

MORPHOLOGY AND BIOLOGY OF *EUSEIUS METWALLYI* N. SP. (ACARI: GAMASIDA: PHYTOSEIIDAE)

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(Accepted Octobre 2000)

PHYTOSEIIDAE,
EUSEIUS METWALLYI N.SP.,
BEMISIA TABACI, EGYPT

SUMMARY: A detailed description of the different developmental stages of *Euseius metwallyi* n. sp. was done. The duration of the mite developmental stages, feeding capacity and fecundity were measured when fed crawlers of *Bemisia tabaci* at $27.1 \pm 0.21^\circ \text{C}$ and $80.2 \pm 1.4\% \text{ R.H.}$

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RÉSUMÉ : Description de l'adulte et des stases de *Euseius metwalli* n.sp. dont la durée de développement, la consommation et la fécondité sont mesurées sur *Bemisia tabaci* à $27.1 \pm 0.21^\circ \text{C}$ et $80.2 \pm 1.4\% \text{ R.H.}$

INTRODUCTION

The biological activities of mites of the family Phytoseiidae attracted attention of different authors engaged in describing and rearing several species of various parts of the world. In Egypt, morphological, taxonomical and biological researches on this family has been reported by EL-BADRY (1968); ZAHER & SHEHATA (1971); YOUSEF (1981); FOULY & EL-LAITHY (1992); NAWAR & EL-SHERIF (1993). The phytoseiid *Euseius metwallyi* n.sp. is commonly found in guava orchards at Zagazig district, Egypt. Its life span, feeding capacity, fecundity were evaluated under laboratory conditions.

MATERIAL AND METHODS

Individuals were collected from guava trees *Psidium guajava* L. at Zagazig district, Egypt. Adult females were transferred to rearing substrate and left

for 24 hours and the deposited eggs were used for the, biological studies. Leaflets of *Phaseolus vulgaris* L. were placed singly upside down on a layer of cottonwool placed in PETRI dishes 10 cm diameter each. Suitable moisture was maintained by adding few drops of water daily. Eggs were transferred singly to the rearing leaflets and the newly hatched larvae were supplied during the whole life span with sufficient known numbers of crawlers of *Bemisia tabaci* (Gen-nadius) obtained from infested castor bean *Ricinus communis* L. leaves. Replacement of the prey was carried out daily and records of development, reproduction and prey consumption were recorded twice a day. The experiments were carried out under laboratory conditions at $27.1 \pm 0.2^\circ \text{C}$ and $80.2 \pm 1.4\% \text{ R.H.}$. Eggs and postembryonic developmental stages were mounted in HOYER's medium to be identified according to concepts and publications of CHANT (1959, 1965), SCHUSTER & PRITCHARD (1963), MUMA & DENMARK (1970), YOSHIDA-SHAUL & CHANT

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(1995). All measurements are given in micrometers. The setal nomenclature follows that of CHANT & MCMURTRY (1994).

Morphology of *Euseius metwallyi* n. sp.

This species was named after Dr. SALAMA HUISEN METWALLY, late Professor of Agricultural Zoology, Plant protection Department, Faculty of Agriculture, Zagazig University Egypt.

DIAGNOSIS: This species is similar to *E. scutalis* (Athias-Henriot) El-Hady (1995), but differs in having setae s4, S4, S5, Z4 and Z5 arising on stout tubercles; setae s4 appearing to be the longest as it exceeds the length of setae Z5 which seems finely serrate. Three crescentic and two circular pores occurring on the dorsal shield. Anterior part of the peritreme approached the level between setae z2 and z4; posterior margin of epigynial shield much wider than the anterior edge of ventrianal shield; with a single pair of spindle shaped metapodal platelets; setae JV5 arising on a stout tubercles. Cheliceral fixed digit with 2 teeth and a *pilus dentilis*. Spermathecal cervix long, with a distal narrow portion, minor duct tiny.

