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Z. Barbar. Survey of phytoseiid mite species (Acari: Phytoseiidae) in citrus orchards in Lattakia governorate, Syria. *Acarologia*, 2013, 53 (3), pp.247-261. 10.1051/acarologia/20132098 . hal-01566021

HAL Id: hal-01566021

<https://hal.science/hal-01566021>

Submitted on 20 Jul 2017

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Previous volumes (2010-2015): 250 € / year (4 issues)

Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d'avenir » programme (Labex Agro: ANR-10-LABX-0001-01)



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SURVEY OF PHYTOSEIID MITE SPECIES (ACARI: PHYTOSEIIDAE) IN CITRUS ORCHARDS IN LATTAKIA GOVERNORATE, SYRIA

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(Received 19 February 2013; accepted 10 May 2013; published online 30 September 2013)

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ABSTRACT — The present study aimed to identify predatory mite species of the family Phytoseiidae on citrus trees and common wild plants species within or around citrus orchards. Surveys were carried out in fifty orchards in seven different sites in Lattakia governorate (the main citrus growing region of Syria). Fifteen phytoseiid species belonging to ten genera were found, among which fourteen are recorded for the first time from Syria. *Euseius stipulatus* was the most abundant on citrus trees, followed by *Typhlodromus (Typhlodromus) athiasae* and *Amblyseius andersoni*. In this study, one female of the species *Typhlodromus (Anthoseius) thesbites* is rediscovered and illustrated. Information concerning locations, host plants, number of specimens, and measurements of morphological characteristics of each species collected are provided.

KEYWORDS — taxonomy; phytoseiid mites; biological control; citrus; Syria

INTRODUCTION

Predatory mites of the family Phytoseiidae have been widely studied for the biological control of phytophagous mites and other small arthropods (McMurtry and Croft, 1997). Although more than 2,000 species are known all around the world (Chant and McMurtry, 2007), this fauna has been poorly investigated in Syria. In fact, only two species were recorded in this country in the last catalog of this family (Moraes *et al.*, 2004): *Typhlodromus (Anthoseius) porathi* Swirski and Amitai (1967) and *Eharius hermonensis* Amitai and Swirski (1980). Several studies have been carried out in the last decade. *Typhlodromus (Typhlodromus) pyri* Scheuten (1857) was observed on apple trees in the south of Syria (Swaida governorate) (Jamal, personal communication), and *Typhlodromus (Typhlodromus) athi-*

asae Porath and Swirski (1965) was the only species recorded in vineyards in the central region of Syria (Homs governorate) (Barbar *et al.*, 2012).

The aim of the present paper was to identify phytoseiid mite species in several citrus orchards in Lattakia governorate (northwest Syria).

MATERIALS AND METHODS

Surveys were conducted on 27 April, 05 May 2011 and 01 July 2012. Citrus leaves were collected from 50 orchards at seven different sites (Lattakia governorate) (Figure 1): Al-ya'robiyah, 30°35'50"N, 48°35'70"E; Al-Sanobar, 29°35'30"N, 53°35'07"E; Al-Shir, 30°35'88"N, 50°35'66"E; Al-Jinderiyah, 33°35'92"N, 52°35'42"E; Karsana, 37°35'73"N, 48°35'64"E; Al-Bahlouliyah,

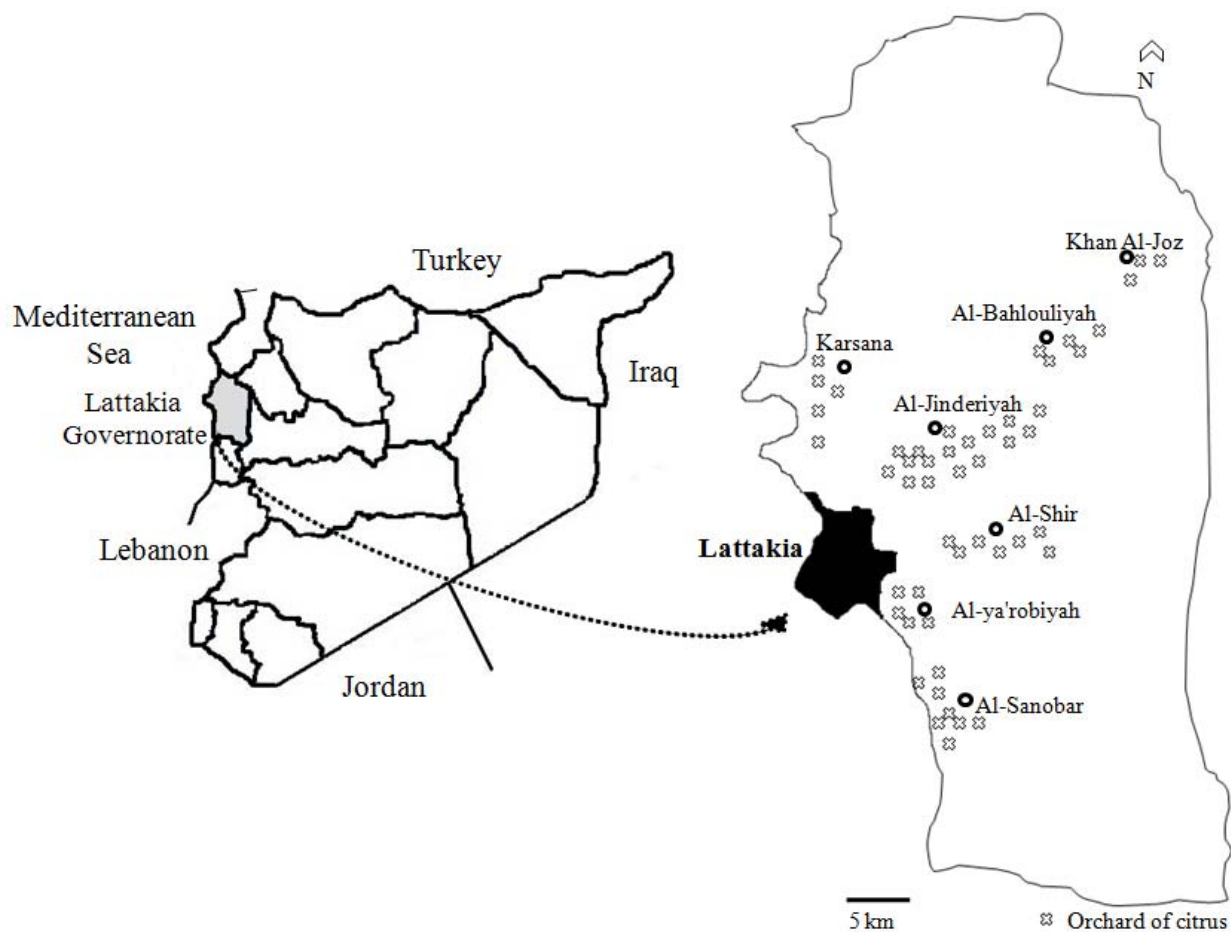


FIGURE 1: Map of Syria and locations of study sites in Lattakia governorate.

