by adult female through its life was 185.6 eggs.

The mean duration of adult female from egg to adult stage was 2.67 days, the longevity of female was 27.8 days, the mean daily egg production was 2.7 egg with total egg productivity of 72.1 egg.

INTRODUCTION

Several species of the family Macrochelidae (Acarina: Mesostigmata) are predacious on house fly *Musca domestica* eggs and first instar larvae, they also feed on nematodes, collembola and other small arthropods as alternative food in the absence of house fly immature stages (Rodriguez and Wade, 1961; Evanse *et al.*, 1961).Pereira and Castro (1945) were the first to report Macrochelid mites feed on eggs and first stages of house fly. Axtell (1961) and Kinn (1966) reported the rate of predation on house fly eggs and larvae by many species of Macrochelidae. Mean while the biology and ecology of the Macrochelid mites have been studied by many workers (Axtell, 1961, 1963, 1966; Axtell and Edwards, 1983; Fillipponi, 1955, 1960; Keiback, 1978; Mahunka, 1971; O'Donell and Axtell, 1965; Rodriguez and Wade, 1961).

In Iraq the only available information on the mites of Macrochelidae were that reported by Mahmood and Al-Dulaimi (1986, 1988 and 1989) but the necessity for more basic studies in this field still desirable to clarify the role of Macrochelid mites in controlling house fly populations. Therefore, this study was conducted to provide more information on the biology of *M. glaber* to determine whether this mite is capable of being an efficient biological agent in controlling house fly.

MATERIALS AND METHODS

Macrocheles glaber(Müller) was collected from poultry houses in Baghdad area during 1992, several individuals of this mite for the stock culture were isolated and transfered to petri-dishes (7 cm diameter) containing sterilized horse dung moistened with water and placed in a dessicator in which a constant relative humidity of 90%. Then the desicator was maintained and kept in an incubator at 28°C±1, frozen fly eggs have been supplied daily as a food. *Musca domestica* adults were maintained and allowed to lay eggs on cellucotton saturated with milk-water solution and placed in petri-dish (7 cm diameter) ,then confined to cubic cages (18 cm) wire framed completely covered with netting withlong sleeve at one

side,the hatching larvae were transfered to a round plastic containers (13.5X5.5 cm) containing sterilized horse dung, yeast and malt (600, 22 and 200) gms respectivly, the constituents were mixed well and moistened with 200 ml water, then the culture was covered with organdy and kept in an incubator at 30°C.

Small cells were used to follow the life development of the mites, each cell consisted of small glass containers (2.5X3 cm) in which 0.5 gm of sterilized horse dung was placed, 0.3 ml of water was added and allowed to stand until all the water absorbed evently, then the substrate was packed down in half of cell bottom to facilitate observation of various stages of the mites within the rearing cell.

Many pairs of mites were transferred from the stock culture to lay eggs into individual cell containing the same substrate, sealed with para-film and kept under the same conditions as the stock culture for 24 hours.

Twenty-three of known age mite eggs of each treatment were transferred carefully into rearing cell using a small-flattened needle. Each egg was placed into an individually numbered cell and then sealed with para-film. Observations were made hourly until hatching occurred and then every six hours until the mites reached mortality. Ten of the females which completed their development in the rearing cell were taken for fecundity studies, each one was placed in a new cell with male chosen from the stock culture, each unit was numbered and kept under the experiment conditions. Cells were examined twice daily under low power binocular microscope to count the number of eggs laid by each female. The mites were transferred to a new cell having the same number after each examination. The counting of the eggs continued until the death of females. The mites were fed on the house fly frozen eggs.

To determine the number of house fly eggs destroyed per mite, the same rearing cells were used. Forty fly frozen eggs were placed in each cell provided with one newly emerged adult mite starved for 24 hours, the number of frozen eggs destroyed by *M. glaber* were determined at each twenty four hours by microscopic examinations.

