Egypt. J. Agric. Res., 79 (4), 2001.

SOME BIOLOGICAL OBSERVATIONS ON *GRAMMOLICHUS AEGYPTICUS* SP.N., WITH DESCRIPTION OF ADULT AND IMMATURE STAGES, (ACARI : ASTIGMATA-GLYCYPHAGIDAE)

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(Manuscript received September 2000)

Abstract

Grammolichus aegypticus sp.n. (Acari : Glycyphagidae) was collected from stored maize in Sahel Road El-Farag, Cairo. Adult and immature stages were described in details. This species was successfully reared on dog food, dry yeast, powder of meat and pupal powder of fruit flies *Ceratitis capitata* at 18 and 25°C. Duration of life-cycle averaged 40.7, 47.7, 54.7 and 63.3 days at 18°C, while at 25°C, it was 20.5, 24.3, 31.8 and 35.3 days on the aforementioned diets, respectively. A normal female laid 62.0, 60.0, 55.5 and 40.3 eggs at 18°C and 89.6, 84.9, 59.9 and 50.0 eggs at 25°C on the above-mentioned diets, respectively.

INTRODUCTION

Members of the family Glycyphagidae are free- living mites and were found in animal meal, stored maize flour (Hughes, 1976). Fain (1968) described six new species of genus *Grammolichus*, while Portus and Fain (1982) described another new one, *G. eliomys.*

In the present work, the new species, *Grammolichus aegypticus* which found in stored maize in Sahel Road El-Farag, Cairo and in stored flour in Beheira (Rasheed) was described as adult and immatures. Also, its biology on different foods was studied.

MATERIALS AND METHODS

Grammolichus aegypticus sp.n. was collected from old maize in Sahel Road El-Farag and house dust at Giza (El-Mehtemideia) by using modified Tullgren funnel. Twenty-five newly hatched larvae were singly reared in plastic chambers (3.0 x 3.0 x 0.5 cm) and left to reach adulthood and deposited eggs. Bottom of each chamber (cell) was provided with a mixture of dust, plaster of Paris and manure and its upper side was covered with a glass slide. Few drops of water were added and the diets : dog food, dry

yeast granules, powder of meat and pupal powder of fruit flies were supplied as food. Experiments were carried out at 18°C and 25°C and 75 % R.H. Mites were examined daily. Also, the rate of reproduction on various kinds of diet were carried out by placing ten newly emerged females together with five males in a small plastic cell (3 cm in diameter) and supplied with each food. This experiment was replicated five times. After one month, the number of eggs, immatures and adults were counted.

Adult and immature stages were illustrated and described.

RESULTS AND DISCUSSION

Family : Glycyphagidae

***Grammolichus aegypticus* sp. n.:** This new species is very similar to *G. malukuensis* Fain, but it could be distinguished by its smaller length (390 μ) than that of *G. malukuensis* (420 μ), pseudotrachea kidney-shape, pretarsi with claws and internal vertical setae in both sexes bi-branched; in *G. malukuensis* (vi) tri-branched in male.

A. Description of different stages

Egg : Elongate, translucent, whitish and pale brown, 142 μ long and 76 μ wide.

Larva Fig. 1a & b

Dorsum, Fig. 1 , a : Body oval, the integument completely covers the gnathosoma and palpi, chelicerae slightly sclerotized and with 3 fine teeth; cuticle transversally striated. Idiosoma 214 μ long and 132 μ wide. Propodosomal shield at the anterior part of the integument wholly granulated. External vertical setae (ve) and internal vertical setae (vi) short and ciliated. (Sce) and (sci) present. Four pairs of dorsal setae (d_1-d_4), three pairs of lateral setae (L_1-L_3) and one pair of humeral located dorsally. All setae short and heavily barbed.

Ventrum, Fig. 1 , b : Epimeres I fused, Y-shaped, with short sternum (16.5 μ), more sclerotized. Epimeres II free, sclerotized and Y-shaped. A pair of sternal setae (s) short, smooth, distinct. Subhumeral setae (sh) short and barbed. Clapared's organ beside sternal setae as a small papillae. Coxae I and II without setae, while coxae III with a pair of smooth setae (cx_3). Genital plate absent and plate with a pair of short barbed setae at the posterior end, larva with only three pairs of legs.

Chaetotaxy of legs : Tarsi 6-6-3, tibiae 2-2-1 and genua 1-1-1.