38°35'95"N, 57°35'07"E; Khan Al-Joz, 41°35'45"N, 59°35'07"E.

(<http://www1.montpellier.inra.fr/CBGP/phytoseiidae/feuillepresentationclefs.html>)).

Leaves of wild plant species within or surrounding each citrus orchard were also collected. Phytoseiid mites were removed from leaves using the "dipping-checking-washing-filtering" method (Boller, 1984). Mites were mounted on slides in Hoyer's medium and dried in an oven at 45 °C for one week.

The generic and subgeneric concepts used in this paper follow those of Chant and McMurtry (2007). Morphological characteristics of collected specimens were compared with original descriptions or re-descriptions, and also with the electronic polytomous keys to species of some phytoseiid genera (Hernandes *et al.*, 2012; Tixier, 2012:

When the number of specimens per species was relatively high, twenty specimens per species were measured. Average measurements and corresponding ranges are given in micrometers. Setal nomenclature is that of Rowell *et al.* (1978) and Chant and Yoshida-Shaul (1991) for the dorsal and ventral shields of the idiosoma, respectively. The specimens were deposited in the Arthropod Collection of the Department of Plant Protection, Faculty of Agriculture, Al-Baath University, Homs, Syria.

TABLE 1: Number of specimens of Phytoseiidae species found on citrus and wild plants in Lattakia governate (Syria) in 2011 and 2012.

Sampled plants	Phytoseiid mite species (No. of specimens per plant)														No. of phytoseiid species per plant
	<i>Typhlodromus (Typhlodromus) athiasae</i>	<i>Typhlodromus (Anthoseius) rhenanus</i>	<i>Typhlodromus (Anthoseius) foenilis</i>	<i>Typhlodromus (Anthoseius) thesbitis</i>	<i>Phytoseius finitimus</i>	<i>Paraseiulus talbii</i>	<i>Paraseiulus triporus</i>	<i>Amblyseius andersoni</i>	<i>Proprioseiopsis messor</i>	<i>Phytoseiulus persimilis</i>	<i>Iphiseius degenerans</i>	<i>Noeseiulus barkeri</i>	<i>Graminaseius graminis</i>	<i>Euseius stipulatus</i>	
<i>Cartamus syriacum</i> (Boiss)							5					1	1		3
<i>Cichorium intybus</i> L.	2														1
<i>Cirsium arvense</i> L.	30	2					2	1		1		1	2		7
<i>Cistus</i> sp.		31													1
<i>Citrus</i> sp.	39			1	1		38			25			198	32	7
<i>Cupressus sempervirens</i> L.	116	5	3										1		4
<i>Ficus carica</i> L.		1													1
<i>Juglans regia</i> L.							1								1
<i>Malus domestica</i> Borkh													14		1
<i>Malva sylvestris</i> L.	31	1	1				3		5				11	2	7
<i>Morus alba</i> L.													1		1
<i>Ponica granatum</i> L.							2						10		2
<i>Rubus fruticosus</i> L.	4	8	1		52	2	1	18					2		8
<i>Xanthium strumarium</i> L.		6						3		2					3
Unidentified herb					2		8								2
No. of host plants	6	7	3	1	2	2	1	9	1	1	3	1	1	9	2

RESULTS

SUBFAMILY AMBLYSEIINAE MUMA, 1961

Euseius stipulatus (Athias-Henriot, 1960a)*Amblyseius stipulatus* Athias-Henriot, 1960a: 294.

Specimens collected — 198 ♀ on *Citrus* sp. and 42 ♀ on eight host plants in different sites in 2011 and 2012 (Tables 1 and 2).

Female — Specimens measured: 20 ♀ from *Citrus* sp., Al-Sanobar, 05 May 2011.

Dorsum — Dorsal shield smooth, with five pairs of solenostomes (gd2, gd4" duplicate", gd6, gd8 and gd9), 367 (360 – 375) long and 241 (230 – 250) at level of setaej6; j1 35 (33 – 38), j3 41 (38 – 45), j4 16 (15 – 17), j5 15 (13 – 17), j6 15 (13 – 15), J2 17 (15 – 18), J5 8, z2 18 (18 – 20), z4 29 (28 – 30), z5 13 (13 – 15), Z1 17 (15 – 18), Z4 20 (17 – 20), Z5 63 (60 – 68), s4 42 (40 – 43), S2 23, S4 27 (25 – 28), S5 27 (25 – 28), r3 18 (18 – 20), R1 15. All dorsal setae smooth, except Z5, which is slightly serrate.

TABLE 2: Number of specimens of Phytoseiidae species found on citrus and wild plants at the different locations considered in Lattakia governate (Syria) in 2011 and 2012.

Location	Date of sampling	Sampled plants	Phytoseiid mite species (No. of specimens per plant)														
			<i>Typhlodromus (Typhlodromus) athiasae</i>	<i>Typhlodromus (Anthoseius) rhenanus</i>	<i>Typhlodromus (Anthoseius) foenilis</i>	<i>Typhlodromus (Anthoseius) thesbites</i>	<i>Phytoseius finitimus</i>	<i>Paraseiulus talpii</i>	<i>Paraseiulus triporus</i>	<i>Amblyseius andersoni</i>	<i>Proprioseiopsis messor</i>	<i>Phytoseiulus persimilis</i>	<i>Iphiseius degenerans</i>	<i>Noeseiulus barkeri</i>	<i>Graminaseius graminis</i>	<i>Euseius stipulatus</i>	<i>Euseius scutalis</i>
Al-ya'robiyah	IV-2011	<i>Citrus</i> sp.	8					1							11	10	
		<i>C. intybus</i>	2														
		<i>C. arvense</i>	28	1							1						
		<i>C. sempervirens</i>	46														
		<i>M. sylvestris</i>	6													8	
Al-Sanobar	V-2011	<i>Citrus</i> sp.	16												42	3	
		<i>C. arvense</i>	2	1													
		<i>C. sempervirens</i>	25														
		<i>R. fruticosus</i>		1			24										
Al-Shir	V-2011	<i>Citrus</i> sp.	4						5						13	11	
		<i>C. sempervirens</i>	22												1		
Karsana	V-2011	<i>Citrus</i> sp.	7												14	8	
		<i>C. sempervirens</i>	4														
		<i>M. sylvestris</i>	25								4					2	
Al-Jinderiyah	V-2011	<i>Citrus</i> sp.							5						7		
		<i>M. sylvestris</i>			1							1			3		
	VII-2012	<i>Citrus</i> sp.				1				21		11				68	
		<i>C. syriacum</i>								5			1			1	
		<i>C. arvense</i>								2		1		1		2	
		<i>C. sempervirens</i>	9	5	3												
		<i>J. regia</i>								1							
		<i>M. domestica</i>														14	
		<i>M. sylvestris</i>			1					3							
		<i>M. alba</i>														1	
		<i>P. granatum</i>														6	
		<i>R. fruticosus</i>			7		27	2	1	18						2	
		<i>X. strumarium</i>								3		2					
		unidentified herb					2			8							
Al-Bahlouliyah	VII-2012	<i>Citrus</i> sp.	1						3		14				36		
		<i>P. granatum</i>							2						4		
		<i>R. fruticosus</i>	4		1	1											
Khan Al-Joz	VII-2012	<i>Citrus</i> sp.	3						4						7		
		<i>Cistus</i> sp.			31												
		<i>C. sempervirens</i>	10														
		<i>F. carica</i>			1												
		<i>X. strumarium</i>			6												

