BIOLOGICAL AND MORPHOLOGICAL STUDIES ON *LOMELACARUS WERYI* FAIN AS A FIRST RECORDED IN EGYPT (ACARI – ASTIGMATA- GLYCYPHAGIDAE)

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Abstract

The mit species Lomelacarus weryi Fain (1978) was recorded for the first time in Egypt in house dust in El – Mehtemedia, Giza, and cow manure in El- Zahween (Qalyobia).Immature stages has been discriped and illustrated as well as adult stages.This species successfully reared on each of powder of dry fish, dry yeast, ground wheat and ground rice at 25ºC and30ºC and 75%R.H.Egg incubation period averaged 7.0 days for all the previous mentioned diets at 25ºC while at 30ºC it averaged 2.2, 2.5, 2.6, and 2.9 days on the same dites,respectively.Duration of total immature stages at 25ºC averaged 17.0, 23.4, 27.5 and 29.6 days on the aforementioned diets respectively while at 30ºC it was 9.3, 10.7, 13.9 and 16.4,on the same diets respectively. At 25ºC,female laid an average of 29.2 , 28.3 , 26.3 and 24.2 eggs while at 30 °C it laid 21.1, 20.2, 18.2 and 15.3 eggs when fed on the above mentioned dites respectively.

INTRODUCTION

Lomelacarus weryi Fain is considered.a house dust mite which cause allergen problems all over the world and requires more research (De Weck and Todt, 1988)

More than 100 million of more than 5 billion inhabitants of our planet are affected today by house dust mites Warton(1976).

These mites have great importance for their wide spread occurrence in house dust, nests of birds and stores of grains, and with different feeding behaviour as fungivorous, saprophagus and grain feeders.It also adapted to live on carpets, bed mattresses and feather pillows , Muller et al . (1995) and Chang – Yeung et al. (1995). The occurrence of allergens in house dust , causing allergic rhinitis and asthmatic symptoms was firstly suggested by Kern 1921.

The allergic factor in hous dust remains unresolved however importance clues were found in 1964 when Voor Horst et al. (1964) suggested that some mite species may be responsible for the house dust allergen. Also, Fain (1966 a & b) mentioned that *Dermatophagoides pteronyssinus* Troussart was the cause of house dust allergy.

The house dust mites increased to enormous numbers. It contaminate the house dust, bed mattresses and grains with its bodies, faeces, moulting exuvae and their fragments causing bronchial asthma, prennia rhinitis, itching,digestive troubles and unpleasant test for food. It also live as ectoparasites on skin, shed scales,hair frgments, glandular exudations of farm animals and feather of birds causing decrease in its milk, meat and eggs. Moreover it cause sever damage for grains and animal meals. In Egypt the importance of this group showed up considerably than even before due to their damage to stored products, domestic mammals and human public health. Several taxonomical, ecological and biological studies were carried out on this group in the foreign countries while few trials were done in Egypt (i.e.Wafa et al 1966 a&b,Attiah, 1969, Gamal El – Din et al., 1982, Saleh et al., 1985 and Shereef et al. 1990 a & b).

As *L.weryi* was recordèd for the first time in Egypt,it was felt prober to study the biology of this species when reared on powder of dry fish, dry yeast, ground wheat and ground rice at 25 and 30°C and 75% R. H. Also, adults and immature stages were described and drawn.Some biological aspects including oviposition, moulting and mating were investigated.

MATERIALS AND METHODS

1- Sampling:

Samples of house dust,all of about 2 Kgs were collected from many houses in El Mehtemedia, Giza and transfered to laboratory in plastic bags. Mites were extracted by using modified Tullgren funnels then cleared in Nesbitt's solution.Mites were mounted in Hoyer's medium on glass slides,then identified and drawn.

2- Rearing experiments:

Mites were reared by using plastic blocks (3,3,0.5 cm),each with a small circular chamber of 1 cm diameter.

