

MORPHOLOGICAL STUDIES ON THE PREDATORY MITE *PHYTOSEIUS KASSASINI* BASHA & YOUSEF (ACARI: PHYTOSEIIDAE)

Basha, A. E.

Plant Protection Dept., Fac. Agric., Zagazig Univ., Zagazig, Egypt.

Accepted 14/1/2008

ABSTRACT: The egg, larva, protonymph, deutonymph and adult male of the predatory mite, *Phytoseius kassasini* Basha & Yousef (Acari: Phytoseiidae) are described and illustrated for the first time. The ontogenetic development of idiosomal chaetotaxy of this species is also given.

Key words: Phytoseiidae, *Phytoseius kassasini*, morphology.

INTRODUCTION

The genus *Phytoseius* Ribaga contains most of the described species of the subfamily Phytoseiinae Berlese and has a cosmopolitan distribution. In Egypt, a number of new species and new records of this genus have been reported (El-Badry, 1967; Shehata, 1973; Nassar & Kandeel, 1987 and Basha & Youssef, 1999). Mostafa, (2004) reported that, the phytoseiid mite species *Phytoseius kassasini* Basha & Yousef was found in high numbers associated with various arthropod pests attacking vegetative parts of eggplant, *Solanum melongena* L. and fig trees, *Ficus carica* L. in Zagazig district, Sharkia Governorate, Egypt. Little has been published on the immature stages of the described species. Therefore, the

present work aimed to introduce a detailed description for the life stages of the phytoseiid mite *P. kassasini* except adult female, that described previously by Basha and Yousef (1999) to clarify the expected changes of the morphological characters of this species during its ontogeny.

MATERIALS AND METHODS

All stages of *Phytoseius kassasini* were collected from laboratory cultures initiated on eggplant leaves, which were infested with the two-spotted spider mite, *Tetranychus urticae* Koch. These stages except egg were placed separately in Nesbitt clearing agent, then each was mounted singly in Hoyer's medium and well dried. The slides after drying were ringed with Canada

balsam and all stages were examined and drawn using research microscope with the help of drawing eye piece and the details were completed using an oil immersion objective. The setal nomenclature follows that of Chant (1958); Lindquist & Evans (1965); Denmark (1966) and Chant & McMurtry (1994) as used for the genus *Phytoseius*. All measurements are given in microns (μ). Three specimens were used.

RESULTS AND DISCUSSION

The life stages of *Phytoseius kassasini* include egg, larva, protonymph, deutonymph and adults of both female and male. All stages occur on the leaves among the prey.

EGG (Fig.1,A) Oval, translucent when newly deposited, then changed to pale white before hatching, measuring 195 μ long and 126 μ wide; egg shell ornamented with irregular striae which almost meet with each others.

LARVA (Fig.1,B-E)- Newly emerged larva whitish; dorsum with two weakly sclerotized shields. Podonotal shield smooth, 121 μ long and broadest width of 112 μ , with 9 pairs of simple setae, of which setae s4 arising on distinct tubercles (Fig.1,B). Setae

j1, j3, j4, j5, j6, z2, z4, z5 and s4 measuring 10, 16, 6, 6, 7, 6, 27, 7 and 54 μ , respectively. Opisthontal shield nearly subconical, smooth 41 μ long and 108 μ wide, with only the whip-like seta Z4, 71 μ long and arises on distinct tubercles.

Venter (Fig.1,D) Shields absent. Sternogenital region with 3 pairs of subequal setae ST1, ST2 and ST3 measuring 18, 20 and 18 μ respectively. Four pairs of opisthogastric setae, JV1, JV2, JV5 and ZV2 on the membrane around the anal shield in front of the two pairs of venterolaterally displaced opisthontal setae and measuring 10, 9.9 and 9 μ respectively. Stigmata and peritremes are absent. Cheliceral fixed digit with two minute teeth and a pilus dentitis, movable digit with one tooth (Fig.1,C). Legs with chaetotaxic formula of femora, genua and tibiae of legs I, II and III, respectively as follows: 10-7-5, 8-6-6 and 8-7-7 (Fig. 1, D, I-III).