Peritreme — Extending to level of setae j3.

Venter — Sternal shield with three pairs of setae (St1, St2 and St3); distances between St1-St1 62 (58 – 65), St2-St2 70 (68 – 73), St3-St3 88 (88 – 90), St1-St3 64 (63 – 65), St4-St4 110 (108 – 115). Distance between genital setae St5-St5 79 (75 – 84). Ventrianal shield 113 (110 – 115) long, 60 (58 – 63) wide at level of ZV2 and 79 (78 – 80) wide at level of anus, with three pairs of preanal setae and a pair of large pores posteromesad to JV2; JV5 39 (35 – 43).

Chelicera — Fixed digit 25 long, tridentate; movable digit 23 long, unidentate.

Spermatheca — Calyx tubular, 20 long, parallel sides; atrium prominent, attached directly to calyx.

Legs — SgeII 25, SgeIII 27, StiIII 26 (25 – 28), SgeIV 35 (32 – 37), StiIV 28 (27 – 30), StIV 56 (55 – 60).

Remarks — The specimens examined are similar to those given in the original description (Athias-Henriot, 1960a) and to those collected in France (Okassa *et al.*, 2009).

Euseius scutalis (Athias-Henriot, 1958a)

Typhlodromus scutalis Athias-Henriot, 1958a: 183.

Euseius scutalis Ferragut and Escudero, 1997: 233.

Specimens collected — Al-ya'robiyah: 10 ♀ on *Citrus* sp., 27 April 2011. Al-Sanobar: 3 ♀ on *Citrus* sp., 05 May 2011. Al-Shir: 11 ♀ on *Citrus* sp., 05 May 2011. Karsana: 8 ♀ on *Citrus* sp. and 2 ♀ on *Malva sylvestris*, 05 May 2011 (Tables 1 and 2).

Female — Specimens measured: 20 ♀ from *Citrus* sp., Al-ya'robiyah, 27 April 2011, and Al-Shir, 05 May 2011.

Dorsum — Dorsal shield smooth, with five pairs of solenostomes (gd2, gd4 "duplicate", gd6, gd8 and gd9), 374 (370 – 375) long and 236 (230 – 250) at level of setae j6; j1 35 (33 – 42), j3 48 (45 – 50), j4 21 (20 – 23), j5 21 (20 – 23), j6 38 (35 – 40), J2 44 (40 – 48), J5 5, z2 42 (40 – 45), z4 55 (50 – 60), z5 19 (18 – 20), Z1 36 (35 – 38), Z4 42 (40 – 45), Z5 71 (67 – 75), s4 74 (70 – 80), S2 41 (40 – 43), S4 38 (38 – 40), S5 37 (33 – 43), r3 23 (22 – 25), R1 18 (18 – 20). All dorsal setae smooth, except Z5, which is slightly serrate.

Peritreme — Extending to level between setae z2 and z4.

Venter — Sternal shield with three pairs of setae (St1, St2 and St3); distances between St1-St1 67 (65 – 68), St2-St2 74 (70 – 75), St3-St3 89 (85 – 90), St1-St3 67 (65 – 68), St4-St4 112 (109 – 115). Distance between genital setae St5-St5 83 (80 – 88). Ventrianal shield 95 (93 – 103) long, 65 (63 – 68) wide at level of ZV2 and 67 (63 – 75) wide at level of anus, with three pairs of setae and a pair of large pores posteromesad to JV2; JV5 45 (43 – 53).

Chelicera — Fixed digit 25 long, with two prominent and apical teeth, and four minute teeth clustered midway along digit; movable digit 23 long, unidentate.

Spermatheca — Calyx elongate, narrow flaring towards vesicle, 37 long.

Legs — SgeII 27, SgeIII 39 (38 – 40), StiIII 31 (30 – 32), SgeIV 62, StiIV 47 (45 – 50), StIV 81 (78 – 85).

Remarks — Measurements of the specimens collected are close to those of the original description (Athias-Henriot, 1958a). However, setae j3, J2, z2, z4, Z5 and S2 are about 20 – 30 % longer than those of specimens from Cape Verde (Ueckermann, 1992) and Ghana (Moraes *et al.*, 2001). The number of teeth on fixed digit of Syrian specimens is close to this illustrated by Ueckermann (1992). However it is different from specimens examined by Cobanoglu (1989) (2-3 teeth), and by Ferragut and Escudero (1997) (3-4 teeth).

Iphiseius degenerans (Berlese, 1889)

Seius degenerans Berlese, 1889:9.

Iphiseius degenerans (Berlese) Berlese, 1921: 95.

Specimens collected — 25 ♀ on *Citrus* sp., 2 ♀ on *Xanthium strumarium* and 1 ♀ on *Cirsium arvense* in 2012 (Tables 1 and 2).

Female — Specimens measured: 20 ♀ from *Citrus* sp., Al-Jinderiyah and Al-Bahlouliyah, 01 July 2012.

Dorsum — Dorsal shield strongly sclerotized, with seven pairs of solenostomes (gd1, gd2, gd4, gd5, gd6, gd8 and gd9), 405 (395 – 420) long and 359 (355 – 360) at level of setae j6; j1 27 (25 – 38), j3 5, j4 5, j5 5, j6 5, J2 5, J5 5, z2 5, z4 5, z5 5, Z1 5, Z4 5, Z5 16 (13 – 17), s4 5, S2 5, S4 5, S5 5, r3 5, R1 5. All dorsal setae smooth.

