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A new record and description of a new species of the genus *Thrips*, with an updated key to species from Iran

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Abstract

An illustrated key is provided to distinguish the 26 species of the genus *Thrips* L. (Thripidae: Thripinae) recorded from Iran. *Thrips alavii* Mirab-balou, Tong & Chen, **sp. n.** is described and illustrated. *Thrips alliorum* (Priesner) is newly recorded for the fauna of Iran. A checklist is provided for all recorded species in this genus from Iran, with information on the geographical distribution for each species.

Keywords: checklist, identification
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Introduction

Thrips L. (Thripidae: Thripinae) is the largest genus in the Thysanoptera subfamily Thripinae, with about 280 described species in the world. Most species of *Thrips* are flower–living, although a few appear to breed mainly on leaves (Mound and Ng 2009), and several species play an important role in the pollination of crops. For example, *T. hawaiiensis* (Morgan) is an effective pollinator for oil and banana palms in the pacific region, and *T. imagines* Bagnall and *T. obscuratus* (Crawford) in Australia and New Zealand (Kirk 1984). Several species of *Thrips* are considered crop pests in various parts of the world, such as *T. angusticeps* Uzel, *T. flavus* Schrank, *T. hawaiiensis* (Morgan), *T. meridionalis* Priesner, and *T. tabaci* Lindeman (Moritz et al. 2001). The latter species is well known as the most important pest of onion crops, greenhouses and ornamental plants in Iran (Khanjani & Mirab-balou 2005 a,b; Mirab-balou et al. 2008, 2009, 2012), and it is a carrier of some Tospovirus diseases on ornamental plants, especially in Tehran and Markazi provinces (Ghotbi et al. 2003). Recently, transmission of an isolate of Tomato spotted wilt virus on cineraria (*Senecio* sp.) by *T. tabaci* has been confirmed in Fars province, Iran (Rasoulpour and Izadpanah 2003).

Because species belonging to the genus *Thrips* occur worldwide, taxonomic keys for the genus have been provided for many parts of the world, i.e., California (Bailey 1957); Illinois (Stannard 1968); Korea (Woo 1974); the European part of the USSR (Dyadechko 1977); India (Bhatti 1980); Asia and Australasia (Palmer 1992); North America (Nakahara 1994; Hoddle et al. 2009); Europe and the Mediterranean (zur Strassen 2003); Pakistan (Akram et al. 2003); Australia, New Caledonia and New Zealand (Mound & Masumoto 2005); Peninsular Malaysia (Mound & Azidah 2009); Afro-tropical Region (Mound 2010); and China, including Taiwan (Han 1997; Wang 2002; Zhang et al. 2011).

Currently, 26 species of the genus *Thrips* have been recorded in Iran (Bhatti et al. 2009). A key to 72 species of *Thrips* is available in zur Strassen's book (2003), and is useful for the study of Iranian thrips. The objective of our present paper is to provide an illustrated identification key to all 26 species known from Iran, including one new species, and one new record for the fauna of this country. In addition, some important characteristics shared by Iranian species of *Thrips* are listed in Table 1; a checklist is provided for all recorded species in this genus from Iran, with information on geographical distribution for each species (Table 2). Deciding the true host plant of Thysanoptera species is difficult, because plants on which adults are found are not always the same as those on which larvae can develop. Nevertheless, thrips-associated plants in Iran are listed in Table 3.

Materials and Methods

Thrips specimens were collected from different sites in Iran during 2007–2011. The method for preparing and mounting thrips on slides follows Mirab-balou & Chen (2010). All descriptions, measurements, and photos were made with a Leica DM IRB microscope, with a Leica Image 1000 system. All specimens were deposited in the Institute of Insect Sciences, Zhejiang University, Hangzhou, China (ZJUH). All measurements are given in micrometers, unless otherwise stated.

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Specimens were also studied from the following collections: Insect Collection, Department of Entomology, South China Agricultural University, Guangzhou, Guangdong Province; and Entomological Museum, Northwest A. & F. University, Yangling, Shaanxi Province.

Genus *Thrips* L.

All members of the genus *Thrips* lack ocellar setae pair I on the head, and they all have paired ctenidia on abdominal tergite VIII, posteromesad to the spiracles. Other characteristics, such as number of antennal segments and setae on the forewing veins, and number of discal setae on the sternites, vary between species (Palmer 1992; Nakahara 1994; Mound and Masumoto 2005; Mirab-balou and Chen 2011). See Bhatti (1980) and Mound & Masumoto (2005) for generic characteristics, and the list of its synonyms.

Among Iranian species of the genus *Thrips*, *T. tabaci* (commonly known as onion thrips or tobacco thrips) is widely distributed. This polyphagous species is particularly abundant in warm, dry sites, especially where onion, its preferred host, is grown. It is a major pest of glasshouse crops, such as cucumber, sweet pepper, chrysanthemum, and many bedding plants in Iran (Pourian et al. 2009). Taxonomically, *T. tabaci* is principally characterized by rows of ciliate microtrichia on the sides of abdominal tergites II–VII, 4–7 distal setae on the first vein of the forewing, three lateral marginal setae on abdominal tergite II, and narrow transversely elongate pore plates on sternites III–V (males only). Another species, *T. major* Uzel, is characterized by having rows of ciliate microtrichia on the sides of abdominal tergites II–VII, similar to *T. tabaci*, but it can be distinguished from the latter by the following characters: tergite VIII with comb present laterally, forewing first vein with three distal setae, and tergite IX with two pairs of campaniform sensilla. Males of this species are very rare; we found less than ten males, but more than a thousand females.

Although *T. iranicus* and *T. pistaciae* have been recorded in Iran (Bhatti et al. 2009), little information on these two species is available. Dyadechko (1977) listed several characteristics for these two species as follows: (1) antennal segment V much shorter than IV in both species; (2) forewing first vein with 6–8 distal setae in *T. pistaciae,* and 3 distal setae in *T. iranicus*; (3) antennal segments I–III brownish yellow in *T. pistaciae*, but segments I and IV dark in *T. iranicus*; (4) abdominal tergite VIII without comb on posterior margin in *T. pistaciae*.