FEMALE (FIG. 1, A-E): Body oval, with yellow whitish colour when alive. Dorsal shield 337 μm long and 189 μm wide, slightly sclerotized, faintly reticulate, with 17 pairs of simple smooth setae except Z5 which seems slightly serrate and 5 pairs of pores. Setae j1 33, j3 36, j4 21, j5 19, j6 37, z2 36, z4 48, z5 17, s4 66, J2 39, J5 9, ZI 29, S2 40, S4 21, S5 30, Z4 33 and Z5 58 μm . Sublateral setae r3 and R1 which occur on the interscutal membrane measuring 18 and 14 μm respectively. Each of setae s4, S4, S5, Z4 and Z5 arise on stout tubercles (FIG. 1, A). Ventrally (FIG. 1, C), sternal shield slightly longer than wide, it bearing 3 pairs of sternal and two pairs of lyriform pores. Metasternal platelets subtriangular in shape, each with a single seta (St4). A pair of slender metapodal platelets 26 μm long. Posterior margin of the epigynial shield much wider than the anterior margin of the ventrianal shield. Ventrianal shield much longer than wide, with a rather convex anterior margin, lateral margins moderately concave; bearing three pairs of preanal

setae and a pair of crescentic shaped pores. Four pairs of setae surrounding ventrianal shield, with setae JV5 on stout tubercles. Peritreme and peritremal shield extending forward approaching the mid-distance between setae z2 and z4. Cheliceral fixed digit with 2 teeth and a *pilus dentilis*, movable digit with a single distinct tooth (FIG. 1, B). Spermathecal cervix long (30 μm), with a distal narrow portion, minor duct tiny (FIG. 1, D).

Legs with chaetotaxic formulae of femora, genua and tibiae as follows (FIG. 1, E, I-IV): 12-10-6-6, 10-7-7-6 + one macroseta of 55 μm , 10-7-7-5 + one macroseta of 44 μm , in addition to another macroseta on basitarsus IV of 70 μm .

MALE (FIG. 1, F & G): Smaller than female, with a dorsal shield 249 μm long and 163 μm wide. Sternogenital shield smooth 128 μm long and 64 wide, bearing 5 pairs of short simple setae and two pairs of circular pores, genital aperture bulb shaped located near the anterior margin of the sternogenital shield. Ventrianal shield triangular, 132 μm long and 94 μm wide, with 3 pairs of simple setae and a pair of crescentic pore (FIG. 1, F). Spermatodactyl with a nearly triangular shank and short foot. Cheliceral fixed digit with two distinct teeth and a *pilus dentilis*, movable digit with a single tooth (FIG. 1, G).

EGG (FIG. 2, A): The newly deposited egg is oval, 205 μm long and 162 wide translucent white. The egg shell is ornamented with irregular striae which almost meet with each other.

LARVA (FIG. 2, B - E): The newly emerged larva whitish. Dorsal shield distinct, divided into an anterior podonotal and a posterior opisthonotal region. Podonotal shield nearly elliptical, smooth, 126 μm long and broadest width of 139 μm ; with 9 pairs of setae; s4 59 μm arising on stout tubercles (FIG. 2, B). Setae j1, j3, j4, j5, j6, z2, z4 and z5 measuring 12, 11, 7, 8, 26, 12, 18 and 7 μm respectively. Opisthonotal shield nearly subconical, smooth, 52 μm long and 139 μm wide, bearing only the whip-like setae Z4 which is 177 μm long and arises on stout tubercles.

Idiosomal venter smooth, bearing 8 pairs of setae in addition to the postanal seta (FIG. 2, D). Setae St1, St2, St3, Jv1, Jv2, Jv5, S5, para and post-anal setae