Peritreme — Extending to level between setae j3 and z2.

Venter — Sternal shield with three pairs of setae (St1, St2 and St3); distances between St1-St1 60, St2-St2 75 (72 – 78), St3-St3 92 (90 – 92), St1-St3 60 (60 – 62), St4-St4 105 (105 – 107). Distance between genital setae St5-St5 105 (100 – 110). Ventrianal shield separated into ventral shield bearing three pairs of preanal setae and a pair of large pores, and anal shield; JV5 30 (28 – 30).

Chelicera — Fixed digit 28 long, five or six teeth; movable digit 25 long, unidentate.

Spermatheca — Calyx tubular, 30 long, minor duct long.

Legs — SgeIV 43(40 – 45), StiIV 34 (30 – 35), StIV 30.

Remarks — Measurements of the specimens collected are close to those of the redescription of Athias-Henriot (1957) and Swirski *et al.* (1998).

Phytoseiulus persimilis Athias-Henriot (1957)

Specimens collected — Al-Jinderiyah: 1 ♀ on *Malva sylvestris*, 05 May 2011; Karsana: 4 ♀ on *Malva sylvestris*, 05 May 2011 (Tables 1 and 2).

Female — Specimens measured: 5 ♀.

Dorsum — Dorsal shield moderately sclerotized, reticulated laterally, 359 (350 – 365) long and 211 (195 – 230) at level of setae j6; j1 24 (20 – 25), j3 39 (35 – 43), j4 56 (51 – 60), j5 67 (60 – 78), j6 158 (145 – 168), J5 5, z2 13 (10 – 18), z4 66 (60 – 70), z5 10, Z1 104 (95 – 110), Z4 134 (128 – 138), Z5 123 (118 – 130), s4 146 (130 – 175), S5 30 (28 – 33), r3 30 (28 – 33), R1 31 (28 – 33). Dorsal setae s4, j6, Z1, Z4, Z5 are slightly serrate.

Peritreme — Extending to level between setae j3-z2.

Venter — Sternal shield with three pairs of setae (St1, St2 and St3); distances between St1-St1 56 (55 – 58), St2-St2 80, St3-St3 91 (85 – 95), St1-St3 67 (55 – 73), St4-St4 115 (105 – 125). Distance between genital setae St5-St5 85 (80 – 88). Ventrianal shield oval, without preanal setae, 88 (83 – 93) long and 78 (70 – 85) wide; JV5 46 (38 – 50).

Chelicera — Fixed digit 28 long, with eight teeth; movable digit 25 long, tridentate.

Spermatheca — Calyx vesicular, 30 long.

Legs — SgeIV 78, StiIV 45, StIV 121 (113 – 125).

Remarks — The Syrian specimens are morphologically close to the type specimens (Athias-Henriot, 1957) and the redescriptions of Swirski *et al.* (1998), Denmark *et al.* (1999) Guanilo *et al.* (2008) and Okassa *et al.* (2010).

Proprioseiopsis messor (Wainstein, 1960)

Typhlodromus messor Wainstein, 1960: 688.

Proprioseiopsis (Amblyseiulus) messor Karg, 1989: 212.

Proprioseiopsis messor Moraes *et al.*, 2004: 180.

Female — Specimens measured: 1 ♀ from *Cirsium arvense*, Al-ya'robayah, 27 April 2011.

Dorsum — Dorsal shield smooth with seven pairs of solenostomes (gd1, gd2, gd4, gd5, gd6, gd8 and gd9), 360 long and 203 at level of setae j6; j1 28, j3 53, j4 4, j5 4, j6 4, J5 4, z2 35, z4 15, z5 4, Z1 5, Z4 130, Z5 180, s4 95, S2 8, S4 8, S5 15, r3 20, R1 13. All dorsal setae smooth.

Peritreme — Extending to level of setae j1.

Venter — Sternal shield with three pairs of setae (St1, St2 and St3); distances between St1-St1 60, St2-St2 73, St3-St3 80, St1-St3 63, St4-St4 80. Distance between genital setae St5-St5 85. Ventrianal shield 120 long, 113 wide at level of ZV2 and 95 wide at level of anus, with three pairs of setae and a pair of small pores posteromesad to JV2; JV5 83.

Chelicera — Fixed digit 33 long, tridentate; movable digit 31 long, unidentate.

Spermatheca — Calyx saccular, 15 long, atrium attached directly to calyx.

Legs — SgeII 33, SgeIII 38, StiIII 25, SgeIV 80, StiIV 58, StIV 75.

Remarks — Measurements of the unique female collected resemble those of the original description (Wainstein, 1960) and there descriptions of Athias-Henriot (1961), Swirski *et al.* (1998) and Moraes *et al.* (2007).

Amblyseius andersoni (Chant, 1957)

Typhlodromus (Amblyseius) andersoni Chant, 1957: 296.

Amblyseius andersoni Athias-Henriot, 1958b: 33.

Specimens collected — 38 ♀ on *Citrus* sp. and 42 ♀ on eight other plant species in 2011 and 2012 (Tables 1 and 2).

Female — Specimens measured: 20 ♀ from *Citrus* sp., Al-Jinderiyah, 01 July 2012.

Dorsum — Dorsal shield smooth, with six pairs of solenostomes (gd1, gd2, gd4, gd6, gd8 and gd9), 395 (382 – 405) long and 242 (240 – 245) at level of setae j6; j1 33 (30 – 35), j3 59 (55 – 65), j4 12 (10 – 13), j5 8 (8 – 10), j6 9 (8 – 10), J2 8 (8 – 10), J5 8, z2 20 (15 – 22), z4 20 (15 – 22), z5 8, Z1 8 (8 – 10), Z4 75 (65 – 80), Z5 124 (120 – 140), s4 82 (78 – 85), S2 19 (15 – 20), S4 12 (10 – 13), S5 12 (10 – 13), r3 27 (25 – 30), R1 15 (15 – 17). All dorsal setae smooth, except Z4 and Z5, which are slightly serrate.

Peritreme — Extending anterior to level of setae j1.

Venter — Sternal shield with three pairs of setae (St1, St2 and St3); distances between St1–St1 66 (65 – 68), St2–St2 80 (75 – 83), St3–St3 87 (85 – 88), St1–St3 73 (73 – 75), St4–St4 101 (93 – 110). Distance between genital setae St5–St5 81 (78 – 83). Ventri-anal shield 141 (135 – 150) long, 89 (85 – 95) wide at level of ZV2 and 85 (80 – 88) wide at level of anus, with three pairs of setae and a pair of elliptical pores posteromesad to JV2; JV5 76 (75 – 78).