2. Protonymph, Fig. 2, a & b

Dorsum, Fig. 2, a : Idiosoma oval, yellowish, with transverse striations. Integument wholly covers the gnathosoma and palpi. Idiosoma covered with strongly punctuated sclerites, transverse striae laterally and grooves. Idiosoma 264 μ long and 173 μ wide. External vertical setae (ve) rod shape 5 μ; while setae (vi) 12 μ with fine barbs; all dorsal setae similar to those of larvae; (sci) and (sce) setae with densely fine barbs and slightly subequal in length. A pair of barbed humeral setae (h) 13 μ. Pseudotrachea covers the trochanter of leg I from the dorsal side, kidney shape, 9 μ long and 5 μ wide. Five pairs of barbed dorsae setal (d_1, d_2, d_3, d_4 and d_5). Five pairs of barbed lateral setae (l_1, l_2, l_3, l_4 and l_5), d_5 and l_5 located ventrally.

Ventrum, Fig. 2, b : Similar to larva, but integument slightly more sclerotized. Genital plate located between coxae IV, with a pair of circular suckers and with a pair of short smooth genital setae (5.9 μ). Anal plate indistinct with 3 pairs of setae; the anterior one smooth and the others barbed.

Chaetotaxy of legs : Tarsi 6-6-3.3, tibiae 2-2-2-2 and genua 1-1-1-0.

Tritonymph, Fig. 3, a & b

Dorsum, Fig. 3, a : Body more sclerotized and pale brown. Idiosoma oval, 346 μ long and 224 μ wide. Integument completely covers the gnathosoma and palpi, cuticle strongly striated on the dorsal side, striation directed to the middle of the body. Propodosomal shield more widened (70 μ), punctuated, sclerotized, ridges slightly longer and distinct, 50 μ wide. Pseudotrachea longer than that of protonymph. (ve) setae rod shaped, while (vi) setae located anteriorly and branched with fine barbs. Setae (sce) and (sci) lanceolated with fine barbs and slightly equal in length. A pair of barbed humeral setae distinct. Four pairs of barbed dorsal setae (d_1, d_2, d_3 & d_4), while d_5 located ventrally. Four pairs of barbed lateral setae (l_1, l_2, l_3 & l_4), and l_5 located laterally.

Ventrum, Fig. 3, b : Integument with irregular area of punctations. Epimeres I fused, Y-shaped, more sclerotized with sternum 16.5 μ. Epimeres II free and also sclerotized and Y-shaped, sternal setae short and smooth, while subhumeral setae short and barbed. Two pairs of genital suckers present between coxae IV. At the anterior part of genital suckers, there are two pairs of smooth and short setae present. Coxae I, II, IV without setae, while coxae III with a pair of simple short setae. Anal plate indistinct with four pairs of small setae, the anterior two pairs smooth, while the others barbed.