The females of *T. trehernei* were very similar to the females of *T. physapus*, the type-species of this genus, but *T. trehernei* had abdominal tergite X more than 80 microns long (less than 80 microns long in *T. physapus*), and the major setae on the body were longer than in *T. physapus*. The two species are most readily distinguished by the males, these being brown in *T. trehernei,* and yellow in *T. physapus*.

Key to *Thrips* species (females) in Iran

1. Abdominal sternites with at least one pair of discal setae (Figs. 42, 43, 44)……..…….2
– Abdominal sternites without discal setae (Fig.45)…….....20
2. Pleurotergites III–VII with discal setae (Fig. 11, 13, 14)…….....3
– Pleurorergites III–VII without discal setae (Figs. 12, 15)……...……...……...12

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3. Forewing first vein with five or more distal setae (Fig. 32); abdominal tergite II with 3 or 4 lateral setae……..4
– Forewing first vein with three or rarely four distal setae (Figs. 7, 16, 33–35); abdominal tergite II with 3 lateral setae (Fig. 11)……7
4. Pronotum with two pairs of long setae on anterior (same as *Frankliniella*)..... .....***T. verbasci*** (Priesner)
– Pronotum without long setae on anterior (Figs. 8–10)……...5
5. Antennae 7–segmented; abdominal tergite II with four lateral setae…… ……....***T. minutissimus*** Linnaeus
– Antennae 8–segmented (Figs. 30–31, 49–52); abdominal tergite II with 3 lateral setae (Fig. 11)……..6
6. Body dark; antennal segments generally dark; abdominal sternite VII with more than 13 discal setae that arranged on two rows (Fig. 43)……...***T. atratus*** Haliday
– Body blackish brown; antennal segment III pale yellow in basal third; abdominal sternite VII with about 13 discal setae that arranged in 1–2 irregular rows (Fig. 44).....***T. fraudulentus*** Priesner
7. Body yellow or light brown with a darker abdomen; antennae 7– or 8–segmented……..8
– Body dark brown to black; antennae 8–segmented……...9
8. Antennae 7–segmented (Fig. 39); MCS absent; median metanotal setae situated far from anterior margin……..... .....***T. pillichi*** Priesner
– Antennae 8–segmented; MCS present; median metanotal setae situated at anterior margin……***T. trybomi*** (Karny)
9. Metanotal campaniform sensiall (MCS) present (Fig. 18)……10
– MCS absent (Figs. 17, 19–22)……11
10. Antennal segment III light yellow, or yellow; segment VII and VIII in equal length (Fig. 50); forewing dark (Figure 16)……..***T. meridionalis*** Priesner
– Antennal segment III brown to light brown (Fig. 51); segment VII about 0.6–0.7 times as length as VIII; forewing pale or shaded……...***T. vulgatissimus*** Haliday
11. Postocular setae pair II small and situated well behind row; median metanotal setae situated far behind anterior margin; abdominal tergite VIII posteromarginal comb may appear, absent or represented by a few microtrichia laterally and a very short lobed flange or craspedum medially (Fig. 27)……..***T. alliorum*** (Priesner)
– Postocular setae pair II in line with I & III; median metanotal setae situated near anterior margin; abdominal tergite VIII with complete comb on posterior margin (Fig. 24)……..... ....***T. alavii*** Mirab–balou, Tong & Chen, **sp. n.**
12. Abdominal sternites II–VII or III–VII with discal setae……13
– Abdominal sternites III–VI, IV–VI or V–VI with discal setae……19
13. MCS present; abdominal tergite II with four lateral setae……...……...14
– MCS absent; abdominal tergite II with three lateral setae……...15
14. Forewings with base pale; metanotum with lines of sculpture longitudinal medially, but transverse at anterior; metanotal median setae situated on anterior margin; antennae 7– or 8–segmented (Fig. 52)…… ……..***T. hawaiiensis*** (Morgan)
– Forewings pale or dark but without base distinctly paler; metanotum with sculpture broadly striate; metanotal median setae

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situated just behind anterior margin; antennae 7–segmented….....***T. coloratus*** Schmutz
15. Antennae 8–segmented..... .....***T. simplex*** (Morison)
– Antennae 7–segmented……..……...16
16. Forewing first vein with 5–10 (rarely with 4) distal setae (Fig. 33)…….....***T. angusticeps*** Uzel
– Forewing first vein with 3 distal setae……..…17
17. Abdominal segment X more than 80 microns long; body with long major setae…….....***T. trehernei*** Priesner
– Abdominal segment X less than 80 microns long; body with major setae relatively short……..18
18. Antennal segment III-V and half of VI yellow; abdominal segment X usually 58-73 microns long, the sides slightly concave……..***T. physapus*** Linnaeus
– Antennal segment III-V white; abdominal segment X usually 69-80 microns long, the sides straight……...***T. pelikani*** Schliephake
19. Antennae 8–segmented (Fig. 49); abdominal tergite II with four lateral marginal setae……..***T. vuilleti*** (Bagnall)
– Antennae 7–segmented; abdominal tergite II with three lateral marginal setae.....***T. mareoticus*** (Priesner)
20. Abdominal tergite II with four lateral marginal setae (Fig. 23)……21
– Abdominal tergite II with three lateral marginal setae……...22
21. Abdominal tergite VIII with complete posteromarginal comb……..***T. flavus*** Schrank
– Abdominal tergite VIII with posteromarginal comb only laterally.....***T. fuscipennis*** Haliday
22. Abdominal tergite VIII with posteromarginal comb laterally (Fig. 25).....***T. major*** Uzel
– Abdominal tergite VIII with complete posteromarginal comb…….....23
23. Abdominal tergite IX with two pair of campaniform sensilla……..***T. dubius*** Priesner
– Abdominal tergite IX with one pair of campaniform sensilla (Fig. 46)…….24
24. Forewings first vein with 4–7 distal setae; abdominal pleurotergites with rows of ciliate microtrichia……...***T. tabaci*** Lindeman
– Forewings first vein with at most three distal setae; abdominal pleurotergal sculpture different, without closely spaced rows of microtrichia……...25
25. Macropterous or micropterous (Fig. 36); body yellow…….***T. nigropilosus*** Uzel
– Macropterous; body dark brown……..***T. euphorbiae*** Knechtel