Chamber was filled with mixture of dust, plaster of Paris and few organic manure. This chamber were covered with a glass slide to prevent escaping of mites, and fastened with a rubber band. For obtaining pure culture.One identified adults was placed in the rearing chamber and provided with dry yeast granules as food and few drops of water was added as a source of humidity and examined daily and left to give its off spring. Thirty larvae from the 2nd generation were used

as replicates for biological studies for every food and temperature (25&30°C at 75% R.H.).Powder of dry fish, dry yeast, ground wheat and ground rice were used as food and examination were undertaken twice a day.

RESULTS AND DISCUSSION

A- Morphological studies of *Lomelacarus weryi* Fain:

Fain (1978) described the genus Lomelacarus from house dust in Zaire.

Species Type:

Lomelacarus weryi Fain was found in fisherman house in Zaire on the side of river Lomela in Bokela county. This new species is dedicated to the professor M. weryi, who helped Fain to collect the dust samples which containing the mite. This species has been recorded for the first time in Egypt in house dust in El- Mehtemidae , Giza governorate, and in cow manure in El-Zahween, Qalyobia.

Genus *Lomelacarus* is identified by its small size with soft cuticle and sclerotized in some sites to form bends. Dorsal prolonged interiorly forming ā tegument around the gnathosoma and covering a big part of it. Sejugal furrow obvious . Legs stout and attenuate at the half of tarsus, tarsus terminated with a small pulvillus without claw . Epimera I Y shaped and fused to form short thick sternum,epimera II free, posterior epimerae weakly developed. Sexual organ situated at the level of coax III. Genital suckers present and anus situated posterior to the sexual organ immediately.

The male without para anal or tarsal sucker. And with 2 pairs of a chitinized pits located between legs II & III. Pits absent in female. Bursa copulatrix long, straight and very close to the spermatheca in the posterior part of the female body. .

1- **Egg (Fig. 1)** :

Elongate, translucent 110 mu long and 66.6 mu. wide and whitish before hatching. Its length is 110 mm and width 66.6 mm.

2- Larva (Fig . 2 a & 6):

Dorsum (Fig . 2a) : Body oval, integument covering the gnathosoma reticulated, while the rest dorsal shield striated transversally or longitudinally except the median dorsal shield between d1 and d3. Chelicerae slightly sclerotized and with 3 fine teeth. Idiosma 115 mu long and 91 mu wide. External vertical setae (ve) and

internalvertical setae (vi) very fine. (Sce) and (Sci) setae present. Four prais of dorsal setae (d1 – d4), three pairs of lateral setae (L1 – L3) and one pair of hermeral setae located dorsally. All setae very fine.

Ventrum (Fig 2 & b): Integument with some small tubercle located posterior of anus opening. Epimera 1 sclerotized, fused , Y shaped, and with short sternum. Epimera 2 free, sclerotized and Y shaped. A pair of sternal setae (s) short and smooth. Sub humeral setae (sh) short and located beside coxae III laterally. Coxae I and II without setae, while coxae III with a pair of smooth setae (cx3). One pair of hypostigmatic (ps) setae located ventrally of gnathosoma. Genital plate absent and anal plate with one pair of short simple setae lays at the posterior end of the body.One short pair of lateral setae (L4). Larva with only three pairs of legs.

legs: Tarsi 7-7-4, tibia 3-3-2 and genue 3-3-1.

3- Protonymph (Fig 3 a & b):

Dorsum (Fig 3 a) : Idiosoma oval, yellowish with Sejugal furrow and a median region of dorsal shield surrounded by transverselly and longitudinal striation between d1 & d3.Two long bends along the two lateral sides of dorsal shield present . Idiosoma 235.3 mu long and 129.4 mu wide. Two pairs of vertical setae minute and simple (ve) and (vi). The internal vertical setae (vi) located on the anterior ridge of the propodosomal plate, while the external vertical setae situated near the sejugal furrow.

A one pair of supracoxal setae (scx) beside (ve) setae, internal and external scapular setae (sci, sce) minute ,simple and located on transversal raw ,one pair of humeral setae (h) present laterally ,four pairs of dorsal setae (d1 – d4) located on the middle of dorsal shield while the (d5) located ventrally after the anal opening ,three pairs of lateral setae (L1 – L3) located laterally and the fourth pair located ventrally.