PROTONYMPH (Fig. 2,A-D)- Body white yellowish. Dorsal shield smooth, 193 μ long and 132 μ wide. Fifteen pairs of serrate setae, including the anterior sublateral seta r3 on the dorsal shield, of which setae s4, s6, Z4 and Z5 on distinct tubercles. A pair of elongate oval pores and a rather circular one located on the dorsal shield (Fig. 2, A). Sctal

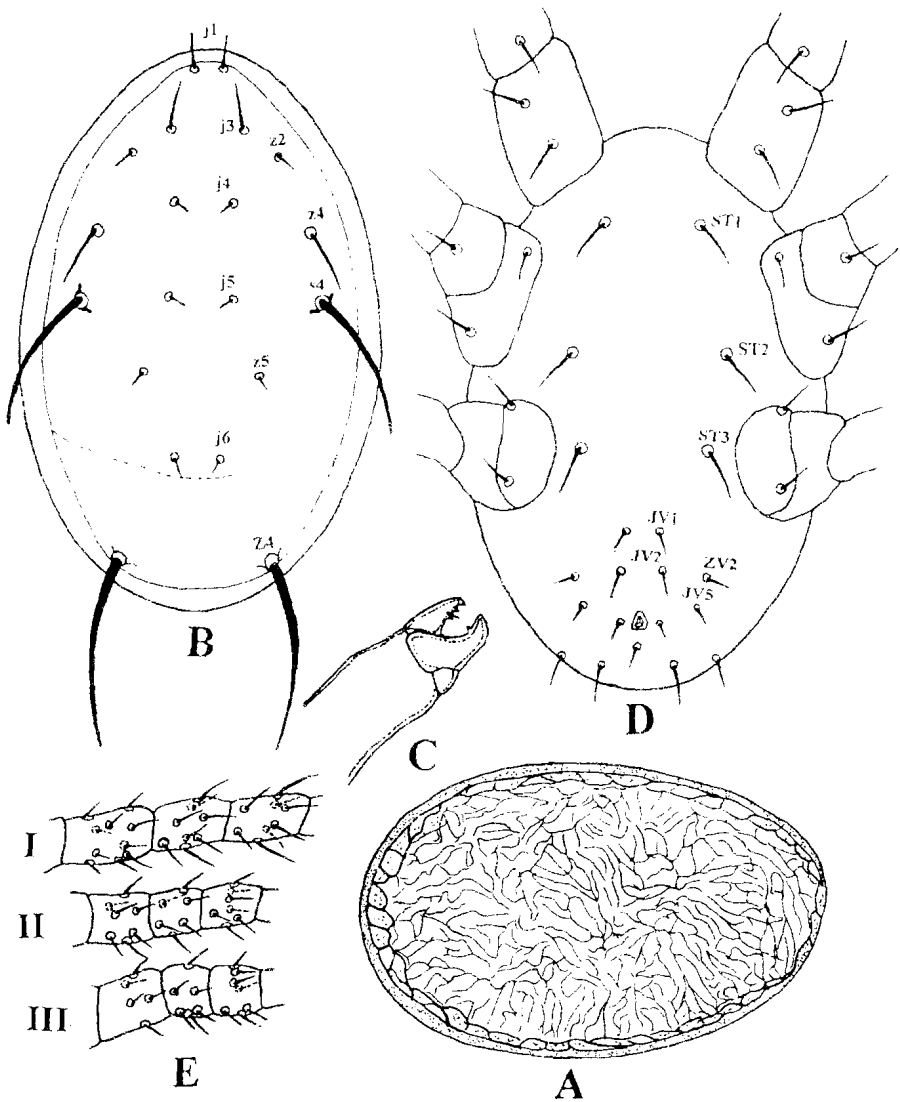


Fig. 1. *Phytoseius kassasini* Basha & Yousef. A. egg, B. larva dorsum, C. chelicera, D. larva ventrum, E. femora, genua, tibiae of legs I – III, respectively.