Key to *Thrips* species (males) in Iran (excluding *T. alavii* and *T. fraudulentus* for which males are not known)

1. Abdominal sternites with at least one pair of discal setae (Figs. 53–54, 56)…….2
– Abdominal sternites without discal setae (Figs. 55, 57–58)……...17
2. Abdominal sternites III–VII with pore plate (Fig. 58)……..3
– Abdominal sternites III–VI or III–V with pore plate……..15
3. Pronotum with two pairs of long setae on anterior margin (same as *Frankliniella*).....***T. verbasci*** (Priesner)
– Pronotum with short setae on anterior margin……4
4. Most pleurotergites with at least one discal setae……5
– All pleurotergites without discal setae…….9
5. Micropterous (Figure 37); abdominal tergite VIII with comb of a few microtrichia laterally; setae S1 on tergite IX situated anterior to S2, between campaniform sensilla, subequal in length to S2 and slightly closer

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together than to S2 (cf. Fig 60)……..***T. alliorum*** (Priesner)
– Macropterous; other above characters variable……...6
6. Antennae 7–segmented; body yellow……***T. pillichi*** Priesner
– Antennae 8–segmented; body brown to dark……7
7. Forewing first vein with 5–11 distal setae……***T. atratus*** Haliday
– Forewing first vein with 3 or rarely 4 distal setae……8
8. Body brown to dark brown…….....
.....***T. vulgatissimus*** Haliday
– Body yellow……...***T. trybomi*** (Karny)
9. Forewing first vein with 4 or more distal setae……..10
– Forewing first vein with 3 distal setae…...12
10. Antennae 8–segmented……
……***T. simplex*** (Morison)
– Antennae 7–segmented……11
11. Abdominal tergite IX setae S1 as length as S2; tergite VIII with incomplete posteromarginal comb…..***T. angusticeps*** Uzel
– Abdominal tergite IX setae S1 slightly longer than S2; posteromarginal comb absent on tergite VIII……***T. coloratus*** Schmutz
12. Abdominal tergite II with four lateral setae; MCS present; abdominal sternites with discal setae laterally and posterior to pore plate (Fig. 56)……...***T. hawaiiensis*** (Morgan)
– Abdominal tergite II with three lateral setae; MCS absent; abdominal sternites with discal setae laterally to pore plate……13
13. Body yellow……***T. physapus*** Linnaeus
– Body brown to dark brown……...14
14. Median metanotal setae short (less than 35 microns); antennal segments IV & V pale yellow or white, VI largely yellow, only apical 1/5th light brown…….....
.....***T. pelikani*** Schliephake
– Median metanotal setae long (about 50 microns); antennal segments IV & V yellow basally, distally brown, segment VI brown, except basal 1/3rd yellow…….....
.....***T. trehernei*** Priesner
15. Abdominal sternites III–VI with pore plate; antennal segment I brown to dark brown, usually darker than II……16
– Abdominal sternites III–V (or IV) with pore plate; antennal segment I yellow or pale brown, usually as pale as II…….....***T. minutissimus*** Linnaeus
16. Antennae 8–segmented; MCS present……***T. meridionalis*** (Priesner)
– Antennae 7–segmented; MCS absent……***T. mareoticus*** (Priesner)
17. Abdominal sternites III–VII with pore plate (Fig. 58)……18
– Abdominal sternites III–V with pore plate (Fig. 57)……***T. tabaci*** Lindeman
18. Micropterous or brachypterous; pore plate sometimes very strongly, transversely elongated; MCS absent; abdominal tergite VIII with complete and long comb…….....***T. nigropilosus*** Uzel
– Macropterous; other above characters variable……19
19. MCS present……..***T. fuscipennis*** Haliday
– MCS absent……...20
20. Body brown; antennal segment I brown to dark brown……21
– Body yellow, or pale brown; antennal segment I white……22
21. Antennal segment V comparatively slender, 2.0–2.1 times the length as its width; pronotum and abdominal tergite IX with brown to dark brown setae (Fig. 59).....***T. dubius*** Priesner
– Antennal segment V comparatively stout, 1.5–1.7 times the length as its width; pronotum and abdominal tergite IX with pale setae……***T. euphorbiae*** Knechtel

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22. Abdominal tergite II with three lateral setae……***T. major*** Uzel
– Abdominal tergite II with four lateral setae……..23
23. Antennae 8–segmented; forewing first vein with four distal setae; body brown to dark brown……...***T. vuilleti*** Bagnall
– Antennae 7–segmented; forewing first vein with three distal setae; body yellow.....***T. flavus*** Schrank

Note. Known Iranian male *Thrips* species have pore plates on abdominal sternites as follows: on sternites III–V (or IV): *T. minutissimus*; on sternites III–V: *T. tabaci*; on sternites III–VI: *T. mareoticus* and *T. meridionalis*; and the remaining species with pore plates on sternites III–VII.]

Thrips alavii **Mirab-balou, Tong & Chen, sp. n.**
(Figures 1, 7, 8, 13, 24, 30, 42)

Material studied. Holotype female (in ZJUH), Iran**:** Eberu (N 48° 55', E 34° 71', 2345 m. ASL), Hamedan Province, from *Euphorbia* sp., 8.vi.2009, Coll. M. Mirab-balou.

Description
Female macropterous. Body length ~1.5 mm. Body dark brown; antennal segment III, apex of II, distal of IV and V yellowish brown, the rest uniformly brown to dark brown (Figure 30); tarsi pale brown; fore femora yellowish brown, except laterally; body setae dark brown; forewings and clavus pale (Figure 7).

Measurements (Slide-mounted specimens). Distended body length 1500. Head: length 170, width 120; ocellar setae III 38, II 20. Compound eyes: dorsal length 53, dorsal width 40; distance between compound eyes 53. Pronotum: median length 190, median width 125; posteroangular setae I–II 55. Forewings: length 740, hind wing 640. Abdominal tergite IX: median length 70; tergite X median length 60. Ovipositor 210. Antennal segments I to VIII had a length (width) as follows: 17 (18), 26 (16), 35 (14), 30 (11), 25 (11), 38 (11), 6 (5), and 9 (4).