Ventrum (Fig 3,b): Integument with a transversel striation between epimerae 1 and 3 . Two bends along the two lateral sides of the ventrum. Epinera I fused , Y shaped with a small sternum. A pair of simple short hyposigmatic setae on the ventrum of gnathosoma and one pair of sternal setae (s) short between epimera 1 and 2. Epimera 2 Y shaped and free, while the epimera 3 and 4 not well developed. The sub humeral setae (sh) short and simple. Coxae I and VI without setae while

coxae II and III with 2 pairs of smooth setae (cx2 & cx3). Genital plate located between coxa IV and surrounded by three pairs of genital setae (ga, gm and gp) smooth and short . Anal opening located immediately after genital plate and with 2 pairs of anal setae (a1, & a2).

Undeveloped genital plate surrounded by a pair of small round genital suckers. Anal opening located immediately after genital plate and with 2 pairs of anal setae (a1 & a2).

Legs: Tarsi 7-7-4-4, tibia 3-3-2-1 and genua 3-3-1-0.

4- Tritonymph (Fig 4 a & b):

Diorsum (Fig 4 a): Body more sclerotized and pale broun. Idiosoma nearly round posteriorly. The integument completely covering the gnathosoma and palpi, cuticle moderately transversally striated. Sejugal furrow separating propodosomal from hysterosomal plate. Striation of dorsal shield resticted a round area including the 2 dorsal pairs of setae d3 and d4. Propodosomal shield more widened and sclerotized. Supracoxal seta (scx) located laterally and very minute. Internal vertical setae (vi) smooth and short located terminally on the top of propodosoma ,external pairs (ve) located laterally near sejugal furrow. Five pairs of simple minute dorsal setae (d1 – d5), the setae (d1 –d4) located on the dorsal shield, while d5 located immediately after anus opening . Five pairs of simple short lateral setae (L1- L5) ,(L1 – L4) located doroally while L5 situated ventrally, one pair of simple short humeral setae (h) located laterally.

Ventrum Fig 4, b: Followed the term of protonymph in its description and its setae except the anal has three pairs of anals setae a1, a2 & a3 and the genital site surrounded with 2 pairs of genital suckers.

Legs: Tarsi 7-7-4-4, tibia 3-3-2-1 and genua 3-3-1-0 .

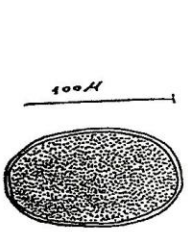
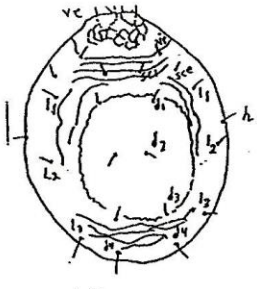
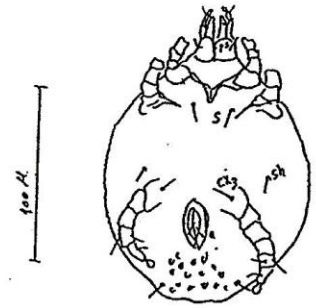