RESULTS AND DISCUSSION

Predation potential:

Table 1 showed that the daily mean number of frozen eggs destroyed by adult female and male of *M. glaber* were (18, 3) eggs respectively, so the male had much lower predation rate compared with the female.

Table 1: Predation rates of adult *Macrocheles glaber* on the house fly frozen eggs in 28°C±1 and 90% relative humidity.

Sex	Number of frozen eggs destroyed per mite per day		
	Mean	Range	S. E.
Female	18	12-27	±4.39
Male	3	2-4	±0.94

From table 2, the mean total number of frozen eggs destroyed by female through its life was 185.6 eggs with daily average of 6.7 egg. This result was less than that reported by Mahmood and Al-Dulaimi (1986), which they found that 32.5 eggs was destroyed daily by adult *M. muscaedomesticae* female, while O'Donell and Axtell (1965) gave 24.8 eggs and larvae destroyed by this mite per day at 26.8-28°C .

The present work together with previous reported study on *M. muscaedomesticae* and latent studies on other Macrochelid mites might be give some important information to control house fly.

Table 2: Number of fly frozen eggs destroyed by adult *M. glaber* female during its life cycle in 28°C±1 and relative humidity 90%.

	Number of frozen eggs destroyed per day	Total number of frozen eggs destroyed through mite life
Range	5.3-8.0	100-301
Mean	6.7	185.6
S. E.	±0.87	±65.86

Life cycle:

Macrocheles glaber has only one larval and two nymphal stages, the mean duration of pre-adult stages of female together with their standard error are given in table 3. The mean incubation period and larval stage duration were 1.43 and 0.3 days respectively, while the mean duration of the protonymph and deutonymph stages were 0.73 and 1.65 days respectively.

Table 3: Average duration in days of the developmental stages of *M. glaber* female at 28°C±1 and 90% relative humidity.

	Egg	Larva	Protonymph	Deutonymph	Total
Range	1.00-1.75	0.25-0.5	0.5-1.0	1.0-2.0	2.0-3.25
Mean	1.34	0.3	0.73	1.65	2.67
S. E.	±0.26	±0.10	±0.14	±0.36	±0.35

From table 4, the female life spane was 27.8 days with a range of 17-51 days, the mean numbers of eggs produced by a female was 2.7 egg/female/day with a range of 1.7-4.2, the mean longevity of the female was 27.8 days with range of 17-51 days, while the mean productivity was 72.1 eggs with a range of 40-94 eggs.

Table 4: Mean fecundity and longevity for 10 females of *M. glaber* at 28°C±1 and 90% relative humidity.

	Number of eggs /day	Longevity (days)	Total egg productivity
Range	1.7-4.2	17-51	40-94
Mean	2.7	27.8	72.1
S. E.	±0.83	±10.39	±18.10

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LITERATURE CITED

Axtell, R.C. 1961. New records of North American Macrochelidae (Acarina: Mesostigmata) and their predation rates on the house fly. *Ann. Ent. Soc. Amer.*, 54(5):748.

Axtell, R.C. 1963. Effects of Macrochelidae (Acarina: Mesostigmata) on house fly production from dairy cattle manure. *J. Econ. Ent.*, 56(3):317-321.

Axtell. R.C. 1966. Comparative toxicities of insecticides to house fly larvae and *Macrocheles muscaedomesticae* a mite predator of the house fly. *J. Econ. Ent.*, 59(5):1128-1130.

Axtell. R.C. and Edwards, T.D. 1983. Efficiency and nontarget effects of larvadex as a feed additive for controlling house flies in caged-layer poultry manure. *Poultry Science* 62(12):2371-2377.

Evans, G.O.; Sheals, J.G. and Macfarlane, D. 1961. The terrestrial Acari of the British Isles. An introduction to their morphology, biology and classification Vol. 1. Introduction and biology. London (*British Museum) nat. Hist.,* 1-219.