Head. The head was 1.5 times as wide as it was long (Figure 1). The cheeks were convex, with two pairs of ocellar setae; pair III was situated outside of the ocellar triangle, and without sculpture between ocelli. Ocellar setae pair III was situated outside of ocellar triangle, behind the front ocellus. Postocular setae I & III were a little longer than others (Figure 1). The antennal was 8–segmented, with forked sense cones on antennal segments III & IV (Figure 30). Segment VI was longer than others. Antennal segments I to VIII had a length/width as follows: 0.94, 1.65, 2.66, 2.62, 2.25, 3.6, 1.5 and 2.

Thorax. The pronotum was 1.6 times as wide as it was long, (Figure 8); two pairs of long posteroangular setae were present; posterior margin with three pairs of setae; at least 30–33 discal setae were present. Mesonotum with median setae far from the posterior margin; metanotum longitudinally striate (but a little more broadly striate than *T. vulgatissimus*), MCS was absent; median pair of setae were situated at the anterior margin. Mesofurca with spinula. Forewings first vein with three setae on the distal half, second vein with complete row of setae (Figure 7).

Abdomen. Abdominal tergites II–VIII without sculpture medially, and the median setae were small and wide apart; tergite II with 3 lateral marginal setae; tergites V–VIII with paired ctenidia laterally, on VIII posteromesad to spiracle; the comb on the

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posterior margin of tergite VIII was complete and long (Figure 24); pleurotergites with discal setae (Figure 13); tergite IX with two pairs of campaniform sensilla; tergite X with median slit at apex; sternites II–VII with discal setae arranged in one row (Figure 42), II with one, and III–VII with 9–11 discal setae; sternite II with two pairs of posteromarginal setae, III–VII with 3 pais; setae S1 on sternite VII arising just in front of margin. The ovipositor was well developed.

Male. Unknown.

Remarks. This new species is similar to *T. vulgatissimus*, but it is readily distinguished from the latter by the following characters: MCS absent (vs. present in *T. vulgatissimus*); metanotal median setae situated at anterior margine (vs. far behind anterior margin in *T. vulgatissimus*); abdominal sternites II–VII with discal setae that arranged in single row (vs. arranged in irregular double row in *T. vulgatissimus*). It is also distinguished from *T. alliorum* by the following character states: metanotal median setae situated near anterior margin (vs. behind anterior margin in *T. alliorum*); abdominal tergite VIII with complete comb on posterior margin (vs. may appear absent or represented by a few microtrichia laterally in *T. alliorum*); head broader than length, and postocular setae arranged in one row (vs. head elongate, and median postocular setae situated far behind rest of row in *T. alliorum*).

Etymology. This species is named in honor of Eng. Jalil Alavi of the Agricultural & Natural Resources Research Center of Khorasan–e–Shomali province, Bojnourd–Iran.

Hosts. *Euphorbia* sp. (family Euphorbiaceae).

Distribution. Iran: Hamedan Province.

***Thrips alliorum* (Priesner) (New record)**

Taeniothrips alliorum Priesner 1935: 128–129.
Taeniothrips carteri Moulton 1937: 183–184.
Thrips alliorum (Priesner): Bhatti 1978: 195; Palmer 1992: 39–40; Han 1997: 287-289.

This species was identified based on the descriptions by Palmer (1992), Nakahara (1994), and Han (1997), and is recorded here for the first time in Iran. This species is easily distinguished from other Iranian species by having an elongate head and median postocular setae situated far behind rest of row (Figure 2).

Material examined. 1,♀, Iran: Heydareh (N 48° 46', E 34° 80', 1968 m. ASL), Hamedan Province, from leek, 16.viii.2010, Coll. M. Mirab-balou; 1 ♀, Heydareh, Hamedan Province, from garlic, 27.vii.2010, Coll. M. Mirab-balou; deposited in the ZJUH.

Distribution. Iran: Hamedan Province; China, Korea, Japan, Manchuria, Hawaii (Palmer 1992; Mirab-balou et al. 2011).

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Table 1. Some important characteristics of Iranian *Thrips* species. a) Discal setae on abdominal sternites: absent 0; present on sternites III–VII 1; present on sternites III–VI 2. b) Discal setae on pleurotergites: absent 0; present 1. c) Distal setae on forewing first vein. d) Number of setae on lateral tergite II. e) MCS: absent 0; present 1. f) Median metanotal setae: situated behind anterior margin 0; situated anterior at margin 1. g) Number of antennal segments. h) Abdominal tergite VIII posteromarginal comb: absent 0; present 1; only laterally 2. i) Position of Ocellar setae III/ocellar triangle: outside 0; inside 1.

Species	a	b	c	d	e	f	g	h	i
T. alavii **sp. n.**	1	1	3	3	0	1	8	1	0
T. alliorum	1	1	3	3	0	0	8	0	0
T. angusticeps	1	0	5–10	3	0	0	7	0	0
T. atratus	1	1	5–9	3	1	1	8	1	0
T. coloratus	1	0	3	4	1	0	7	1	0
T. dubius	0	0	2–4	3	0	1	7	1	0
T. euphorbiae	0	0	3	3	0	0	7	1	0
T. flavus	0	0	3	4	0–1	0	7–8	1	1
T. fraudulentus	1	1	5–8	3	1	1	8	1	0
T. fuscipennis	0	0	3	4	0	0	7	2	0
T. hawaiiensis	1	0	3	4	1	1	7–8	1	0
T. major	0	0	3	3	0	0	7	2	0
T. mareoticus	2	0	3	3	0	1	7	1	0
T. meridionalis	1	1	3	3	1	1	8	1	0
T. minutissimus	1	1	5	4	0	0	7	1	0
T. nigropilosus	0	0	3	3	0	0	7	1	0
T. pelikani	1	0	3	3	0	1	7	1	0
T. physapus	1	0	3	3	0	1	7	1	0
T. pillichi	1	1	3	3	0	0	7	1	0
T. simplex	1	0	5–10	3	0	0	8	1	1
T. tabaci	0	0	4–7	3	0	0	7	1	1
T. trehernei	1	0	3	3	0	1	7	1	0
T. trybomi	1	1	3	3	1	1	8	1	0
T. verbasci	1	1	5	3	1	0	8	1	0
T. vuilleti	2	0	3,4	4	0	0	8	1	0
T. vulgatissimus	1	1	3	3	1	1	8	1	0

Table 2. Distribution of *Thrips* species recorded from Iran.