Fig 1: Egg

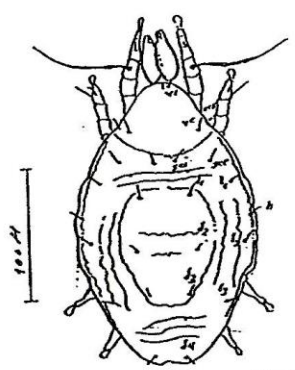


a) Dorsum

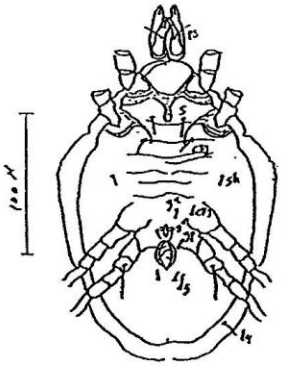


b) Ventrum

Fig 2: Larva

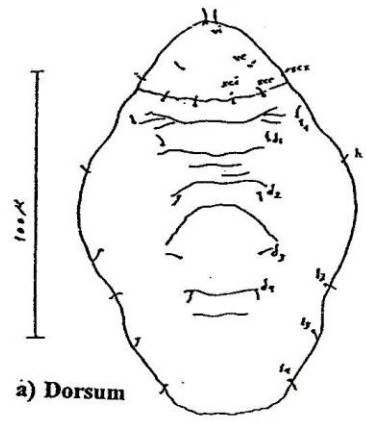


a) Dorsum

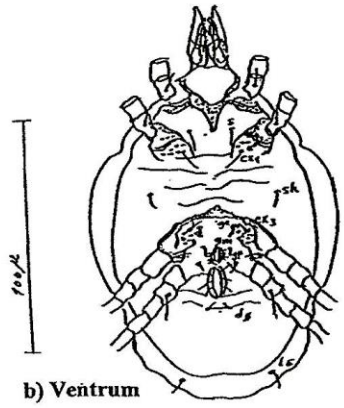


b) Ventrum

Fig 3: Protonymph



a) Dorsum



b) Ventrum

Fig4: Tritonymph

5- Female (Fig. 5 a & b):

Dorsum Fig. 5, a: A small size mite species , with soft cuticle sclerotized in some sites to form bends. Idiosomal 302 mu long and 202 mu wide. The dorsal shield prolonged interiorly forming a tegument around the gnathosoma and covereing a big part of it. Sejugal furrow obvious, 2 long bends between d1- d3 this area unstriated while striation all over this area around, dorsal setae as those of tritonymph.

Ventrum Fig. 5, b:

Integument covered with more tubercles around the sternal region,coxae II &III and behind the anus region. Epimerae 1Y-shaped more sclerotized and fused to form a small sternum, epimerae 2 free, sclerotized and Y shaped, other epimerae 3 & 4 weakly developed. The genitoanal region surrounded laterally of each side with a thick cuticular longitudinal bend. Opisthogastric region with transverse irregular bends, sexual plate situated at the level of coxa III, two pairs of genital suckers present and anus situated posteriorly to the genital plate immediately.

Idiosoma with very minute setae, including setae vi, ve , sci, sce, d1, to d5, L1 to L5, scx, ps , h, sh, ga, gm, gp, cxI, cxIII and anal setae a1 to a5.

Legs: tarsi 8-8-5-4 setae , tibiae 2-2-1-0 and genua 3-3-1-0

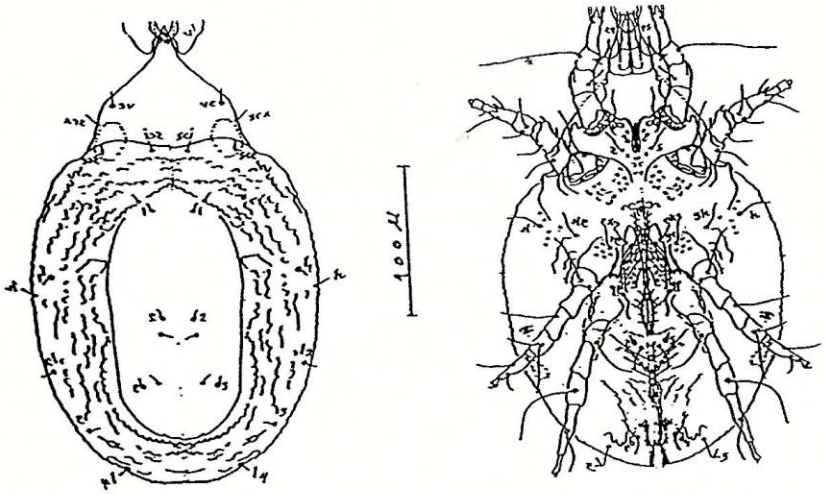
6- Male (Fig 6,a & b)

Dorsum (Fig. 6 a): Body oval, 294.1 mu long and 200 mu wide, anterior part triangular , while the posterior rounded. Sejugal furrow separating propodosoma from hysterosomal plate, hysterosomal plate with transversel and longitudinal striations constructed around area without striation between d1 and d3. Idiosomal chaetotaxy as in female.