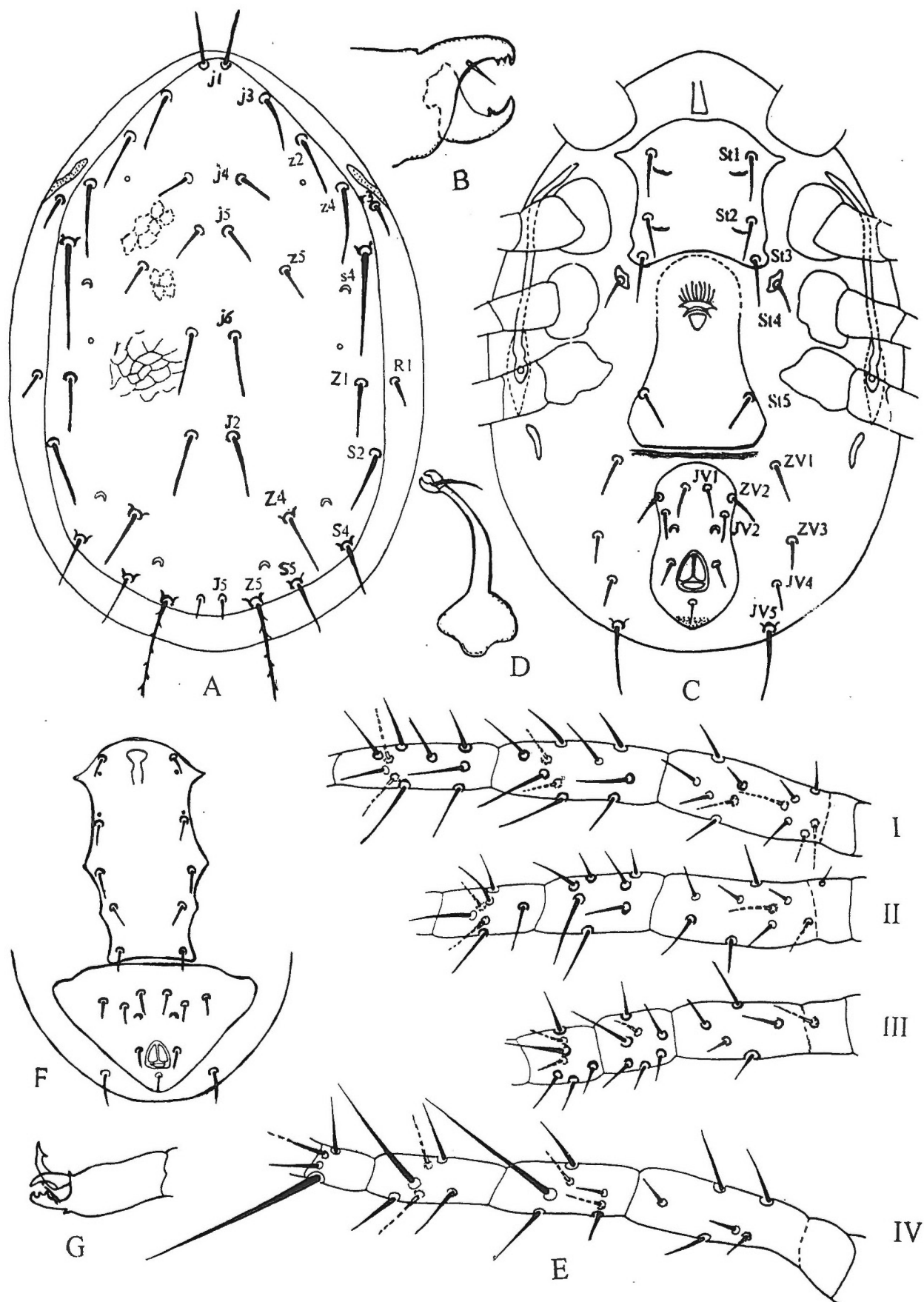


FIG. 1. — *Euseius metwalyi* n.sp. — Female : A. —Dorsal shield .B. — Chelicera. C— Ventral view. D. —Spermatheca. E. — Legs I, II, III, IV: Femur, genu, tibia and basitarsus of leg IV. Male : F. — Sternogenital and enrianal shields. G. Spermodactyle.