Thrips species	World distribution	Distribution in Iran (*first record for each province)
T. alavi Mirab-balou, Tong & Chen, **sp. n.**	Iran	Hamedan*
T. alliorum (Priesner 1895)	China, Korea, Japan, Manchuria, Hawaii	Hamedan*
T. angusticeps Uzel 1895	Western Europe, Turkey, Egypt, Morocco, Canary Islands	Kerman, Hamedan*, Kermanshah*
T. atratus Haliday 1836	China, Korea, Mongolia, Turkey, Cyprus, Europe, USA, Canada	Khorasan–e–Shomali, Golestan, Tehran, Markazi, Kerman, Yazd, Hamedan*, Kermanshah*, Kordestan*, Mazandaran*, Zanjan*
T. coloratus Schmutz 1913	China, Korea, Japan, Nepal, India, Pakistan, Sri Lanka, Indonesia, New Guinea, Australia	Tehran
T. dubius Priesner 1927	Hungary, Austria	Alborz, Hamedan*
T. euphorbiae Knechtel 1923	Georgia, Turkey, Romania, Bulgaria, Hungary, Czech Republic, Germany, Switzerland	Fars, Hamedan*
T. flavus Schrank 1776	China, Korea, Japan, Europe, North America	Khorasan–e–Shomali, Hamedan*
T. fraudulentus (Priesner 1954)	Iran	Fars, Hamedan*, Qazvin*
T. fuscipennis Haliday 1836	China, Turkey, Russia, Europe, USA, Canada	Mazandaran
T. hawaiiensis (Morgan 1913)	Widespread across Asia and the Pacific Islands, also Jamaica, Northern Australia and southern and eastern USA	Isfahan, Hamedan*
T. iranicus Yakhontov 1951	Iran	Kerman
T. major Uzel 1895	China, Mongolia, Turkey, Europe, Morraco	Khorasan–e–Shomali, Golestan, Khuzestan, Tehran, Fars, Kerman, Mazandarn, Hamedan*, Alborz*
T. mareoticus (Priesner 1932)	Turkey, Cyprus, Israel, Egypt, Morocco, Germany	Azarbaijan–e–Sharghi, Hamedan*
T. meridionalis (Priesner 1926)	Georgia, Armenia, Turkey, Cyprus, Lebanon, Israel, South Ukraine, Europe, Northern India, Iraq	Khorasan–e–Shomali, Golestan, Fars, Khuzestan, Lorestan, Tehran, Markazi, Kerman, Yazd, Mazandaran, Hamedan*, Alborz*, Kermanshah*, Zanjan*
T. minutissimus Linnaeus 1758	Europe, Georgiya	Golestan, Mazandaran, Khorasan–e–Shomali, Fars
T. nigropilosus Uzel 1895	China, Japan, Turkey, USSR, Egypt, Ethiopia, Kenya, Tanzania, Australia, Europe, Fiji, Hawaii, New Zealand, Canada, USA	Khuzestan, Khorasan–e–Shomali, Guilan, Hamedan*
T. pelikani Schliephake 1964	Turkey, Romania, Greece	Alborz
T. physapus Linnaeus 1758	Europe, Morocco, Siberia, Mongolia	Teharan, Markazi, Khorasan–e–Shomali, Hamedan*, Zanjan*, Kordestan*, Qazvin*
T. pillichi Priesner 1924	China, Turkey, Ukraine, Romania, Slovakia, Hungary, Germany, France, England, Austria, Spain, Netherland	Khorasan–e–Shomali, Tehran, Markazi, Kerman
T. pistaciae Yakhontov 1951	Iran	Kerman
T. simplex (Morison 1930)	Worldwide distributed	Tehran
T. tabaci Lindeman 1889	Across all the countries	widespread
T. trehernei priesner 1927	China, Turkey, North America, Europe, Australia	Khorasan–e–Shomali, Isfahan, Kerman, Markazi, Qazvin, Tehran, Hamedan*
T. trybomi (Karny 1908)	Europe	Fars
T. verbasci (Priesner 1920)	Europe	Khorasan–e–Shomali
T. vuilleti (Bagnall 1933)	Syria, Turkey, Cyprus, Bulgaria, Greece, Italy, South France, Spain	Khorasan–e–Shomali, Khuzestan, Lorestan, Alborz, Azarbaijan–e–Gharbi, Azarbaijan–e–Sharghi, Guilan, Tehran, Hamedan*, Kordestan*, Kermanshah*, Qazvin*
T. vulgatissimus Haliday 1836	China, New Zealand, Europe, North America	Tehran, Markazi, Hamedan*, Kermanshah*, Zanjan*, Khorasan–e–Shomali*

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Table 3. Plants in Iran associated with the genus *Thrips* (based on present study and data taken from Iranian literature).