Ventrum Fig 6 b: Intergument more sclerotized, covered with more tubercles around coxae II & III and many sites sclerotized between coxae II & III. Epimerae 1, 2, 3 and 4 like in female. Sexual organ limited by two sclerotized long folds and situated at the level of coxae III.Gènital suckers present, anus located immediately posterior to the sexual organ , anal and tarsal suckers absent.

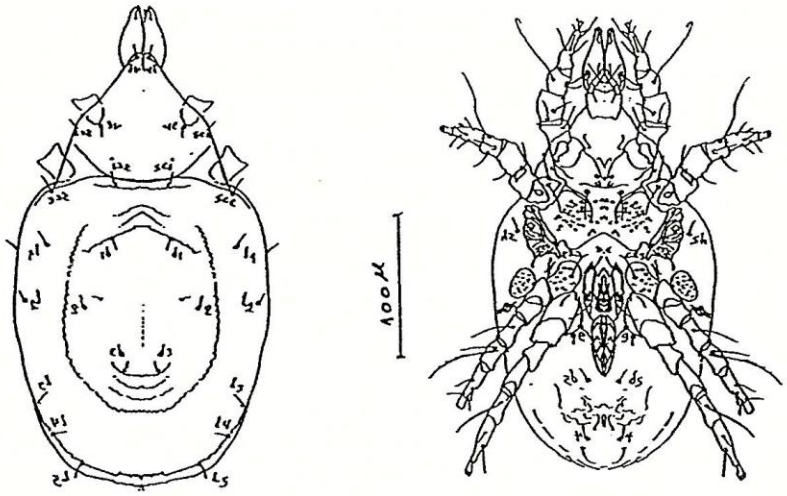
Two pairs of chitinized rings located between legs II & III these pits absent in female. All slenidia of tibia (phi) too long and found in chitinized scale.

Legs : like in female:



a) Dorsum b) Ventrum

Fig 5: Female



a) Dorsum b) Ventrum

Fig 6:male

B- Biological studies: -

Lomelaclacarus weryi Fain could feed on the dry particles of grains. Female deposits its eggs singly and randomly in holes or cracks and sometimes on its food, (Powder of dry fish, dry yeast, ground wheat and ground rice).

Larva passes through protonymph and tritonymph before reaching adult.

1- Moulting:

When full grown every moving immature stage enters into a quiescent stage where it ceases feeding and moving completely. Body swelles and enlarges causing the cuticle to be highly stretched and colour becomes light brown.Legs become shrinked and contracted under the body surface. The quiescent individual never response to any disturbance. Before moulting, the anterior part of the body becomes translucent and this area increases gradually, covering the whole body. The old skin ruptures from one side a long longitudinal line between dorsal and ventral surface, the hind legs appear form the old skin at first, then, the new developmental stage crawls backward coming out of the old exuvia. Newly emerged individual keeps quite beside its old skin for a short period then startes to move actively searching for its food after a period which lasted about 12 minutes,in this experiment.

2- Mating:

During copulation, the male takes a dorsposterior position with its end over the female dorsal end, then its aedeagus curves ventrally to be inserted in the female's posterior bursa copulatrix. The male tightly clasp the mid dorsum of female with legs I and II. Legs III clasp her ventral posterior. Leg IV loosely clasp the female like leg III.

The male body is at the same direction of the female body. The female was active, crawled about and fed, while the male was moveless. The process lasted about 2 hours. Both sexes accepted copulation immediately after emergence and more than once. No parthenogenesis was observed in this species.

3- Biological studies:

At 25ºC and 75% R.H. the incubation period lasted 7.0 days while at 30ºC it averaged 2.2, 2.5 , 2.6 & 2.9 days when rearing on powder of dry fish, dry yeast , ground wheat and rice respectively Table I.

Duration of total immature stages averaged 17, 23.4, 27.5, and 29.6 days at 25ºC on the aforementioned diets respectively and 9.3, 11.1, 13.8 and 16.4 days at 30ºC.

The previous data agreed with Shereef et al.,(1990 a&b) when reared *Blomia tropicalis* and *Chortoglyphus arcuatus* on dry yeast at 18,25 and30°C.