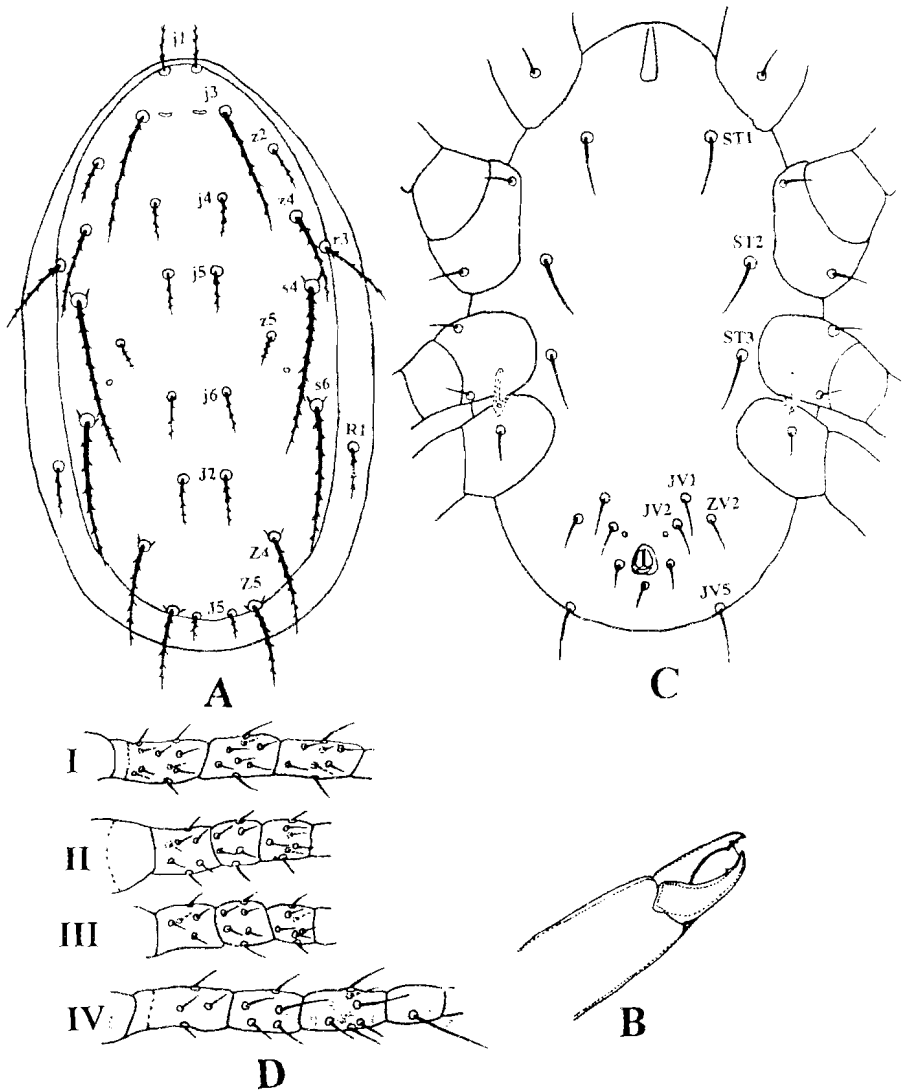


Fig. 2. *Phytoseius kassasini* Basha & Yousef, protonymph A. dorsal view, B. chelicera, C. ventral view, D. femora, genua, tibiae of legs I-IV, respectively and basitarsus IV.

measurements $J_1=16$, $j_3=45$, $j_4=13$, $j_5=15$, $j_6=13$, $J_2=16$, $J_5=10$, $z_2=18$, $z_4=29$, $z_5=14$, $Z_4=39$, $Z_5=30$, $s_4=58$, $s_6=53$ and $r_3=30\mu$. Posterior sublateral seta R1 on lateral integument of 19μ .