Host plants		*Thrips* species																							
Family	Scientific name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Agavaceae	*Yucca* sp.											+													
Amaranthaceae	*Kochia scoparia*					+	+																		
	Chenopodium album													+					+						
Amaryllidaceae	*Allium cepa*								+												+				
	Allium ampeloprasum subsp. *porrum*		+						+												+				
	Allium sativum													+							+				
Anacardiacaea	*Pistacia* sp.																			+					
Apiaceae	*Narthex assafoetida*																		+						
	Carum carvi																	+							
	Conium maculatum													+											+
	Coriandrum sativum																	+							
	Daucus carota																								
	Foeniculum vulgare				+									+											
	Heracleum persicum													+											
Asteraceae	*Achillea millefolium*				+	+								+											
	Anthemis cotula												+	+				+	+						+
	Artemisia dracunculus				+																				
	Aster sp.																							+	
	Carthamus sp.																							+	
	Centaurea repens																	+						+	
	Chrysanthemum sp.					+								+	+										
	Cichorium intybus																							+	
	Cnicus sp.																	+							
	Cynara cardunculus																							+	
	Echinacea purpurea															+									
	Echinops sphaerocephalus																							+	
	Grindelia camporum															+									
	Gundelia sp.													+											
	Helianthus annuus													+											+
	Hieracium sp.																+								
	Leucanthemum vulgare																							+	
	Onopordum sp.																							+	
	Taraxacum officinale			+										+				+							+
	Tragopogon porrifolius			+														+							
	Xanthium spinosum																	+							
Boraginaceae	*Anchusa officinalis*				+									+											
	Echium vulgare													+				+							
Buxaceae	*Buxus* sp.																		+						
Brassicaceae	*Brassica napus*													+											
	Capsella bursa-pastoris													+				+							
	Cardaria draba			+	+				+			+		+				+							+
	Crambe orientalis			+																					
	Erysimum cheiranthoides			+							+			+				+			+			+	+
	Lepidium draba													+											
	Matthiola sp.									+															
	Raphanus raphanistrum													+											
	Raphanus sativus				+									+											
	Sinapis arvensis													+											+
	Sisymbrium irio			+								+		+				+			+				+
	Thlaspi arvense																	+							
Caprifoliaceae	*Lonicera maackii*													+											
	Valeriana officinalis													+											
Caryophyllaceae	*Lychnis officinalis*				+				+																
	Vaccaria hispanica				+																	+			
	Acanthophyllum sp.											+													
Convolvulaceae	*Convolvulus arvensis*													+				+							+
Cucurbitaceae	*Cucumis melo*													+				+							
	Cucumis sativus													+				+							

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Elaeagnaceae	*Elaeagnus angustifolia*												+												
Euphorbiacea	*Euphorbia* spp.	+		+		+	+						+												+
Fabaceae	*Lathyrus odoratus*												+												+
	Medicago sativa				+				+				+												+
	Melilotus officinalis												+												+
	Onobrychis sp.												+												+
	Robinia pseudoacacia												+												
	Coronilla varia												+												
	Trifolium spp.												+				+								
	Trigonella sp.												+												+
	Vicia villosa												+				+								
Fagaceae	*Quercus alba*													+											
Hypericaceae	*Hypericum perforatum*				+										+										
Iridaceae	*Iris germanica*												+												+
Ixioliriaceae	*Ixiolirion tataricum*												+												
Lamiaceae	*Marrubium vulgare*												+												+
	Mentha spp.				+										+										
	Salvia nemorosa				+				+				+				+							+	
	Thymus sp.				+								+				+								+
Malvaceae	*Althaea* sp.				+																				+
	Althaea officinalis				+																				
	Gossypium hirsutum										+														
Oleaceae	*Forsythia suspensa*												+												
	Ligustrum ovalifolium										+														
Papaveraceae	*Papaver rhoeas*			+						+			+							+					
	Fumaria officinalis				+																				
Plantaginaceae	*Plantago coronopus*												+		+										
	Plantago major												+												
	Veronica officinalis										+														
Poaceae	*Alopecurus pratensis*				+																				
	Cynodon dactylon										+		+				+								+
	Hordeum spp.			+	+								+	+											
	Lolium multiflorum												+												
	Oryza sativa											+													
	Poa spp.																+								
	Setaria viridis										+														
	Triticum aestivum			+	+						+		+	+										+	+
Ranunculaceae	*Ranunculus acris*										+						+								+
Rosaceae	*Chaenomeles japonica*												+												
	Crataegus sp.										+														
	Cydonia oblonga				+																				
	Malus pumila												+												+
	Sanguisorba minor										+														
	Prunus amygdalus				+								+												+
	Prunus cerasus							+																	
	Prunus persica																								
	Pyrus communis				+																				
	Rosa spp.										+		+				+								+
	Spiraea sp.										+														
Scrophulariaceae	*Verbascum virgatum*								+				+									+	+		+
Typhaceae	*Typha latifolia*										+														
Verbenaceae	*Verbena officinalis*				+																				
Vitaceae	*Vitis vinifera*				+					+															

(1) *T. alavii* sp. n.; (2) *T. alliorum*; (3) *T. angusticeps*; (4) *T. atratus*; (5) *T. dubius*; (6) *T. euphorbiae*; (7) *T. flavus*; (8) *T. fraua*
fuscipennis; (10) *T. hawaiiensis*; (11) *T. major*; (12) *T. mareoticus*; (13) *T. meridionalis*; (14) *T. minutissimus*; (15) *T. nigropilos*
pelikani; (17) *T. physapus*; (18) *T. pillichi*; (19) *T. pistaciae*; (20) *T. trehernei*; (21) *T. trybomi*; (22) *T. verbasci*; (23) *T. vuilleti*;
vulgatissimus. * *Thrips tabaci*: Polyphagous. * *Thrips iranicus*: May be *Pistacia* spp. * *Thrips simplex*, *T. coloratus*: Unknown