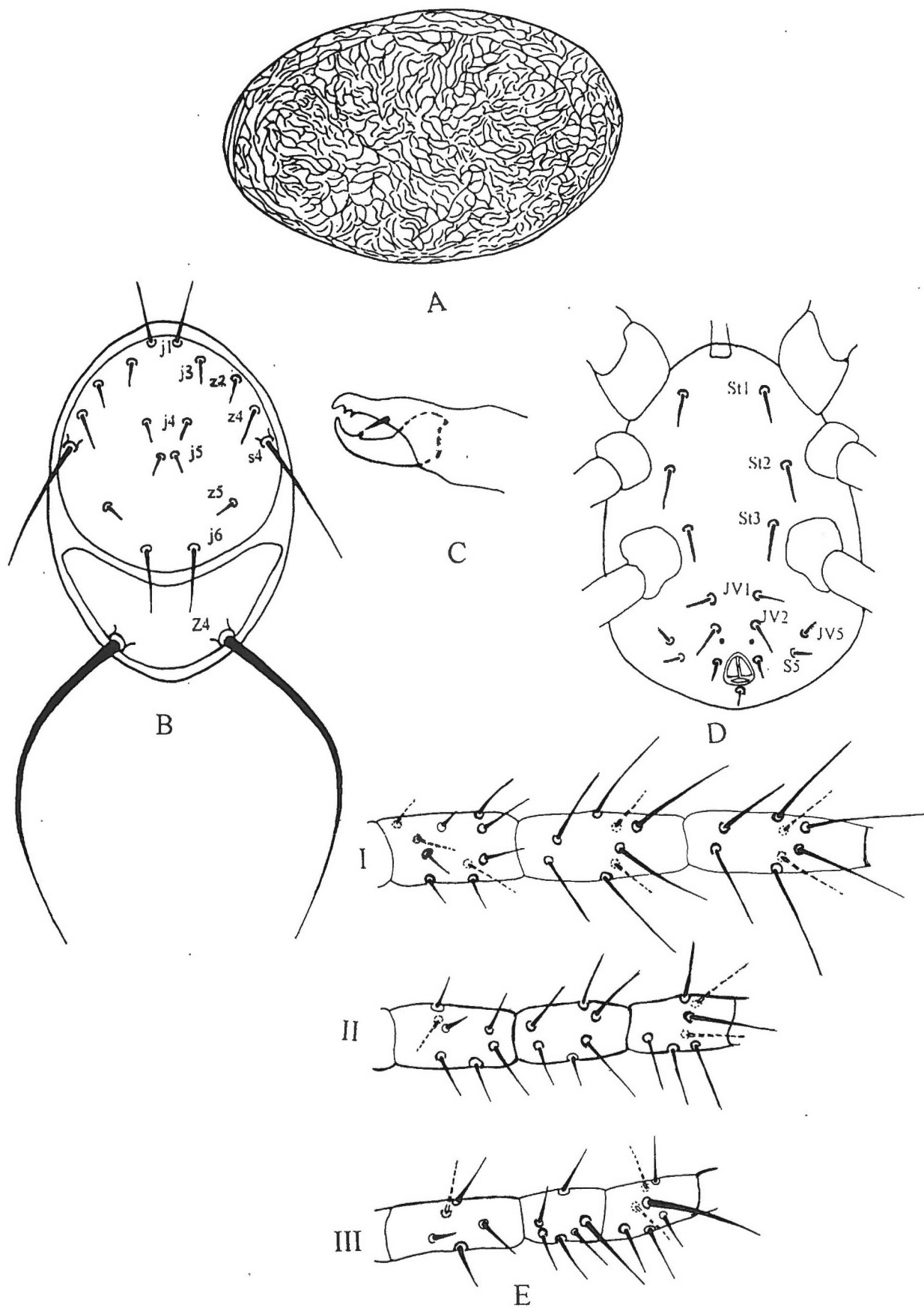


FIG. 2. — *Euseius metwalyi* n.sp. — A. —egg, B— Larva. C— Chelicera. D. — Ventral view. E. — Femur, genu & tibia (legs III)..

measuring 18, 20, 21, 9, 18, 7, 9, 9, and 8 μm , respectively. A pair of small circular pores located behind setae JV2. Cheliceral fixed digit with two rather distinct teeth and a *pilus dentilis*; movable digit with a minute tooth (FIG. 2, C).

Legs chaetotaxic formulae of femora, genua and tibiae as follows (FIG. 2, 1-111) 10-7-5, 8-6-5 + one macroseta of 29 μm , 8-7-6 + one macroseta of 39 μm .

PROTONYMPH (FIG. 3, A - D): Protonymph white yellowish. Dorsal shield, smooth, 216 μm long, and 156 μm wide, bearing 3 pairs of pores. Nine pairs of setae and a pair of circular pores, occurring on the pronotal region; while 8 pairs of setae in addition to a pair of circular and another crescentic pores located on the opisthotal area. Setae j1, j3, j4, j5, j6, z2, z4, z5, s4, J2, J5, Z1, S2, S4, S5, Z4 and Z5 measuring 22, 20, 13, 12, 18, 21, 32, 10, 70, 20, 7, 105, 225, 15, 185 and 21 μm respectively. Setae s4 arise on stout tubercles. Setae S4, S5, Z4 and Z5 arising on distinct tubercles, Z5 seems to be finely serrate (FIG. 3, A). Both setae r3 and R1 first appear during this stage and measure 14 and 12 μm respectively.