Venter -Smooth, bearing 7 pairs of setae, of which 3 pairs in the podonotal area and 4 pairs in addition to a pair of para-anals and a single postanal seta on the opisthosomal region (Fig.2,C). Setae ST1, ST2, ST3, JV1, JV2, JV5, ZV2, para-anal and postanal setae measuring 22, 21, 20, 14, 13, 19, 13, 12 and 10μ , respectively. A pair of minute circular pores located posteromedial to seta JV2. Stigmata, peritreme and peritremal shield arise during the protonymphal stage, the latter element short and do not surpass cox III. Cheliceral fixed digit with two distinct teeth and a pilus dentilis, movable digit with one tooth (Fig.2, B). Legs chaetotaxical formulae of femora, genua and tibiae of legs I-IV as follows (Fig. 2,D, I-IV) 10-7-5-4, 8-6-6-5 and 8-7-7-6. A moderately long macroseta (30μ) on basitarsus IV.

DEUTONYMPH (Fig.3,A-D) Similar to protonymph except in being larger in size and having a dark yellowish colour. Dorsal shield smooth, measuring 225μ long and 136μ wide and bearing

16 pairs of simple serrate setae, of which setae j_3 , z_3 , s_4 , s_6 , Z_4 and Z_5 arising on distinct tubercles. A pair of elongate oval pores and 2 pairs of rather circular ones situated on the dorsal shield (Fig.3,A). Setal measurements; $j_1=22$; $j_3=57$; $j_4=18$; $j_5=16$; $j_6=19$ $J_2=22$; $J_5=12$; $z_2=19$; $z_3=39$; $z_4=22$; $z_5=16$; $Z_4=52$; $Z_5=48$; $s_4=69$; $s_6=75$; $r_3=45$ and $R_1=25\mu$. Peritreme more developed and extending forwardly to setae z_3 (Fig.3,A).

Venter -Smooth, with 11 pairs of setae in addition to para-anals and a single postanal seta (Fig. 3,C). Ventral setae ST1, ST2, ST3, ST4, ST5, JV1, JV2, ZV1, ZV2, ZV3, para-anal and postanal setae measuring 25, 24, 23, 20, 18, 18, 17, 18, 18, 14, 13, and 12μ , respectively. A pair of small circular pores occurred posteromedial to JV2. Seta JV5 serrate, on distinct tubercles and seemed to be the longest ventral setae (38μ). Cheliceral fixed digit with two distinct teeth and a pilus dentilis, while movable one with one tooth (Fig. 3, B). Chaetotaxical formulae of femora, genua and tibiae of legs I-IV as follows: 12-10-6-6, 10-7-6-7 and 10-7-7-6. Basitarsus IV with a moderately long macroseta of 35μ (Fig.3, D, I-IV).

