

## Thrips (Thysanoptera) species associated with wheat and barley in Golestan province, Iran

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### Abstract

Fields of winter wheat and barley were sampled during two years (November to June 1996-1998) in Golestan province to determine the occurrence, frequency and distribution of thrips species. A total of 32 species belonging to 3 families and 16 genera were found. *Haplothrips tritici* (Kurdjumov) was the dominant species accounting for 70.2% and 55.7% of identified individuals in wheat and barley, respectively. *Sitothrips arabis* Priesner was the second most abundant species, comprising 13.5% and 20.1% in wheat and barley, respectively. Regression analysis showed a non-linear relation ( $y = 42.65 + 0.33x - 0.0002x^2$ ) between altitude ( $x$ ) and population density of *H. tritici* ( $y$ ) on wheat. Locality and date of collection, host(s) and distribution data for each species are given.

**Key words:** Thysanoptera, thrips, wheat, barley, Golestan province, Iran

### چکیده

به منظور شناسایی گونه‌های تریپس مزارع گندم و جو و تعیین فراوانی و پراکنش آنها، از مزارع گندم و جوی زمستانه‌ی استان گلستان در طول سال‌های ۱۳۷۵ و ۱۳۷۶ نمونه برداری به عمل آمد. در مجموع ۳۲ گونه از ۳ خانواده و ۱۶ جنس شناسایی گردید. در این میان تریپس گندم، *Haplothrips tritici* (Kurdjumov) با فراوانی ۷۰/۲٪ و ۵۵/۷٪، به ترتیب روی گندم و جو، در بین تریپس‌های شناخته شده دارای بیشترین فراوانی بود و به عنوان گونه‌ی غالب تعیین شد. پس از آن گونه‌ی *Sitothrips arabis* Priesner با فراوانی ۱۳/۵٪ و ۲۰/۱٪ با همان ترتیب، بعد از تریپس گندم دارای بیشترین فراوانی بود. آنالیز رگرسیونی وجود یک رابطه‌ی غیرخطی ( $y = 42.65 + 0.33x - 0.0002x^2$ ) بین جمعیت تریپس گندم ( $y$ ) و ارتفاع ( $x$ ) را ثابت نمود. اطلاعات مربوط به محل و تاریخ جمع‌آوری، میزبان و پراکنش برای هر گونه ذکر شده است.

**واژگان کلیدی:** بال ریشکداران، تریپس، گندم، جو، استان گلستان، ایران

### Introduction

Thrips are minute, slender-bodied insects 0.5–5.0 mm in length (some tropical species are nearly 14 mm in length). A great many of thrips are plant feeders. They attack flowers, leaves, fruits, twigs, or buds on various types of plants and destroy plant cells by their feeding, and some species act as vectors of plant diseases. Many species are serious pests of cultivated plants. Many species of thrips feed on fungus spores, and a few are predaceous on other small arthropods. These insects sometimes occur in enormous numbers, and a few species may bite people (Borror *et al.*, 1998).

The thrips species living on cereals may be differently attracted on vegetative or generative parts of their host plants. The most important thrips species in the world damaging ears of wheat and barley are *Haplothrips aculeatus* (Fabricius), *Haplothrips tritici*

(Kurdjumov) and *Limothrips cerealium* (Haliday). *H. aculeatus* is a species of wide ecological plasticity. It forms populations with notable individual numbers in cooler zones of Europe. *L. cerealium* is a species of Holarctic distribution. It is a characteristic wheat thrips of the western and northwestern regions of Europe, the Atlantic zone with its well-balanced weather conditions and the maritime climate in general are especially favorable for this species. In the Mediterranean zone, *L. cerealium* and *H. tritici* are damaging together. *H. tritici* produces populations that are seriously damaging in the maritime eastern and southeastern parts of the Palaearctic with hot summer (Czencz, 1994). In Iran, *H. tritici* is the common species on wheat and barley, *H. aculeatus* has only been reported from north and center areas, and *L. cerealium* is unknown.