Adult female longevity was significantly affected by temperature and type of food. The shortest period of female longevity was 9.3, 10.3, 11.2 & 12.8 day at 30°C on dry fish , dry yeast, ground wheat and ground rice respectively while prolonged at 25°C to 15.4, 18.6, 21.7 & 24.1 days on the same diets respectively table 1.Thus the dry fish proved to be the most suitable diet where the duration of total immature stages and life spane, female longevity were the shortest period when mite species fed on it (Table 1). More over the fecundity of female was at its highest level (29.2 eggs) compared with other diets which resulted in less egg deposition (28.3, 26.3 and 24 eggs) when feeding on dry yeast, ground wheat and ground rice respectively at 25°C table 2. Similar results were obtained at 30°C as female deposited an average of 21.1 , 20.2 , 18.2 and 15.3 eggs when female fed on the four previously mentioned diets respectively Table 2.

The previous data agreed with Fawzy (1996) when reared *Glycyphagus ornatus,Lepidoglyphus destructor, Grammolichus aegyptieus sp.n.,Aeroglyphus robustus* and *Suidasia nesbitti* on differrent types of diets at 18&25°C.

Table 1. Duration of developmental stages of *Lommeloacarus weryi* Fain female when fed on different diets at 25°C & 30°C and 75 % R.H.

Developmental stage	Average period (in days)								L.S.D. at 5 %
	Powder of dry fish		Dry yeast		Ground wheat		Ground rice		
	25°C	30°C	25°C	30°C	25°C	30°C	25°C	30°C	
Egg	7.0±0.1	2.2±0.5	7.0±0.2	2.5±0.6	7.0±0.2	2.6±0.2	7.0±0.3	2.9±0.1	0.17 **
Larva	5.0±0.1	2.3±0.1	7.2±0.2	2.5±0.4	8.0±0.3	3.3±0.2	9.1±0.2	4.2±0.5	0.19 **
Q. larva	1.0±0.0	0.5±0.2	1.0±0.0	0.6±0.3	1.0±0.0	0.9±1.1	1.0±0.0	1.3±1.2	0.70 **
Protonymph	3.2±0.2	2.0±0.1	5.1±0.1	2.3±0.1	7.2±0.4	3.2±7.7	7.4±0.2	3.5±0.9	0.14 **
Q. protonymph	1.8±0.1	1.0±0.1	2.0±0.2	1.4±0.2	2.0±0.1	1.5±0.3	2.0±0.1	1.5±0.4	0.15 **
Tritonymph	4.1±0.1	2.1±0.1	6.1±0.3	2.8±0.3	7.3±0.2	3.2±0.5	8.1±0.1	4.2±0.5	0.41 **
Q. tritonymph	1.9±0.1	1.4±0.3	2.0±0.2	1.5±0.4	2.0±0.3	1.7±0.6	2.0±0.3	1.7±0.6	0.71 *
T. immatures	17.0±0.7	9.3±0.7	23.4±0.5	11.1±0.8	27.5±0.8	13.9±0.9	29.6±0.7	16.4±0.9	0.40 **
Life cycle	24.0±0.7	11.5±0.8	30.4±0.9	13.9±0.7	34.5±0.8	16.4±0.9	36.6±0.7	19.3±0.9	0.71 **
Longevity	15.4±0.3	9.3±0.6	18.6±0.4	10.3±0.7	21.7±0.3	11.2±0.8	24.1±0.4	12.8±0.8	0.33 **
Life span	39.4±0.6	20.8±1.36	49.0±0.5	23.5±1.21	55.2±0.5	27.6±1.11	60.7±0.5	32.1±1.3	1.60 **

* Significant
** Highly significant

Table 2. Effect of food types on *Lommeloacarus weryi* Fain female longevity and fecundity at 25°C & 30°C and 75 % R.H.