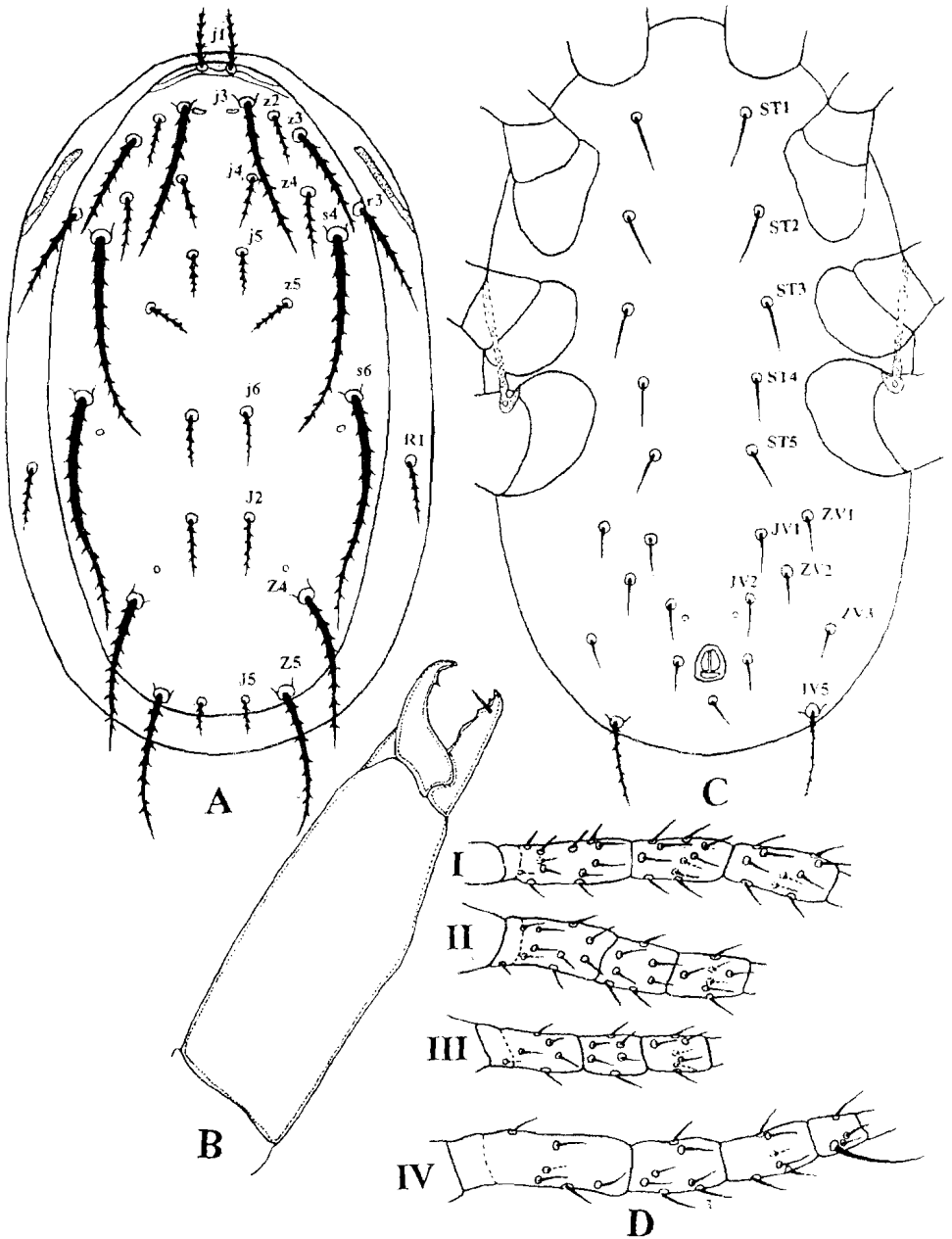


Fig.3. *Phytoseius kassasini* Basha & Yousef, deutonymph. A. dorsal view, B. chelicera, C.ventral view, D. femora, genua, tibiae of legs I-IV, respectively and basitarsus IV.

MALE (Fig. 4, A -D). Body elongate oval and whitish. Dorsal shield of 228μ long and 122μ wide, with some scattered elongate faint patches and 17 pairs of serrate setae, including the anterior and posterior sublateral setae (r3 and R1). Setae s4, s6, Z4 and Z5 on distinct tubercles. Eight pairs of minute circular pores in addition to an oval pair occurred on the dorsal shield. Setal measurements: j1= 22; j3= 45; j4=j5= j6=j2= 19; J5=9; z2=19; z3=29; z4=26; z5=18; Z4=35; Z5=41; s4=58; s6=68; r3=31 and R1=19 μ . Anterior end of peritremal shield reaches the level of setae z3 (Fig. 4, A).