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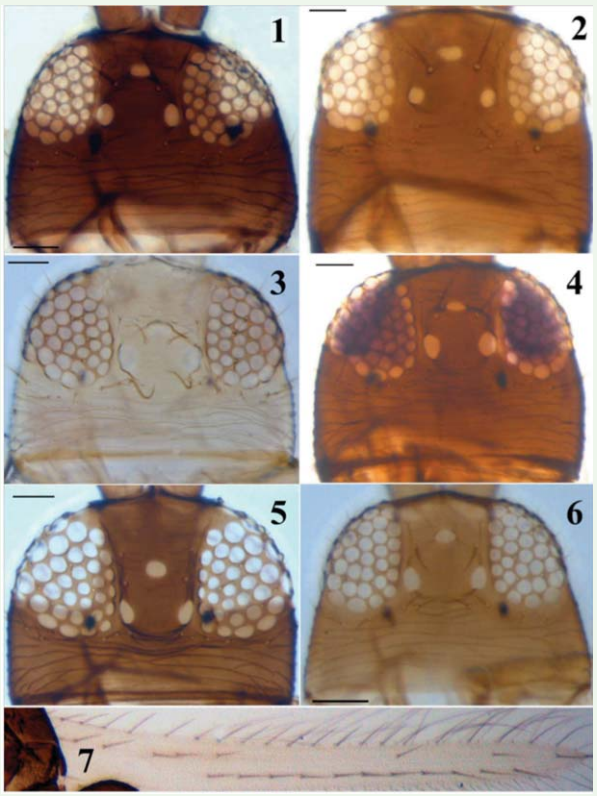
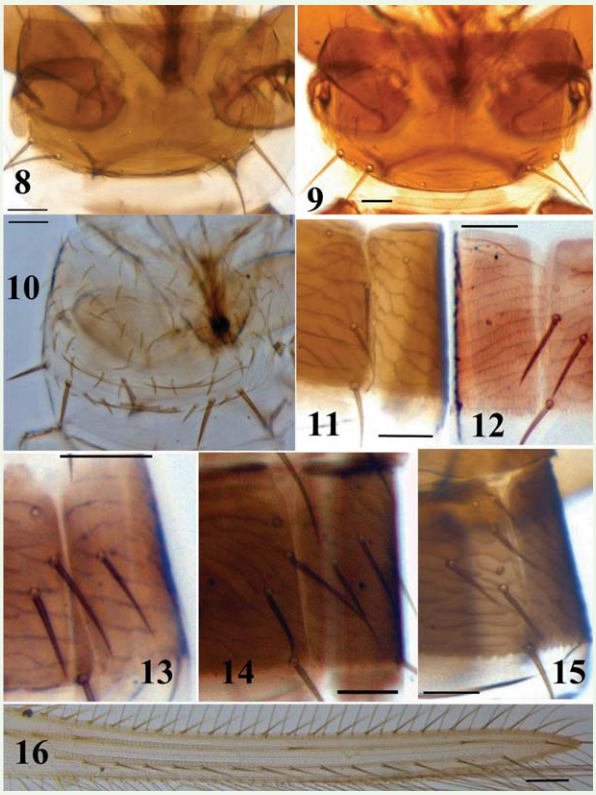
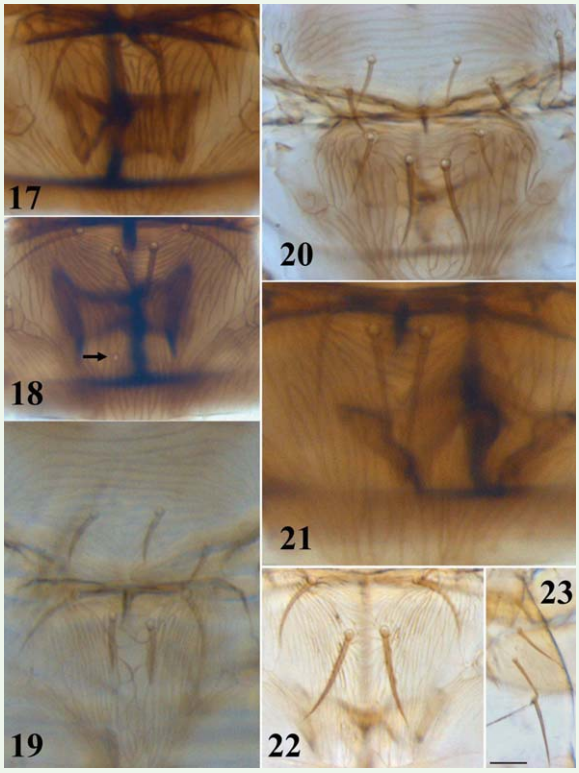


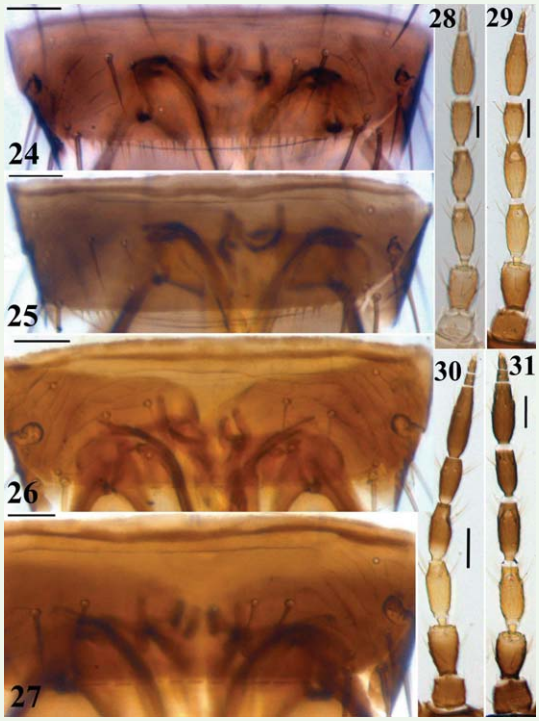
Figures 1-7. *Thrips* species. 1–6: Head: (1) *T. alavii* sp. n., (2) *T. alliorum*, (3) *T. flavus*, (4) *T. meridionalis*, (5) *T. physapus*, (6) *T. pillichi*; (7) *T. alavii* sp. n., forewing. (Scale bar = 30 microns). High quality figures are available online.



Figures 8-16. *Thrips* species. 8–9: Pronotum: (8) *T. alavii* sp. n., (9) *T. alliorum*, (10) *tabaci*; 11–15: Abdominal tergite and pleurotergite: (11) *T. alliorum*, II, (12) *T. tabaci*, V, (13) *T. alavii* sp. n., III, (14) *T. meridionalis*, V, (15) *T. hawaiiensis*, II; (16) *T. meridionalis*, forewing. (Scale bar = 30 microns). High quality figures are available online.



Figures 17-23. *Thrips* species. 17–22: Metanotum and meso– and metanotum: (17) *T. physapus*, (18) *T. meridionalis*, (19) *T. tabaci*, (20) *T. nigropilosus*, (21) *T. trehernei*, (22) *T. flavus*; (23) *T. flavus*, tergite II. (Scale bar = 30 microns). High quality figures are available online.