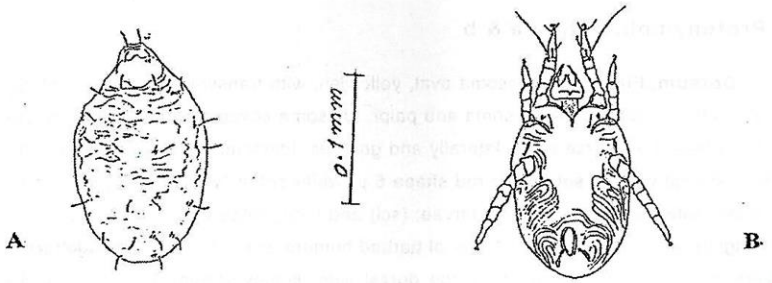

Fig. 1 : Larva of *G. aegypticus*
A- Dorsum, B- Ventrum

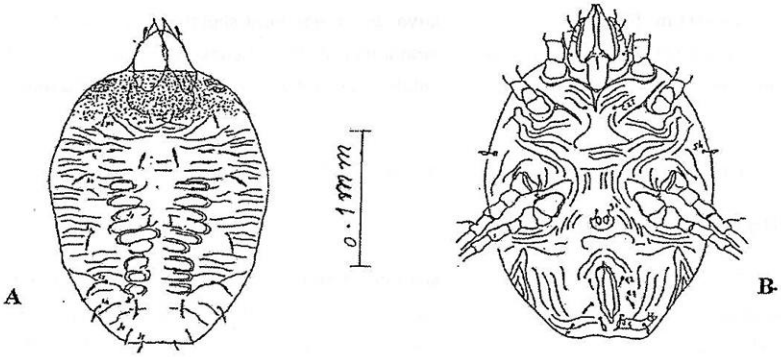

Fig. 2 . Protonymph of *G. aegypticus*
A- Dorsum, B- Ventrum

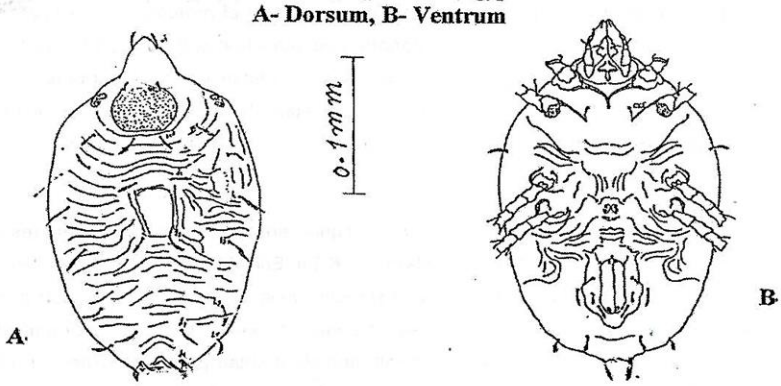

Fig. 3 . Tritonymph of *G. aegypticus*
A- Dorsum, B- Ventrum

Chaetotaxy of legs : Tarsi 7-7-4-4, tibiae 2-2-2-2 and genua 1-1-1-0.

Female, Fig. 4, a & b

Dorsum, Fig. 4 , a : Body strongly sclerotized, dark-brown, with longitudinal and transverse striations. Integument wholly covered with fine rounded punctations. Idiosoma 390 μ long and 250 μ wide. Pseudotrachea kidney shaped. Setae (ve) absent, while (vi) located anteriorly and bi-branched with fine barbs. Setae (sce) and (sci) thick and barbed, subequal in length (26 μ). Five pairs of barbed dorsal setae (d_1, d_2, d_3, d_4 and d_5) present. Five pairs of barbed lateral setae (l_1, l_2, l_3, l_4 and l_5) located laterally.

Ventrum, Fig. 4 , b : Integument with irregular area of punctations. Epimeres I and II sclerotized and Y- shaped, the former fused, while the latter free. Sternal and subhumeral setae distinct and smooth. Epigynium distinct, genital plate triangular, sclerotized and clearly punctuated and with two small rounded genital discs; also three pairs of smooth and short genital setae located laterally of genital plate. Anal plate sclerotized with five pairs of small setae, the anterior pair smooth, while other setae barbed; a pair of barbed distinct postanal setae.

Chaetotaxy of legs : Tarsi 7-7-4-4, tibiae 2-2-2-2 and genua 1-1-1-0.

Male, Fig. 5, a & b

Dorsum, Fig. 5 , a : Boy more sclerotized, pear- shaped, its anterior part triangular, while the posterior rounded. Integument with transverse and longitudinal striations. Punctations covered whole body integument, length of idiosoma 325 μ long and 185 μ wide. External vertical setae (ve) absent, while setae (vi) bi-branched with fine barbs. Two pairs of barbed, thick scapular (sce and sci) setae present. Dorsal and lateral setae similar to those of female.

Ventrum, Fig. 5 , b : Integument more sclerotized and punctated. Epimeres I and II free, more sclerotized and Y-shaped. Genital plate with three pairs of smooth, minute setae; aedeagus elongated with rounded genital suckers. Genital plate very near to anal plate. The latter elongate, sclerotized and with 3 pairs of setae, one smooth minute and 2 pairs small, barbed and one pair of small barbed adanal setae.

Chaetotaxy of legs : Tarsi 6-6-5-5, tibiae 2-2-1-0 and genua 1-1-1-0.