Venter-Sternogenital shield smooth, 110μ long and 54μ wide and with 5 pairs of setae. ST1, ST2, ST3, ST4 and ST5, nearly subequal in length (19 - 21 μ). Genital aperture located near the anterior margin of the sternogenital shield (Fig.3,C). Ventrianal shield subtriangular, 80μ long and 97μ wide slightly striated; with 3 pairs of subequal pre- anal setae JV1, JV2 and ZV2 (16-17 μ). A pair of minute circular pores located posteromedial to JV2. Seta JV5 serrate and arising on distinct tubercles of 30μ . Spermatolactyl with a long shank, short foot and

knobbed toe (Fig.4,B). Cheliceral fixed digit with three distinct teeth and a pilus dentilis, movable digit with a single tooth (Fig.4,B). Legs with chaetotaxic formulae of femora, genua and tibiae as follows (Fig. 4, D, I-IV) 12- 10-6-6, 10-7-6-7 and 10-7-7-6. A moderately long macrosetae (30 μ) on basitarsus of leg IV.

Ontogenetic development of *P. kassasini* idiosomal chaetotaxy

The dorsal and ventral chaetotaxy of the idiosoma of all stages is given in Table 1. In accordance with the findings of other studies on phytoseiids (Prasad, 1973; Yousef, 1981; Fouly and El-Laithy, 1992; Papadoulis and Emmanouel 1993); the dorsal and ventral idiosomal chaetotaxy in *P. kassasini* is complete in the deutonymphal stage. During the molt to protonymph, setae J2, J5, Z5, s6, r3 and R1 are added; seta JV5 is posteriorly displaced. During the molt to deutonymph, seta z3 is added. Metasternal seta ST4 and genital seta ST5 are added in the sternogenital region. The ventral setae ZV1 and ZV3 are added in the opisthogastric region. Setae JV5 is completely displaced posteriorly. During the molt to adult no setae are added.