Chelicera — Fixed digit 33 long, with eight teeth; movable digit 33 long, tridentate.

Spermatheca — Calyx pocular, 10 long.

Legs — SgeII 36 (35 – 37), SgeIII 39 (38 – 40), Sti-III 27 (25 – 28), SgeIV 63 (62 – 64), StiIV 50 (45 – 54), StIV 68 (68 – 70).

Remarks — Measurements of females collected resemble those of the redescription of Chant and Yoshida Shaul (1990).

Graminaseius graminis (Chant, 1956)

Amblyseius graminis Chant, 1956: 34.

Graminaseius graminis Chant and McMurtry, 2004: 219.

Female — Specimens measured: 1 ♀ from *Cirsium arvense*, Al-Jinderiyah, 01 July 2012.

Dorsum — Dorsal shield smooth and slightly sclerotized, with seven pairs of solenostomes (gd1, gd2, gd4, gd5, gd6, gd8 and gd9), 370 long and 215 at level of setae j6; j1 25, j3 43, j4 20, j5 18, j6 18, J2 18, J5 10, z2 38, z4 45, z5 18, Z1 20, Z4 70, Z5 85, s4 65, S2 53, S4 20, S5 18, r3 38, R1 30. All dorsal setae smooth.

Peritreme — Extending to level of setae j1.

Venter — Sternal shield with three pairs of setae (St1, St2 and St3); distances between St1–St1 58, St2–St2 70, St3–St3 78, St1–St3 68, St4–St4 75. Distance between genital setae St5–St5 62. Ventri-anal shield 118 long, 88 wide at level of ZV2 and 78 wide at level of anus, with three pairs of setae and a pair of small pores posteromesad to JV2; JV5 65.

Chelicera — Fixed digit 30 long, tridentate; movable digit 28 long, unidentate.

Spermatheca — Calyx saccular, 20 long; basis of atrium is bifurcate.

Legs — SgeIV 50, StiIV 35, St IV 70.

Remarks — Dorsocentral setae j3, j4, j5, j6 and J2 of the only female collected are about 20 – 30 % longer than those for the original description of Chant (1956) and the redescription of Congdon (2002).

Neoseiulus barkeri Hughes (1948)

Female — Specimens measured: 1 ♀ from *Cartamus syriacum*, Al-Jinderiyahon, 01 July 2012.

Dorsum — Dorsal shield smooth and slightly sclerotized, with four pairs of solenostomes (gd1, gd4, gd6 and gd9), 370 long and 180 at level of setae j6; j1 15, j3 25, j4 17, j5 17, j6 17, J2 20, J5 13, z2 20, z4 (broken), z5 17, Z1 23, Z4 28, Z5 60, s4 21, S2 25, S4 23, S5 20, r3 20, R1 20. All dorsal setae smooth, except Z5, which is slightly serrate.

Peritreme — Extending to level of setae j1.

Venter — Sternal shield with three pairs of setae (St1, St2 and St3); distances between St1–St1 50, St2–St2 65, St3–St3 70, St1–St3 72, St4–St4 70. Distance between genital setae St5–St5 75. Ventri-anal shield 108 long, 102 wide at level of ZV2 and 78 wide at level of anus, with three pairs of setae and a pair of pores posteromesad to JV2; JV5 48.

Chelicera — Fixed digit 32 long, tridentate; movable digit 30 long, unidentate.

Spermatheca — Calyx 20 long.

Legs — St IV 63.

Remarks — Measurements of the unique female collected resemble those of the redescrptions of Athias-Henriot (1966), Moraes *et al.* (1989) and Kade *et al.* (2011).

SUBFAMILY PHYTOSEIINAE BERLESE, 1913

Phytoseius finitimus Ribaga 1904

Phytoseius finitimus Ribaga 1904: 178

Specimens collected — 52 ♀ on *Rubus fruticosus* and 2 ♀ on unidentified herb in 2011 and 2012 (Tables 1 and 2).

Female — Specimens measured: 20 ♀ from *Rubus fruticosus*, Al-Sanobar, 05 May 2011.

Dorsum — Dorsal shield smooth with four pairs of solenostomes (gd2, gd6, gd8 and gd9), 300 (295 – 308) long and 150 (140 – 155) at level of setae j6; j1 29 (25 – 33), j3 63 (60 – 65), j4 11 (10 – 13), j5 10, j6 12 (12 – 13), J2 15 (13 – 15), J5 8, z2 13 (10 – 15), z3 39 (38 – 43), z4 22 (20 – 25), z5 10, Z4 73 (70 – 75), Z5 91 (88 – 98), s4 99 (98 – 100), s6 98 (95 – 100), r3 50 (50 – 52), R1 28 (25 – 33). Setae j1, j3, z3, z4, r3, s4, s6, Z4 and Z5 serrate. Other setae smooth or slightly serrate.

Peritreme — Extending anteriorly to level of setae j3.

Venter — Sternal shield with three pairs of setae (St1, St2 and St3); distances between St1-St1 60 (58 – 64), St2-St2 65 (60 – 68), St3-St3 74 (73 – 75), St1-St3 61 (58 – 63), St4-St4 89 (83 – 95). Distance between genital setae St5-St5 64 (63 – 65). Ventrianal shield vase-shaped, with three pairs of setae and a pair of pores posterior to JV2, 104 (100 – 108) long, 56 (55 – 58) wide at level of ZV2 and 44 (43 – 45) wide at level of anus; JV5 72 (68 – 75), serrate.

Chelicera — Fixed digit 23 long, bidentate; movable digit 20 long, uni- or bidentate.

Spermatheca — Calyx tubular, 10 long; atrium knobbed.

Legs — StIV 39 (38 – 43).

SUBFAMILY TYPHLODROMINAE WAINSTEIN, 1962

Paraseiulus talbii (Athias-Henriot, 1960b)

Typhlodromus talbii Athias-Henriot 1960b: 75.

Paraseiulus talbii Abbasova 1972: 11.

Female — Specimens measured: 3 ♀ from *Citrus* sp., Al-ya'robiyah, 27 April 2011 and from *Rubus fruticosus*, Al-Jinderiyah, 01 July 2012.

Dorsum — Dorsal shield reticulate with three pairs of large solenostomes (gd2, gd6, gd9), 404 (388 – 425) long and 221 (213 – 225) at level of setae j6; j1 21 (15 – 25), j3 29 (27 – 32), j4 22 (20 – 23), j5 20 (18 – 23), j6 33 (30 – 35), J2 35, J5 16 (15 – 18), z2 31 (30 – 32), z3 34 (32 – 35), z4 36 (33 – 38), z5 31 (27 – 35), z6 35 (33 – 38), Z3 36 (32 – 38), Z4 40 (33 – 46), Z5 44 (35 – 50), s4 39 (38 – 40), s6 40, S2 43 (42 – 45), S4 41 (40 – 43), S5 40, r3 32 (30 – 35), R1 32 (30 – 35). All dorsal setae smooth, except Z4 and Z5, which are slightly serrate.