Venter of the body is smooth, bearing 8 pairs of setae of which 3 pairs occurring in the podonotal area and 5 pairs on the opisthosomal region (FIG. 3, C). Setae ST1, ST2, ST3, JV1, JV2, ZV2, JV5, para and post-anal measuring 17, 18, 195, 185, 16, 14, 205, 7 and μm long respectively. A pair of small circular pores behind JV2. Stigmata, peritreme and peritremal shield arise during the protonymphal stage; the latter two elements do not surpass coxae III. Cheliceral fixed digit with two distinct teeth and a *pilus dentilis*, movable digit with one tooth (FIG. 3, B).

Legs chaetotaxic formulae of femora, genua and tibiae as follows (FIG. 3, D, I-IV): 10-7-5-4, 8-6-6-4 + one macroseta of 41 μm , 8-7-7-5 + one macroseta of 33 μm . In addition to another macroseta on basitarsus IV measuring 50 μm .

DEUTONYMPH (FIG. 4, A-D): The deutonymph is white yellowish, darker than protonymph. Dorsal shield smooth 239 μm long and 166 μm wide, with seventeen pairs of setae and 5 pairs of pores, of which 9 pairs of setae and 2 pairs of circular pores on the podonotal area and 8 pairs of setae and 3 pairs of pores (Two pairs of pores are circular and one is

crescentic) on the opisthotal region. Setae j 1, j 3, j 4, j 5, j 6, z2, z4, s4, z5, J2, J5, Z 1, S2, S4, S5, Z4 and Z5 measuring 30, 33, 12, 10, 21, 29, 40, 55, 10, 26, 6, 19, 28, 21, 25, 26 and 50 μm respectively. Setae r3 and R1, 18 and 15 μm respectively. Setae s4, S4, S5, Z4 and Z5 arise on distinct tubercles; Z5 seems finely serrate (FIG. 4, A).

Ventrally (FIG. 4, C), the body seems 'smooth and bears 13 pairs of setae in addition to post-anal seta. The podonotal chaetotaxy comprise setae ST1, ST2, ST3, ST4, and ST5 which measuring 19, 19, 18, 18, and 19 μm respectively. The opisthosomal setae, JV1, JV2, ZV1, ZV2, ZV3, JV4, JV5, para and post-anal measuring 18, 17, 16, 12, 11, 6, 31, 9 and 7 μm respectively. One circular pair of pores lie mesod-posteriorly to JV2. Peritreme and peritremal shield extending forwardly to level between setae z2 and z4 (FIG. 4, A). Cheliceral fixed digit with two teeth and a *pilus dentilis*, movable digit with a single tooth (FIG. 4, B).

Legs chaetotaxic formulae of femora, genua and tibiae as follows (FIG. 4, D, I-IV): 12-10-6-6, 10-7-7-6 + one macroseta of 53 μm , 10-7-7-5 + one macroseta of 40 μm , in addition to another macroseta on basitarsus IV measuring 60 μm .

TYPE MATERIAL: Holotype : A female was collected from Guava trees *Psidium guajava* L. associated with sweetpotato whitefly *B. tabaci* at Zagazig district, Sharkia Governorate, Egypt at 15 September 1997. One egg, one individual of larva, protonymph and deutonymph were mounted from the rearing culture in laboratory, Faculty of Agriculture at Zagazig University, Egypt.

Paratypes : Four females, 3 males, 4 eggs, 3 larvae, 4 protonymphs and 3 deutonymphs were collected with the same data and date of holotype.

Allotype : A male was collected with the same data.

All of the types were kept in the collection of Plant Protection Department, Faculty of Agriculture, Zagazig University, Egypt.

Biology of *Euseius metwallyi* n. sp.