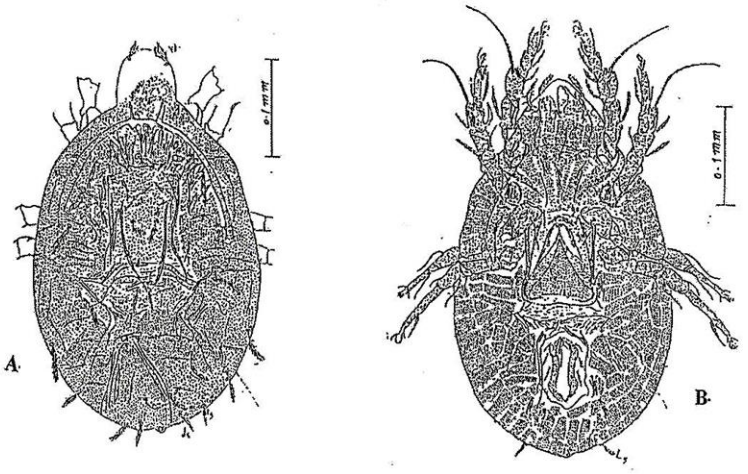

Fig. 4 : Adult female of *G. aegypticus*
A- Dorsum, B- Ventrum

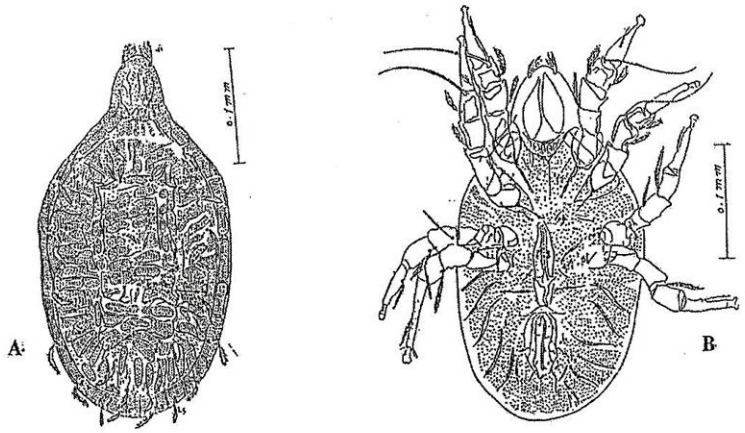

Fig. 5 : Adult male of *G. aegypticus*
A- Dorsum, B- Ventrum

B. Biological Studies

Mites were fed dog food, dry yeast granules, powder of meat and pupal powder of fruit flies. Female deposited eggs singly with a daily rate 4 eggs in cracks of rearing cells on its food. *G. aegypticus* passes through larva, protonymph and tritonymph before reaching adult. Each motile immature stage enters into quiescence. Copulation is necessary for depositing eggs. Both male and female accepted copulation immediately after emergence. At 18°C, the duration of female life- cycle averaged 40.7, 47.7. 54.7 and 63.3 days, while at 25°C, it was 20.8, 24.3, 31.8 and 35.3 days on above mentioned diets, respectively, Table 1.

The shortest adult female longevity was 30.6, 35.6, 48.9 and 55.7 days at 25°C, while the longest was 48.9, 55.5, 62.9 and 69.9 days at 18°C on the same previoulsy mentioned diets, respectively. Normal female deposited 94.2, 89.6, 84.9 and 59.9 eggs at 25°C and 62.0, 60.0, 55.5 and 40.3 eggs at 18°C on abovementioned diets, respectively, Table 2. From the previous results, data indicated that adult female longevity and fecundity was affected by temperatures.

Rate of reproduction : Dog food, powder of meat, dry yeast and pupal powder of fruit flies were used as food for studying the rate of reproduction of *G. aegypticus* at 18°C and 25°C. Resultant offspring of ten females, after one month, at 18°C was 610.2, 590.2, 540.5 and 390.3 individuals and at 25°C was 880.7, 839.6, 589.2 and 490.3 individuals when fed on the aforementioned diets, respectively. From the previous data, it was obvious that the rate of reproduction increased at 25°C than that at 18°C and dog food was the most preferable diet, while pupal powder of fruit flies was the least one, Table 3.

Table 1. Duration of developmental stages of *Grammolichus aegypticus* sp.n. fed on different diets at 18°C and 25°C with 75% R.H.

Developmental stage	Average period in days							
	Dog food		Dry yeast		Powder of meat		Pupal powder of fruit fly *Ceratitis capitata*	
	18°C	25°C	18°C	25°C	18°C	25°C	18°C	25°C
Egg	8.8±0.7	4.9±0.2	9.8±0.7	6.0±0.7	10.8±0.6	6.8±0.5	11.9±0.5	7.0±0.7
Larva	8.0±0.6	2.4±0.6	9.9±0.5	2.9±0.7	12.06±0.4	5.7±0.4	13.8±0.6	6.2±0.5
Quiescent larva	3.8±0.6	2.07±0.3	4.07±0.6	2.1±0.6	5.15±0.6	3.06±0.2	5.9±0.6	3.3±0.5
Protonymph	9.07±0.7	3.1±0.5	9.9±0.6	3.9±0.6	11.8±0.7	5.0±0.7	12.9±0.6	6.8±0.5
Quiescent protonymph	2.9±0.5	2.07±0.3	2.9±0.4	2.0±0.27	3.1±0.7	3.0±0.7	5.0±0.5	3.4±0.5
Tritonymph	6.07±0.49	3.1±0.5	7.8±0.5	5.2±0.4	7.9±0.6	5.3±0.5	8.9±0.5	5.6±0.9
Quiescent tritonymph	2.07±0.27	2.07±0.3	3.3±0.4	2.0±0.2	3.9±0.5	2.9±0.7	4.9±0.5	3.4±0.5
Total immatures	31.9±1.11	15.6±1.0	37.9±1.03	18.3±1.0	43.7±1.9	25.0±1.7	51.4±1.6	28.3±1.2
Life cycle	40.7±1.4	20.5±1.0	47.7±1.6	24.3±1.3	54.7±1.9	31.8±1.7	63.3±1.9	35.3±1.3
Adult longevity	48.9±0.9	30.6±1.2	55.5±1.2	35.6±0.6	62.9±1	48.9±0.7	69.9±1	55.7±0.9
Life span	89.6±1.6	51.1±1.1	103.2±5.4	69.9±1.4	117.6±2.12	80.7±1.9	133.2±4.1	91.0±1.6