Diets	Average period in days ± S.D.								No. of eggs/female			
	Pre-oviposition		Oviposition		Post-oviposition		Longevity		Total average		Daily rate	
	25°C	30°C	25°C	30°C	25°C	30°C	25°C	30°C	25°C	30°C	25°C	30°C
Powder of dry fish	3.0±0.2	1.8±1.1	11.2±0.4	8.4±0.4	1.2±0.1	1.2±0.3	15.4±0.3	9.3±1.7	29.2±0.11	21.1±0.50	2.6±0.3	2.5±0.05
Dry wheat	4.1±0.1	1.9±2.1	12.3±0.4	11.6±1.2	2.2±0.3	1.7±0.2	18.6±0.4	10.3±0.7	28.3±0.50	20.2±0.33	2.3±0.2	1.74±0.11
Ground wheat	5.0±0.0	2.1±1.1	14.2±0.3	12.3±0.9	2.5±0.4	1.9±1.2	21.7±0.3	11.1±0.4	26.3±0.21	18.2±0.41	1.8±0.2	1.47±0.03
Ground rice	5.0±0.2	2.5±1.5	16.1±0.4	12.9±0.9	3.2±0.4	2.1±0.6	24.3±0.4	12.8±1.3	24.0±0.11	15.3±0.21	1.5±0.2	1.18±0.17
L.S.D. at 5 %	0.17		0.17		0.10		0.33		0.38		0.61	
Significance	---		---		---		---		---		***	

*** very highly significant

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دراسات بيولوجية ومورفولوجية على النوع الأكاروسى *Lomalacarus weryi* Fain من فصيلة Glycyphagidae (Astigmata-Acari)

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تم وصف وتسجيل النوع *lomelacarus weryi Fain* من فصيلة (Glycphagidea) تحت رتبة اكاروسات المواد المخزونة لأول مرة فى مصر على تراب المنازل فى المعتمدية بالجيزة وعلى روث الأبقار بالزهويين قليوبية مع تربية هذا النوع على درجتى حرارة ٢٥، ٣٠مْ وعلى بيئات مختلفة تشمل مسحوق السمك، الخميرة الجافة، مجروش الدقيق ومجروش الأرز.

وقد وجد أن فترة حضانة البيض على ٢٥مْ كانت٧ أيام لكل الأغذية السابقة بينما على ٣٠مْ انخفضت إلى متوسطات ٢,٦، ٢,٨، ٣,١ ، ٣,٥ يوما على الأغذية السابقة على الترتيب، وبالمثل تأثرت فترة تطور الفرد من البيضة حتى خروج الطور الكامل نتيجة نوعية الغذاء و درجة الحرارة حيث بلغ متوسطها على ٢٥مْ كانت ١٧، ٢٣,٤، ٢٧,٥، ٢٩,٦ يوما بينما على ٣٠مْ بلغت ٩,٣، ١١,١، ١٣,٨، ١٦,٤ يوما على الأغذية السابقةعلى الترتيب.

كما بلغت فترة حياة الأنثى على ٢٥مْ ١٥,٤، ١٨,٦، ٢١,٧، ٢٤,١ يوما،و على ٣٠مْ كانت ٩,٣، ١٠,٣، ١١,١،، ١٢,٨ يوما على الأغذية السابقة على الترتيب.

ومن هذا نتبين أن فترة حضانة البيض و فترة تطور الفرد وفترة حياة الأنثى استغرقت اقلهم وقتا على مسحوق السمك عن باقى الأغذية مما يؤكد أنه أفضل غذاء لهذا النوع.و بالرغم من طول فترة الحياه على درجة٢٥م عنها على درجة٣٠م إلا أن خصوبة الأنثى زادت على درجة ٢٥م حيث كان متوسط ما تضعه الأنثى من بيض هو ٢٤،٢٦,٣،٢٨,٣،٢٩,٢ بيضه ،بينما قل على درجة ٣٠م بمتوسط ٢١,١، ٢٠,٢، ١٨,٢، ١٥,٣ بيضة على الأغذية السابقة على الترتيب.

وهذه النتائج تدل على أفضلية مسحوق السمك عن باقي الأغذية و على تأثر الخصوبة للأنثى بدرجة حرارة التربية،فكانت الدرجة المثلى هى ٢٥م .

كذلك تم تسجيل العمليات البيولوجية من وضع بيض، انسلاخ، تلقيح، كما تم وصف ورسم أطوار هذا النوع الأكاروسى.