Rearing of *E. metwallyi* on crawlers of the sweetpotato whitefly *B. tabaci* (Gennadius) under laboratory conditions at $27.08 \pm 0.2^\circ\text{C}$ and

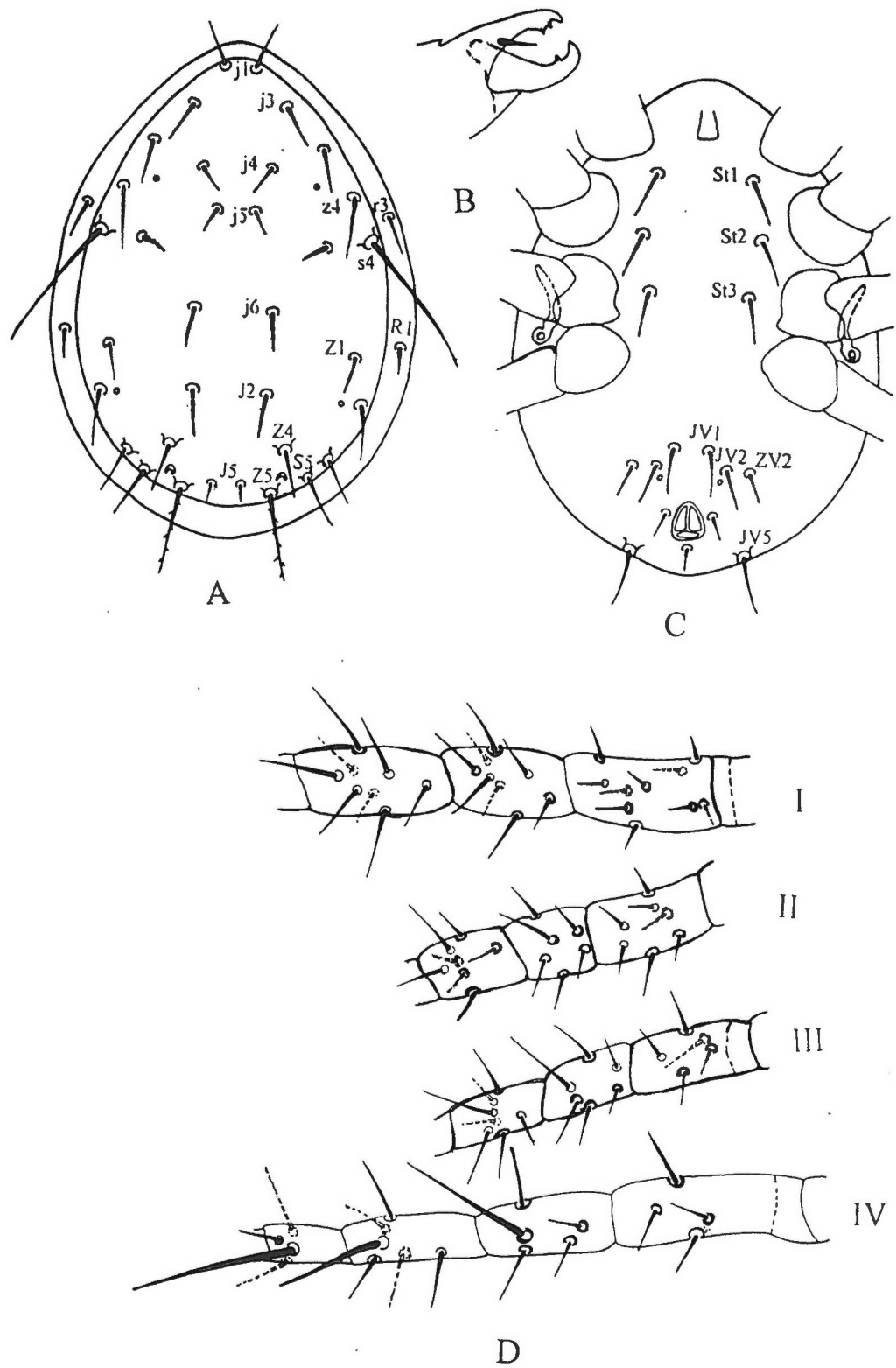


FIG. 3. — *Euseius metwalyi* n.sp., Protonymph. — A. — Dorsal view. B. — Chelicera. C. — Ventral view. D. — Legs I, II, III, IV.