Figures 24-31. *Thrips* species. 24–27: Abdominal tergite VIII: (24) *T. alavii* sp. n., (25) *T. major*, (26) *T. angusticeps*, (27) *T. alliorum*; 28–31: Antennae: (28) *T. major*, (29) *T. physapus*, (30) *T. alavii* sp. n., (31) *T. alliorum*. (Scale bar = 30 microns). High quality figures are available online.

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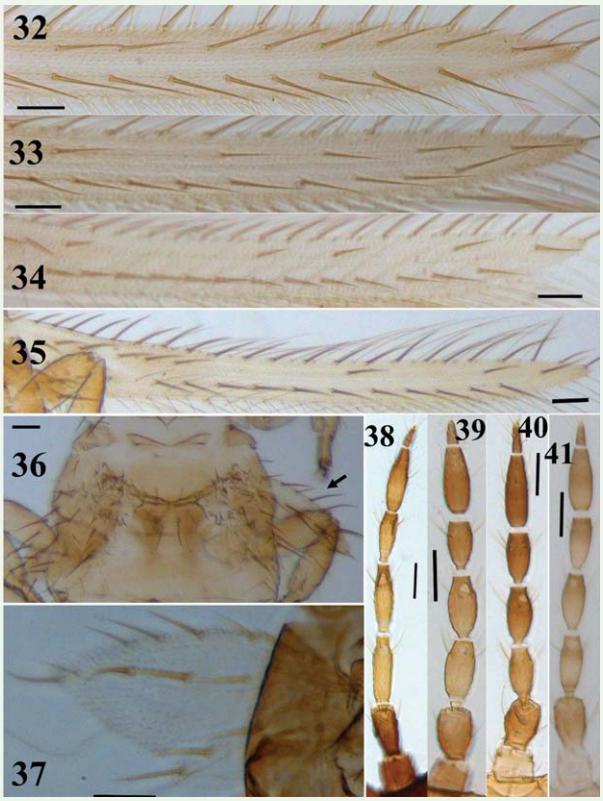
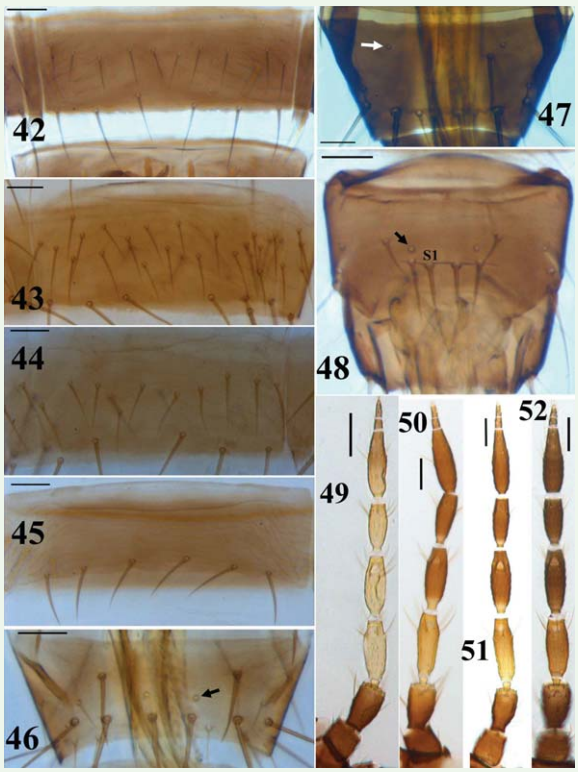
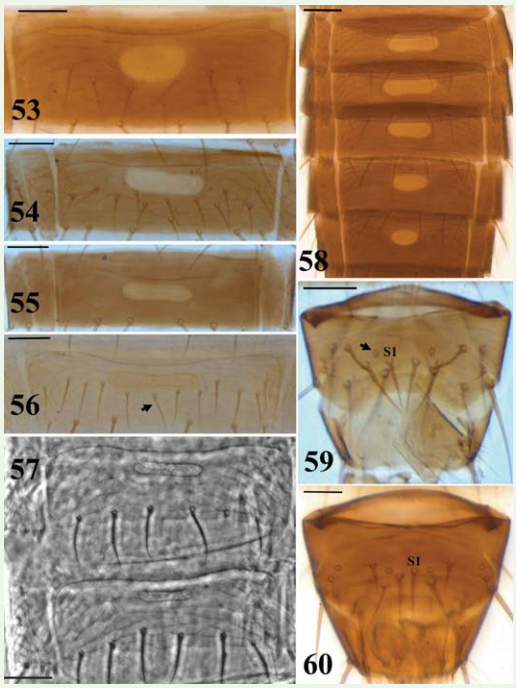


Figures 32-41. *Thrips* species. 24–27: Abdominal tergite VIII: (24) *T. alavii* sp. n., (25) *T. major*, (26) *T. angusticeps*, (27) *T. alliorum*; 28–31: Antennae: (28) *T. major*, (29) *T. physapus*, (30) *T. alavii* sp. n., (31) *T. alliorum*. (Scale bar = 30 microns). High quality figures are available online.



Figures 42-52. *Thrips* species. 42–45: Abdominal sternite: (42) *T. alavii* sp. n., VII, (43) *T. atratus*, VII, (44) *T. fraudulentis*, VII, (45) *T. tabaci*, VI; 46–47: Abdominal tergite IX: (46) *T. tabaci*, (47) *T. trehernei*; (48) *T. physapus*, abdominal tergite IX, male; 49–52: Antennae: (49) *T. vuilleti*, (50) *T. meridionalis*, (51) *T. vulgatissimus*, (52) *T. hawaiiensis*. (Scale bar = 30 microns). High quality figures are available online.



Figures 53-60. *Thrips* species. 53–58: Pore plate on abdominal sternite: (53) *T. meridionalis*, VI, (54) *T. atratus*, VII, (55) *T. dubius*, VII, (56) *T. hawaiiensis*, VI, (57) *T. tabaci*, IV–V, (58) *T. major*, III–VII; 59–60: Abdominal tergite IX, male: (59) *T. dubius*, (60) *T. meridionalis*. (Scale bar = 30 microns). High quality figures are available online.

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