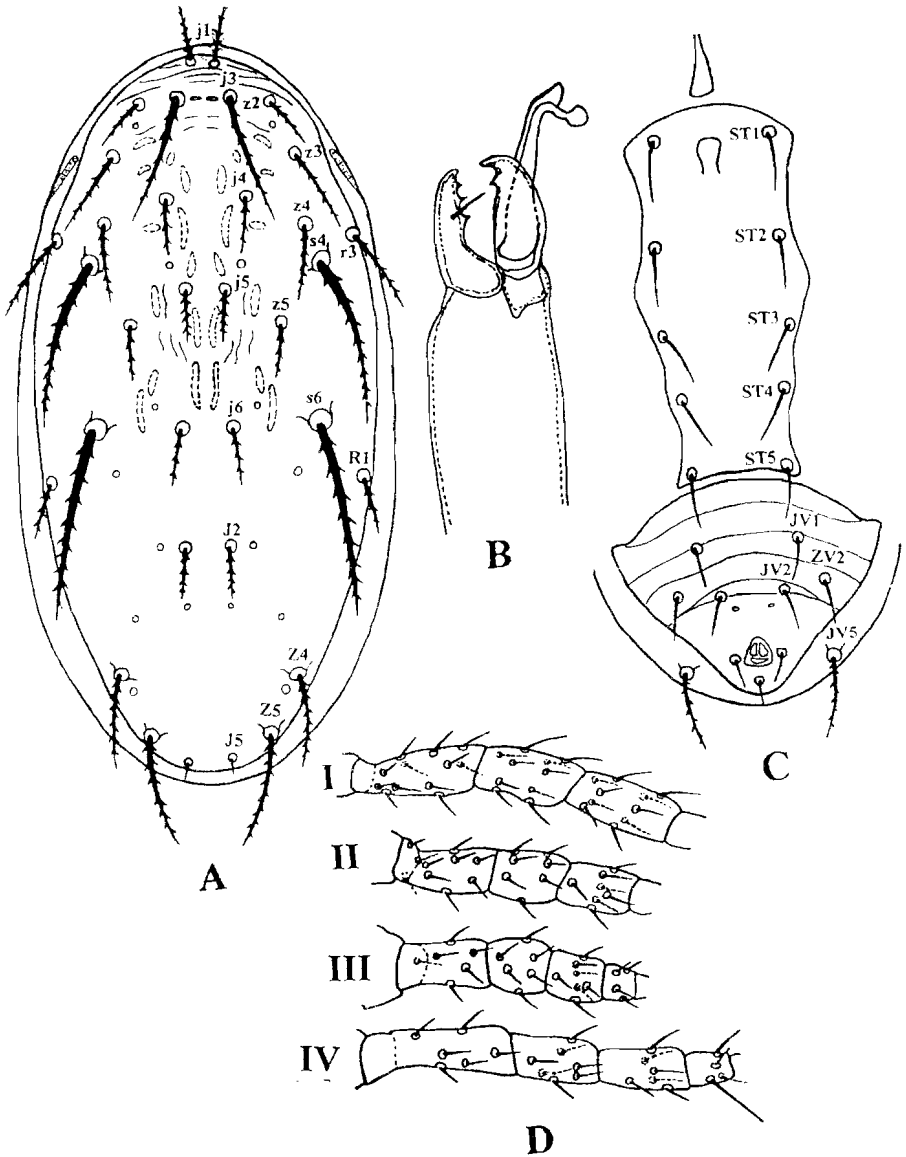


Fig. 4. *Phytoseius kassasini* Basha & Yousef, male, A. dorsal view, B. spermatodactyl, C. sternogenital and ventrianal shields, D. femora, genua, tibiae of legs I-IV, respectively and basitarsus IV.

Table 1. Ontogenetic development of the idosomal chaetotaxy of *Phytoseius kassasini* Basha & Yousef

Stage	Dorsum				Ventrum	
	Central setae	Mediolateral setae	Lateral setae	Marginal setae	Sternogenital setae	Opisthogastic setae
Larva	j1,j3,j4,j5,j6	z2,z4,z5,Z4	s4	-	ST1,ST2,ST3	JV1,JV2,JV5,ZV2
Protonymph	j1,j3,j4,j5,j6, J2, J5	z2,z4,z5,Z4, Z5	s4,s6	r3,R1	ST1,ST2,ST3	JV1,JV2,JV5,ZV2
Deutonymph	j1,j3,j4,j5,j6, J2, J5	z2,z3,z4,z5,Z4, Z5	s4,s6	r3,R1	ST1,ST2,ST3, ST4,ST5	JV1,JV2,JV5,ZV1,ZV2, ZV3
Male	j1,j3,j4,j5,j6, J2, J5	z2,z3, z4,z5,Z4, Z5	s4,s6	r3,R1	ST1,ST2,ST3, ST4,ST5	JV1,JV2,JV5,ZV1,ZV2, ZV3
Female	j1,j3,j4,j5,j6, J2, J5	z2, z3,z4,z5,Z4, Z5	s4,s6	r3,R1	ST1,ST2,ST3, ST4,ST5	JV1,JV2,JV5,ZV1,ZV2, ZV3

Tracing the morphological characters of *Phytoseius kassasini* developmental stages, it was noticed that, the dorsum, ventrum and legs chaetotaxy introduced quantitative and qualitative changes during the predator ontogeny exhibiting the final setal complement during deutonymphal stage. These results agree with the findings obtained by Chant (1958) who discussed the chaetotactic characters of immature stages of the phytoseiid mite *Phytoseius macropilis* Banks.

Type materials

Five specimens of each larva, protonymph, deutonymph and male of *P. kassasini* were obtained from laboratory cultures established on the two-spotted spider mite *T. urticae*. Specimens were deposited in the Acari Collection of Agricultural Zoology, Faculty of Agriculture, Zagazig University, Zagazig, Egypt.