Peritreme — Extending anteriorly to level of setae j3.

Venter — Sternal shield with two pairs of setae (St1 and St2); distances between St1-St1 53 (45 – 60), St2-St2 69 (60 – 80), St3-St3 108 (98 – 115), St1-St3 73 (70 – 75), St4-St4 121 (102 – 142). Distance between genital setae St5-St5 63 (60 – 66). Ventrianal shield 128 (125 – 130) long, 52 (48 – 55) wide at level of ZV2 and 64 (63 – 65) wide at level of anus, with two pairs of setae and without pores; JV5 41 (40 – 42).

Chelicera — Fixed digit 22 long, bidentate; movable digit 21 long, unidentate.

Spermatheca — Calyx: 15 long.

Legs — St IV 33.

Paraseiulus triporus (Chant and Yoshida-Shaul, 1982)

Typhlodromus triporus Chant and Yoshida-Shaul, 1982: 3029.

Paraseiulus triporus Chant and McMurtry, 1994: 243.

Female — Specimens measured: 1 ♀ from *Rubus fruticosus*, Al-Jinderiyah, 01 July 2012.

Dorsum — Dorsal shield reticulate with three pairs of large solenostomes (gd2, gd6, gd9), 360 long and 200 at level of setae j6; j1 20, j3 25, j4 20, j5 18, j6 30, J2 30, J5 10, z2 27, z3 35, z4 35, z5 25, z6

27, Z4 32, Z5 42, s4 40, s6 35, S2 32, S4 27, S5 29, r3 27, R1 25. All dorsal setae smooth.

Peritreme — Extending to level between setae j1-j3.

Venter — Sternal shield with two pairs of setae (St1 and St2); distances between St1-St1 48, St2-St2 60, St3-St3 92, St1-St3 75, St4-St4 105. Distance between genital setae St5-St5 58. Ventrianal shield 118 long, 50 wide at level of ZV2 and 60 wide at level of anus, with two pairs of setae and without pores; JV5 42.

Chelicera — Fixed digit 20 long, bidentate; movable digit 20 long, unidentate.

Spermatheca — Calyx: 20 long.

Legs — St IV 25.

Typhlodromus (Typhlodromus) athiasae Porath and Swirski (1965)

Typhlodromus athiasae Porath and Swirski, 1965: 90.

Typhlodromus (Typhlodromus) athiasae Denmark, 1992: 5.

Specimens collected — 39 ♀ on *Citrus* sp.; 116 ♀ on *Cupressus sempervirens*; 67 ♀ on four other plant species (Tables 1 and 2).

Female — Specimens measured: 20 ♀ from *Citrus* sp., Al-Sanobar and Al-Shir, 05 May 2011.

Dorsum — Dorsal shield reticulate with four pairs of solenostomes (gd2, gd6, gd8 and gd9), 335 (320 – 350) long and 167 (158 – 175) at level of setae j6; j1 26 (23 – 28), j3 32 (30 – 33), j4 17 (15 – 18), j5 18, j6 19 (18 – 23), J2 23 (23 – 25), J5 5, z2 18 (18 – 20), z3 27 (25 – 28), z4 24 (22 – 28), z5 18, Z4 48 (45 – 53), Z5 73 (70 – 82), s4 30 (28 – 32), s6 32 (30 – 35), S2 37 (33 – 40), S4 41 (38 – 45), r3 28 (25 – 30), R1 26 (23 – 28). All dorsal setae smooth, except Z4 and Z5, which are serrate.

Peritreme — Extending anterior to level of setae j3.

Venter — Sternal shield with two pairs of setae (St1 and St2); distances between St1-St1 55 (53 – 58), St2-St2 61 (58 – 63), St3-St3 80 (70 – 85), St1-St3 66 (63 – 68), St4-St4 105 (100 – 110), St5-St5 63 (60 – 65). Ventrianal shield 108 (105 – 113) long, 96 (95 – 100) wide at level of ZV2 and 79 (75 – 80) wide at level of

anus, with four pairs of setae and without pore; JV5 64 (60 – 70).

Chelicera — Fixed digit 28 long, tridentate; movable digit 25 long, unidentate.

Spermatheca — Calyx saccular, 20 long.

Legs — StIV 55 (53 – 58).

Remarks — This species was previously reported in vineyards in the central region of Syria (Homs governorate) (Barbar *et al.*, 2012).

Typhlodromus (Anthoseius) rhenanus (Oudemans, 1905)

Seiulus rhenanus Oudemans, 1905: 78.

Typhlodromus (Anthoseius) rhenanus Moraes *et al.*, 2004: 345.

Specimens collected — 54 ♀ on seven plant species (on *Cistus* sp.) (Tables 1 and 2).

Female — Specimens measured: 20 ♀ from *Cistus* sp., Khan Al-Joz, 01 July 2012.

Dorsum — Dorsal shield completely reticulate with five pairs of solenostomes (gd2, gd4, gd6, gd8 and gd9), 349 (342 – 360) long and 184 (180 – 190) at level of setae j6; j1 19 (18 – 20), j3 27 (25 – 28), j4 16 (15 – 18), j5 17 (15 – 20), j6 20 (18 – 22), J2 23 (20 – 25), J5 9 (8 – 10), z2 20, z3 28 (25 – 30), z4 25, z5 19 (17 – 20), Z4 35 (33 – 38), Z5 52 (42 – 60), s4 32 (30 – 33), s6 34 (33 – 35), S2 34 (33 – 35), S4 32 (30 – 33), S5 31 (30 – 33), r3 31 (28 – 35), R1 29 (28 – 30). All dorsal setae smooth, except Z5, which is serrate.

Peritreme — Extending to level of setae j3.

Venter — Sternal shield with two pairs of setae (St1 and St2); distances between St1-St1 54 (53 – 55), St2-St2 58, St3-St3 79 (75 – 82), St1-St3 63 (58 – 68), St4-St4 102 (95 – 110). Distance between genital setae St5-St5 59 (58 – 60). Ventrianal shield 111 (108 – 113) long, 88 (85 – 90) wide at level of ZV2 and 73 (63 – 83) wide at level of anus, with four pairs of setae and a pair of small pores posterior to level of setae JV3; JV5 51 (48 – 53).