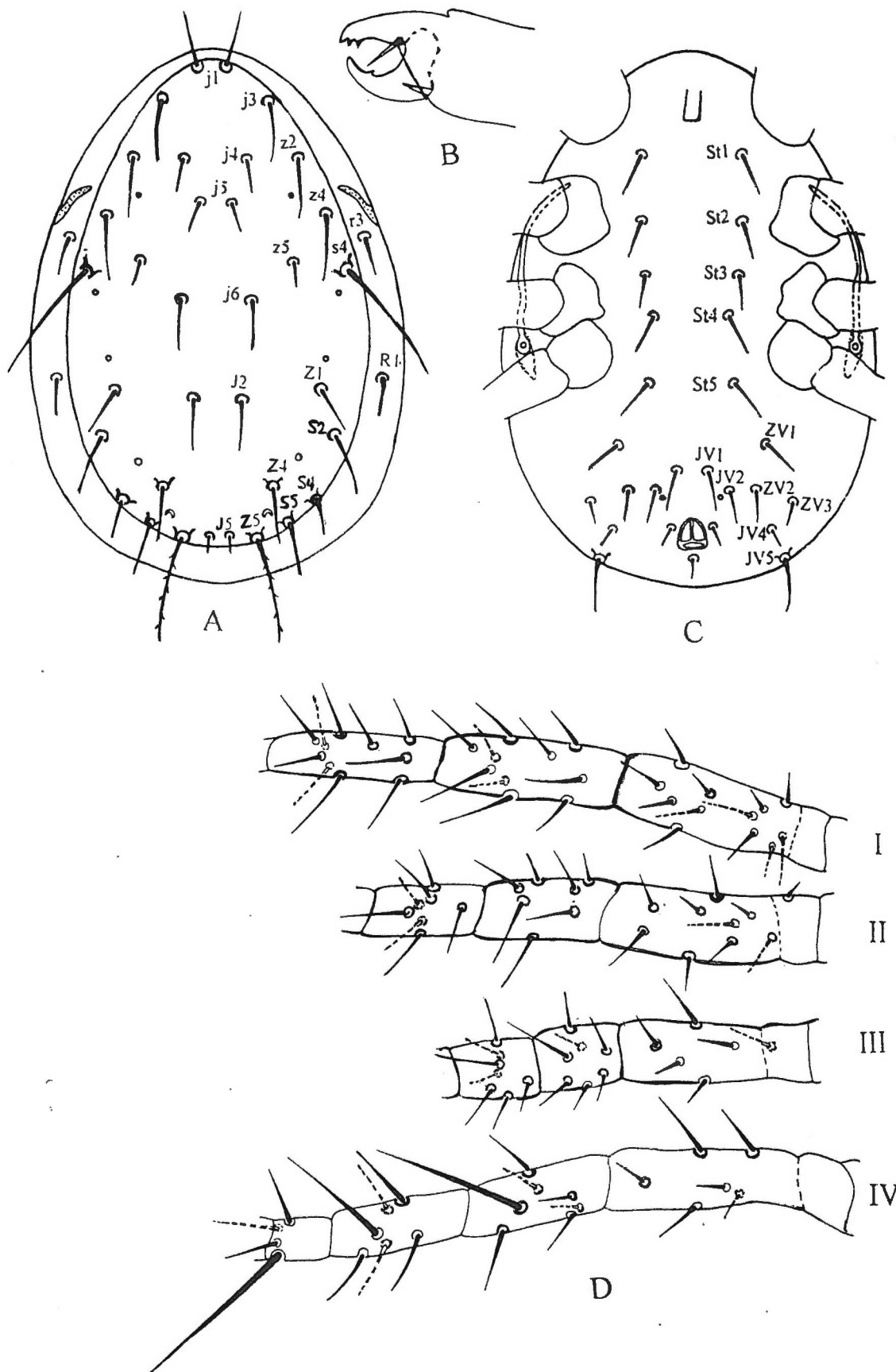


FIG 4. — *Euseius metwalyi* n.sp., Deutonymph. — A. — Dorsal view. B. — Chelicera. C. — Ventral view. D. — Legs I-IV Femur, genu and tibia (I-IV) and basitarsus leg IV.

IMMATURES	Incubation period	Larvae	Protonymphs	Deutonymphs	Duration of immatures stages
Female	1.93 ± 0.06	1.45 ± 0.04	1.64 ± 0.03	2.32 ± 0.03	7.34 ± 0.08
Male	1.28 ± 0.03	0.99 ± 0.23	1.30 ± 0.03	1.91 ± 0.05	5.48 ± 0.06
ADULTS	Pre oviposition period	Oviposition Period	Post oviposition period	Adult longevity	Life span
Female	1.72 ± 0.09	13.40 ± 0.30	2.83 ± 0.34	17.95 ± 0.25	25.30 ± 0.28
Male				8.24 ± 0	13.72 ± 0.28

TABLE 1: Durations of *Euseius metwallyi* n.sp. when fed on crawlers of *Bemisia tabaci* at 27.08 ± 0.21° C and 80.20 ± 1.41% R.H.