REFERENCES

- Basha, A.E. and A.A. Yousef 1999. Two new species the family Phytoseiidae from Egypt (Acari: Phytoseiidae). *Acarologia*, 40 (3): 231-235.
- Chant, D. A. 1958. Immature and adult stages of some British Phytoseiidae Berl. 1916 (Acarina). *J. Linn. Soc. London, Zoology* 43: 599-643.
- Chant, D.A. and J.A. McMurtry 1994. A review of the subfamilies Phytoseiinae and Typhlodrominae (Acari: Phytoseiidae). *Int. J. Acaraol.*, 20 (4): 223-310.
- Denmark, H. A. 1966. Revision of the genus *Phytoseius* Ribaga, 1904 (Acarina: Phytoseiidae). *Fla. Dept. Agric. Bull.* 6:1-105.
- El-Badry, E.A. 1967. The genus *Phytoseius* in Egypt and the Sudan. *Annals of the*

- Entomological Society of America, 61 (5): 1083-1087.
- Fouly, A.H. and A.Y.M. El-Laithy 1992. Immature stages and life history of the predatory mite species *Amblyseius barkeri* (Hughes) (Acarina: Gamasida: Phytoseiidae). Dtsh. Entomol. Zeits 39 (4-5): 472-435
- Lindquist, E.E. and G.O. Evans 1965. Taxonomic concepts in the Ascidae with a modified setal nomenclature for the idiosoma of the Gamasina (Acarina : Mesostigmata) Mem. Ent. Soc. Can. 47 : 1-66.
- Mostafa, E. M. 2004. Studies on mites of the family phytoseiidae at Sharkia Governorate Ph. D. Thesis, Fac. Agric., Zagazig Univ.: 147 pp..
- Nassar, O.A. and M.M.H. Kandeel 1987. Revision of the genus *Phytoseius* Ribaga in Egypt with the description of a new species (Acari: Phytoseiidae). J. Agric. Sic. Monsoura Univ. 12 (4): 1019-1025.
- Papadoulis, G.T. and N.G. Emmanouel 1993. New records of phytoseiid mites from Greece with a description of the larva of *Typhlodromus erymanthii* Papadoulis and Emmanouel (Acarina: Phytoseiidae). Int. J. Acarol . 19 (1): 51-56.
- Prasad, V. 1973. Description of life stages of the predatory mite *Phytoseiulus macropilis* (Banks) (Acarina: Phytoseiidae). Acarologia 15 (3): 391-399.
- Shehata, K.K. 1973. *Phytoseius barkeri* sp.n. from Egypt (Acarina: Phytoseiidae) Zool. Soc. Egypt, 25 : 85-87.
- Yousef, A.A. 1981. Morphology and biology of *Typhlodromus africanus* (Acarina: Phytoseiidae). Acarologia 21 (2): 121-125.

دراسات مورفولوجية على الحلم المفترس (أكارى : فيتوسيدي) *Phytoseius kassasini* Basha & Yousef

عبد العزيز النشرتي باشة
قسم وقاية النبات – كلية الزراعة - جامعة الزقازيق

تضمنت هذه الدراسة وصفاً مورفولوجياً تفصيلياً لكل من طور البيضة- اليرقة - الحورية الأولى - الحورية الثانية - الذكر البالغ للحلم الفيتوسيدي *Phytoseius kassasini* والتي لم تدرس من قبل ، حيث تم توضيح جميع الصفات المورفولوجية لكل طور على حدة بدقة.

كما أوضحت الدراسة نظام توزيع الشعرات chaetotaxy على كل من السطح الظهري والبطني والأرجل لكل الأطوار متضمنة التغيرات الكمية والنوعية للشعرات الموجودة عليها حتى تمام إكتمالها في طور الحورية الثانية والطور الكامل.