Chelicera — Fixed digit 29 (28 – 30) long, tridentate; movable digit 26 (25 – 28) long, unidentate.

Spermatheca — Calyx saccular, 19 (18 – 20) long.

Legs — StIV 33 (30 – 35).

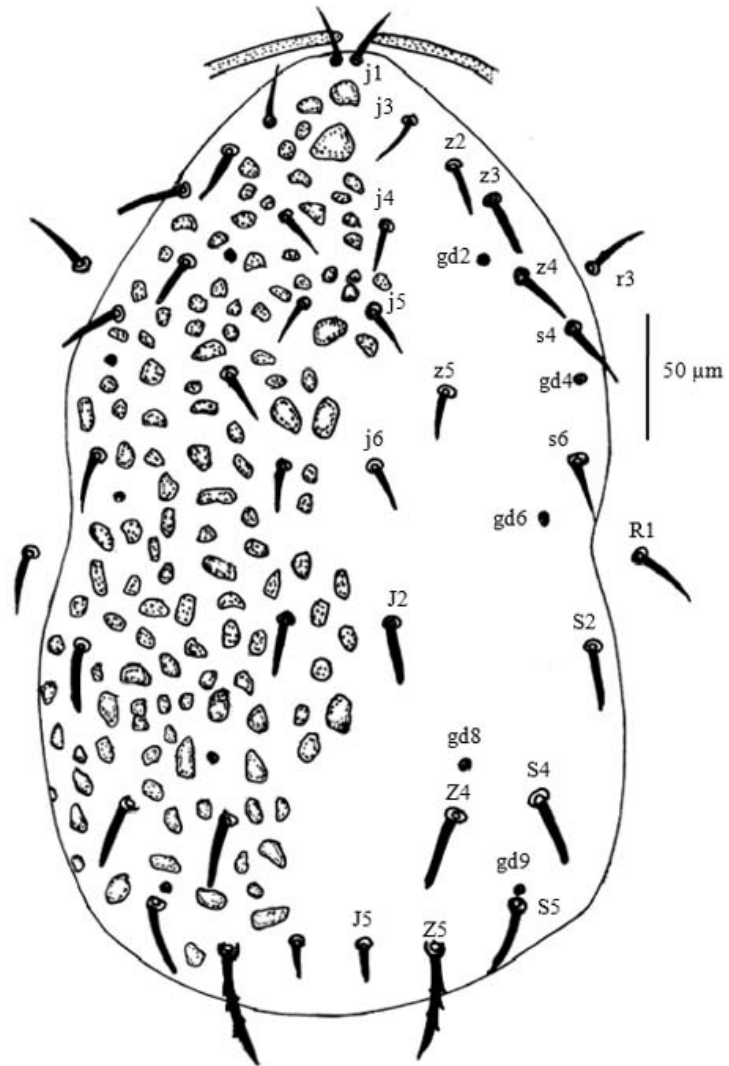
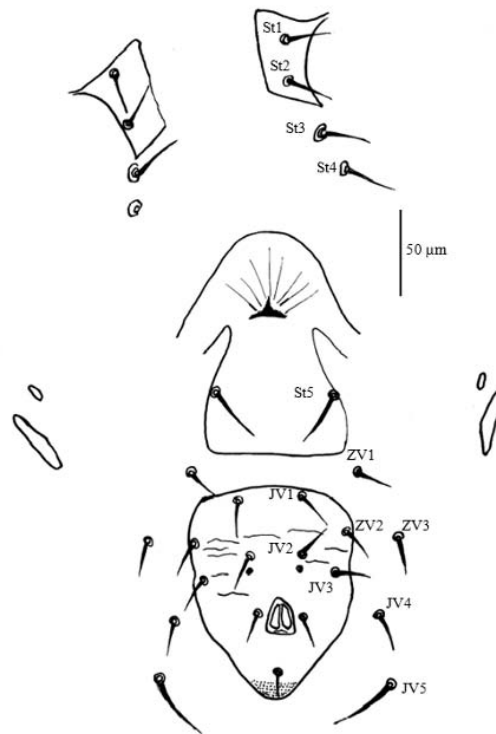


FIGURE 2: Dorsal shield of the female of *Typhlodromus (Anthoseius) thesbites*.

FIGURE 3: Ventral shields of the female of *Typhlodromus (Anthoseius) thesbites*.

***Typhlodromus (Anthoseius) foenilis* Oudemans (1930)**

Typhlodromus foenilis Oudemans, 1930: 70.

Typhlodromus (Anthoseius) foenilis Moraes *et al.* 2004: 323.

Female — Specimens measured: 5 ♀ from *Malva sylvestris*, Al-Jinderiyah 05 May 2011, *Cupressus sempervirens*, Al-Jinderiyah 01 July 2012 and *Rubus fruticosus* Al-Bahlouliyah, 01 July 2012.

Dorsum — Dorsal shield reticulate with five pairs of solenostomes (gd2, gd4, gd6, gd8 and gd9), 360 (345–370) long and 198 (195–200) wide at level of setae j6; j1 22 (20–24), j3 26 (25–28), j4 16 (15–18), j5 18 (15–20), j6 19 (18–20), J2 20 (18–22), J5 5, z2 17 (15–18), z3 22 (20–25), z4 22 (20–25), z5 19 (18–20), Z4 34 (33–38), Z5 52 (48–55), s4 25, s6 28, S2 32 (28–35), S4 30, S5 16 (15–17), r3 22 (20–25), R1 25. All dorsal setae smooth, except Z5, which is slightly serrate.

Peritreme — Extending to level of setae j1.

Venter — Sternal shield with two pairs of setae

(St1 and St2); distances between St1–St1 58 (55–60), St2–St2 65, St3–St3 80, St1–St3 70, St4–St4 102 (95–110). Distance between genital setae St5–St5 67 (65–70). Ventrianial shield 115 (113–118) long, 97 (95–100) wide at level of ZV2 and 88 wide at level of anus, with four pairs of setae and without pore; JV5 52 (50–55).

Chelicera — Fixed digit 30 long, tridentate; movable digit 28 long, bidentate.

Spermatheca — Calyx saccular, 18 long and 10 wide.

Legs — StIV 55.

***Typhlodromus (Anthoseius) thesbites* (Swirski and Amitai, 1997)**

Amblydormella thesbites Swirski and Amitai, 1997: 8.

Typhlodromus (Anthoseius) thesbites Moraes *et al.*, 2004: 354.

Female — Specimens measured: 1 ♀ from *Citrus* sp., Al-Jinderiyah, 01 July 2012.