	Average number of preys consumed					
TOTAL AVERAGE	Larva	Protonymph	Deutonymph	Immature stages	Adult	Life span
Female	0.00	13.26 ± 0.00	23.00 ± 0.72	69.85 ± 2.63	280.02 ± 9.38	322.95 ± 10.20
Male	0.00	9.33 ± 0.36	16.02 ± 0.92	43.91 ± 1.04	126.10 ± 6.37	159.38 ± 4.90
DAILY MEAN	Larva	Protonymph	Deutonymph	Immature stages	Adult	Life span
Female	0.00	9.80 ± 0.56	12.10 ± 0.46	10.95 ± 0.33	15.70 ± 0.32	13.33 ± 0.25
Male	0.00	8.50 ± 0.32	10.20 ± 0.37	9.35 ± 0.19	15.50 ± 0.43	12.43 ± 0.18

TABLE 2. Efficiency of *Euseius metwallyi* n.sp. in attacking crawlers of *Bemisia tabaci* at 27.08 ± 0.21° C. and 80.20 ± 1.41% R.H.

80.20 ± 1.4% R.H., the egg period, larval, protonymphal, deutonymphal stages averaged 1.93 ± 0.06 & 1.28 ± 0.03, 1.45 ± 0.04 & 0.99 ± 0.23, 1.64 ± 0.03 & 1.30 ± 0.03, 2.32 ± 0.03 & 1.91 ± 0.05 days for female and male respectively (TABLE 1). The development from eggs to adults lasted for an average 7.34 ± 0.08 (=females) & 5.48 ± 0.06 days (=males) (TABLE 1). The adult periods averaged 1.72 ± 0.09 (=females) and 9.06 ± 0.11 days (=males). These results agree with the data from *Amblyseius swirskii* (Athias-Henriot) reared on crawlers of *B. tabaci* (IBRAHIM, 1993). The adult female and male lived for an average of 17.95 ± 0.25 and 8.24 ± 0.28 days respectively (TABLE 1). Similar results were obtained by NAWAR & EL-SHERIF (1993) when they reared *Neoseilus cucumeris* (Oudemans) on the eggs, first and second instar larvae of *B. tabaci*. The adult female continued ovipositing eggs for a period averaging 13.4 ± 0.30 days and laid a total average and a daily mean of 14.00 ± 0.33 and 1.05 ± 0.04 eggs respectively, the results agree with IBRAHIM (1993), but differ in the great number of eggs laid by female. The oviposition period agree with NAWAR & EL-SHERIF (1993).

MEYERDIRK & COUDRIET (1986) showed that the oviposition period of *E. scutalis* did not extend beyond 16.6 days. The female and male life span lasted for an average 25.30 ± 0.08 and 13.72 ± 0.28 days respectively (TABLE 1).

Efficiency of *Euseius metwallyi* n. sp. in attacking crawlers of *B. tabaci*

The larval stage of both sexes did not feed on any of introduced preys. The predator protonymphal, deutonymphal and immature stages of female and male attacked 13.26 ± 0.56 & 9.33 ± 0.36, 23.00 ± 0.72 & 16.02 ± 0.92 and 69.85 ± 2.63 & 43.91 ± 1.04 prey individuals respectively (TABLE 2).

During the pre-oviposition, oviposition, post-oviposition periods and adult longevity, the female consumed 23.86 ± 1.51, 249.20 ± 9.03, 48.57 ± 4.49 and 280.02 ± 9.38 prey individuals respectively. Food consumption during the pre-oviposition period nearly agree with results obtained by IBRAHIM (1993). The adult male attacked 126.10 ± 6.37 preys (TABLE 2). GAMEEL (1971) found that the predators *Ambly-*

seius aleyrodis and *Typhlodromus sudanicus* consumed 10.4 and 6.72 larvae of *B. tabaci* per day. During the life span, the predator female and male attacked an average of 322.95 ± 10.20 and 159.38 ± 4.90 prey individuals respectively (TABLE 2).

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