Fillipponi, A. 1955. Sullanatura dell asso ciazione tra *Macrocheles muscaedomesticae* and *Musca domestica*. Riv. *Parassitol.* 16(2):83-102.

Fillipponi, A. 1960. Macrochelidi (Acarina: Mesostigmata) Foreticidi nosch. Risultati parziali di una indagine ecologica in carso nell agro pontino. *Parasitologia*. 2(1-2):167-172.

Keilback, R. 1978 Termination of the aplagae of the little house fly (*Fannia canicularis*) by the foratic *Macrocheles muscaedomesticae* in small animal pers. *Parasitologia*, 19(4): 221-223.

Kinn, A. N. 1966 Predation by the mite *Macrocheles muscaedomesticae* (Acarina: Macrochelidae) on three species of flies. *J Med. Ent.*, 3(2): 221-223.

Mahmood, S. H. and Al-Dulaimi, S. I. 1986 Biological studies on the mite *Macrocheles muscaedomesticae* (Acarina: Macrochelidae). *J. Biol. Sci. Res.*, 17(2): 329-338.

Mahmood, S. H. and Al-Dulaimi, S. I. 1988 Ecological study of Iraqi predator mites developing in animal manure. *J. Biol. Sci. Res. 19(Suppl.)*: 865-876.

Mahmood, S. H. and Al-Dulaimi, S. I.1989 A survey of the acari fauna in cattle and horse manure. *J. Biol. Sci. Res.*, 20(3): 463-473.

Mahunka, S. 1971 Investigations on *Coprophilous* and *Stercoricolous* Macrochelidae (Acarina: Gamasina) in Hungary, as possible agents in control of synanthropous flies. *Parasit. Hung.*, 4: 215-226.

O'Donell, A. E. and Axtell, R. C. 1965 Predation by *Fuscoropoda vegetans* (Acarina:Uropodidae) on house fly *Musca domestica*. *Ann. Ent. Soc. Amer.*, 58(3): 403-404.

Pereiera, C. and de Castro, N. P. 1945 Contribuicao para o conhesimento da especie tipo de *Macrocheles muscaedomesticae* (Scolopi, 1772). *Emend. Arg. Inst. Biol. (Sao Paulo),* 16:153-186.

Rodriguez, J. G. and Wade, C. F. 1961 The nutrition of *Macrocheles muscaedomesticae* (Acarina: Macrochelidae) in relation to its predatory action on the house fly eggs. *Ann. Ent. Soc. Amer.*, 54: 782-788.

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***Macrocheles glaber* (Müller) (Acarina: Macrochelidae)** ملحلا ةس لرتلا ا ة لفكا ا ي لزملاب الذا ىلء ***Musca domestica* L.** ضء ع م

هتي ت ا يج لء طلاملا

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م لجا ا (Müller) *Macrocheles glaber* طو . ي ى لعنغ تتي . ل ا عو .لأن . م يغصدل لسقف ل ة تجي . .تويلي ز ن لمبا نبـ . لا. ربي هذا الحلم في المختبر على البيوض لمدة للذباب المنزلي في درجة حرارة ٢٨ °م± ١ ورطوبة نسبية ٩٠% باستعمال روث الخيل المعقم كوسط للتربية.

وقد أظهرت النتائج بان معدل الافتراس اليومي للإناث والذكور الكاملة على البيوض لمدة كان ١٨ و ٣ بيضة على التوالي. كما وجد بان معدل عدد بيوض الذباب المنزلي لمدة التي تغذت عليها إناث الحلم الكاملة خلال حياتها كان ١٨٥.٦ بيضة. ووجد أيضاً بان معدل دورة حياة الأنثى من الفقس حتى طور الكاملة٢.٦٧ يوم. وأظهرت النتائج أيضاً بان طول عمر الإناث كان ٢٧.٨ يوم وكان معدل الإنتاج اليومي من البيوض ٢.٧ بيضة، وقد بلغ معدل الإنتاج الكلي من البيوض ٧٢.١ بيضة خلال فترة حياتها.