Dorsum — Dorsal shield sclerotized, strongly ornamented with cells (Figure 2), with five pairs of

solenostomes (gd2, gd4, gd6, gd8 and gd9), 395 long and 220 wide at level of seta j6; j1 20, j3 20, j4 18, j5 18, j6 18, J2 20, J5 10, z2 18, z3 18, z4 20, z5 18, Z4 27, Z5 40, s4 23, s6 20, S2 25, S4 27, S5 25, r3 20, R1 20. Some dorsal setae truncated distally, setae Z5 serrate.

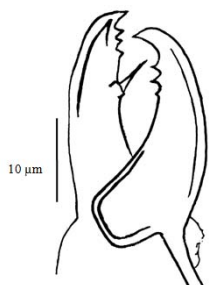


FIGURE 4: Chelicera of the female of *Typhlodromus (Anthoseius) thesbites*.

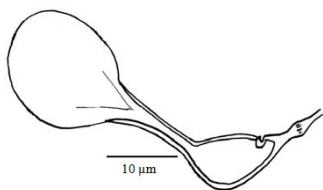


FIGURE 5: Spermatheca of the female of *Typhlodromus (Anthoseius) thesbites*.

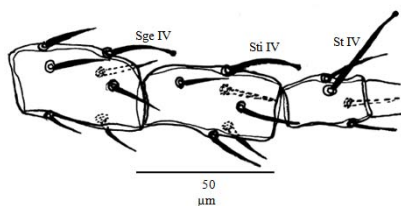


FIGURE 6: Macroseta on the basitarsus of the leg IV of the female of *Typhlodromus (Anthoseius) thesbites*.

Peritreme — Extending to level of setae j1.

Venter — Sternal shield with two pairs of setae (St1 and St2) (Figure 3); distances between St1-St1 60, St2-St2 80, St3-St3 100, St1-St3 70, St4-St4 110. Distance between genital setae St5-St5 68. Ventri-anal shield 138 long, 134 wide at level of ZV2 and 80 wide at level of anus, with four pairs of setae and a pair of small pores posterior to level of setae JV2; JV5 30.

Chelicera — Fixed digit 30 long (Figure 4), tridentate; movable digit 28 long, tridentate.

Spermatheca — Anterior part of calyx tubular, thick-walled, 15 long and 3 wide. Posterior part swollen 15 long and 10 wide (Figure 5).

Legs — StIV 55 (Figure 6).

Remarks — Measurements of the female collected are close to those of the original description of Swirski and Amitai (1997) and the redescription of Swirski *et al.* (1998). However, the dorsal shield of the Syrian female is characterized by the presence of a waist posterolateral to setae s6.

DISCUSSION

A total of fifteen phytoseiid species belonging to ten genera are reported in the present study. Seven phytoseiid species are reported on citrus trees in 48 of the 50 sampled citrus orchards: *Euseius stipulatus* was the dominant species (59 %, Figure 7) and was found in all the sites considered (Table 2). *Typhlodromus (T.) athiasae* and *E. scutalis* were relatively abundant (12 % and 10 %, respectively, Figure 7) in orchards close to costal region of Latakia governorate (Al-ya'robayah, Al-Sanobar, Al-Shir and Karsana, Table 2). On the opposite, *A. andersoni* and *I. degenerans* were more abundant in northeast of this governorate (Al-Jinderiyah and Al-Bahlouliyah, Table 2). The two other species *T. (A.) thesbites* and *P. talbii* seemed to be rare in Syrian citrus orchards (only one specimen per species was found).

The number of phytoseiid mite species found on uncultivated plant species within or around citrus orchards was relatively high (14 species, Table 1). Some plant species seemed to be favorable to phytoseiid species. In fact, *Rubus fruticosus* harbored eight species especially *P. finitimus* and *A. andersoni* (Table 1) and this latter was abundant on citrus trees in Al-Jinderiyah (Table 2). The number of phytoseiid species encountered on other plants as *C. arvensis*, *M. sylvestris* and *C. sempervirens* was also high (four species at least, Table 1), suggesting that these plants could constitute a reservoir for many phytoseiid species such as *T. (T.) athiasae* and *E. stipulatus* that were abundant on citrus trees.

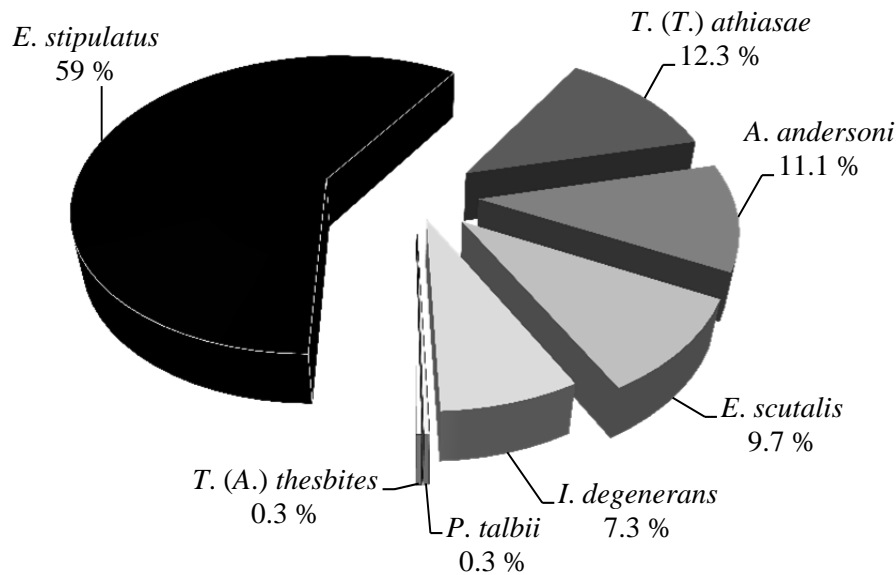


FIGURE 7: Relative abundance of phytoseiid mite species on citrus trees in the sites considered in Lattakia governorate, Syria, based on samples collected in 2011-2012.

In conclusion, some species reported in the present paper were abundant on citrus trees and their surrounding vegetation. This result could be useful in biological control programs of phytophagous mites present in Syrian citrus orchards. Further studies are required to identify these predators in citrus orchards at other sites in Lattakia governorate and other Syrian citrus productive regions.

ACKNOWLEDGEMENTS

I wish to thank Serge Kreiter, Marie-Stéphane Tixier, George Papadoulis, Leonid Kolodochka, Edward A. Ueckermann, Farid Faraji, Ignace D. Zannou and Aberto D. Guanilo for supplying papers concerning the descriptions of the species reported here. I also kindly thank Edward A. Ueckermann and Michael Costello for notes and English improvement of the first version of this paper.

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