Table 2. Effect of food kinds on female longevity and fecundity of *Grammolichus aegypticus* sp.n. at 18°C and 25°C.

Diets	Average period in days								No. of eggs/female			
	Pre-oviposition		Oviposition		Post-oviposition		Longevity		Total average		Daily rate	
	18°C	25°C	18°C	25°C	18°C	25°C	18°C	25°C	18°C	25°C	18°C	25°C
Dog food	2.07 ±0.2	2.02 ±0.4	38.0 ±0.7	24.8 ±0.7	8.9 ±0.6	3.8 ±0.6	48.9 ±0.9	30.6 ±1.2	62.0 ±0.7	89.6 ±1.2	1.6 ±0.5	3.6 ±1.0
Dry yeast	3.0 ±0.6	2.7 ±0.4	39.9 ±0.8	27.9 ±4.0	12.6 ±0.6	4.9 ±0.4	55.6 ±1.2	35.6 ±0.6	60.0 ±1.1	84.9 ±0.4	1.5 ±0.4	3.0 ±0.7
Powder of meat	3.9 ±0.5	3.0 ±0.5	44.9 ±0.6	39.9 ±0.5	14.08 ±0.5	5.9 ±0.7	62.9 ±1.0	48.9 ±0.7	55.5 ±0.7	59.9 ±0.6	1.2 ±0.4	1.5 ±0.5
Pupal powder of fruit fly	5.09 ±0.5	3.9 ±0.2	50.8 ±0.9	4.5 ±0.7	14.01 ±0.6	6.8 ±0.3	69.9 ±1.0	55.7 ±0.9	40.3 ±1.1	50.0 ±4.8	0.79 ±0.3	1.1 ±0.4

Table 3. Reproduction of *Grammolichus aegypticus* on different diets at 18°C and 25°C.

Food type	Number of eggs and individuals/10 females after a month	
	25°C	18°C
Dog food	880.7±12.0	610.2±7.5
Dry yeast	839.6±4.9	590.2±11.1
Powder of meat	589.2±7.2	540.5±7.9
Pupal powder of fruit flies *Ceratitis capitata*	490.3±7.8	390.3±11.2

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وصف نوع جديد من الأكاروس فى مصر
Grammolichus aegypticus sp.n.
(Acari : Astigmata _ Glycyphagidae)
مع وصف أطواره غير الكاملة ودراسات بيولوجية عليه

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جمع هذا النوع من الأكاروس من الذرة المخزونة فى ساحل روض الفرج، وقد وصف الطور البالغ وكذلك الأطوار غير الكاملة له بالتفصيل. كما ربى هذا النوع بنجاح على عدة أغذية وهى : طعام الكلاب والخميرة الجافة ومسحوق اللحم ومسحوق عذارى ذبابة الفاكهة *Ceratitis capitata* على درجتى حرارة ١٨ و ٢٥°م.

بلغ متوسط مدة دورة حياة أنثى هذا النوع ٤٠,٧ و٤٧,٧ و٥٤,٧ و٦٣,٣ يوما على درجة حرارة ١٨°م و ٢٠,٥ و٢٤,٣ و٣١,٨ و٣٥,٨ يوما على درجة حرارة ٢٥°م عند التغذية على الأطعمة سابقة الذكر على الترتيب.

وقد وضعت الأنثى ٦٢,٠ و٦٠,٠ و٥٥,٥ و٤٠,٣ بيضة فى المتوسط على درجة ١٨°م بينما وضعت على ٢٥°م ٨٩,٦ و٨٤,٩ و٥٩,٩ و٥٠,٠ بيضة عندما تغذت على الأطعمة سابقة الذكر على الترتيب.

وبالتالى يتضح أن أفضل الأطعمة التى تغذى عليها هذا النوع الجديد هو طعام الكلاب وأقلها أفضلية هو مسحوق عذارى ذبابة الفاكهة والطعام الأول يتكون من مسحوق العظم واللحم وبعض البقوليات.