The first report of thrips on wheat in Iran was given by Davatchi in 1949. He found *H. tritici* on wheat from the vicinity of Tehran (Tehran province), Yazd (Yazd province), Rafsanjan and Kerman (both in Kerman province). Farahbakhsh (1961) reported *Frankliniella intonsa* (Trybom) on various crops, especially wheat and barley with a generally distribution. Cheraghian (1996) in a faunistic study of Thysanoptera in Ahwaz (Khuzestan province) found 9 species on wheat and barley. Kheyrandish Koshkoie (2000) reported *Haplothrips reuteri* (Karny), *Melanthrips pallidior* Priesner and *Sitothrips arabicus* on wheat, and *H. tritici* on both wheat and barley from Kerman province. Kamangar & Radjabi (2000) and Bagheri & Radjabi (2000) mentioned *H. tritici* on wheat in Kordestan and Isfahan provinces, respectively. Alavi (2000) listed 34 species taken on wheat and barley in Golestan province, including 11 species new for the fauna of Iran. He also collected 9 species in a preliminary study on olive trees in Golestan province, including 1 new species for the fauna of Iran (Alavi, 2004). Takalloozadeh & Zohdi (2000) studied the biology of *H. tritici* in Kerman province. Minaei & Alich (2001) collected *H. aculeatus* (Fabricius) and *H. tritici* on wheat, and *Haplothrips niger* (Osborn) on barley from Shiraz region (Fars province). Minaei *et al.* (2001) reported *Aeolothrips collaris* Priesner, *Rhipidothrips graciosus* Uzel, *Melanthrips fuscus* (Sulzer) on wheat, and *Aeolothrips intermedius* Bagnall on wheat and barley from Fars province. Minaei *et al.* (2002) reported *S. arabicus* on barley from Fars province. Rowshandel (2002) studied the biology and economic importance of *H. tritici* on wheat in Chaharmahal-Bakhtiari province. Alavi & Kamali (2003) collected *M. pallidior*, *S. arabicus*, *H. tritici*, and *H. reuteri* on wheat from Bojnourd region which adjoins the Golestan province. Jafari & Fallahzadeh (2004) reported eight species of thrips on wheat from Lorestan province.

Shekarian & Rajabi (2004) estimated the economic injury level of *H. tritici* on wheat in Lorestan province.

The first record of thrips from Golestan province was given by Davatchi (1949) who reported *Thrips tabaci* Lindeman from the Northern regions of Iran (seashores of Caspian Sea). Bournier & Couiloud (1959) reported *Frankliniella schultzei* (Trybom) from Gorgan on cotton (Mortazawiha & Dern, 1977). Mortazawiha & Dern (1977) listed 26 species from several parts of Iran, of which 7 species were from Gorgan, and *F. intonsa* was reported on *Triticum* spp. Gilasian *et al.* (2000) reported 26 species on field crops, ornamental plants, and weeds in Gorgan, including 5 species new to Iran fauna. Gilassian (2000) also collected 11 species on wheat and barley. Alavi & zur Strassen (2002) found 14 species on soybean in Golestan province including records of 2 species new for Iran.

In a division of Mazandaran province in 1997, Golestan province was founded with Gorgan city as its capital. Golestan is one of 30 provinces in Iran now. This province, with an area of 22,033 km<sup>2</sup>, is located in the southeast of Caspian Sea between 36° 44' and 38° 5' north latitude and 53° 51' and 56° 14' east longitude. It is about 1.3% of the total area of the country. It has 270 km international border with Turkmenistan at the north. The eastern extension of Alborz Mountains Range surrounds the coastal plains of the Caspian Sea as a high and long wall, thus all over the province the land slope decreases from the southern and eastern mountains towards the sea, with altitude range between -25 to 3000 m. The climate of the province is under the influence of Alborz Mountains, Caspian Sea, the southern wildernesses of Turkmenistan, and forests. According to De Martonne advanced climate classification system, the province contains five different climates: Mediterranean in center, arid-desert in north, semi-arid in coast, center and northeast, humid in sub-south, and semi-humid in south. In Golestan province, about 589,000 hectares were cultivated in 1997. Wheat, barley, oilseed crops and rice were the main crops with 33.2, 17.8, 29 and 5 percentages of all cultivated areas, respectively. Uncultivated areas are covered with pastures and forests. Wheat and barely are generally grown in a central band with a width of up to 20 km where it extends from low altitude coastal areas in west to high mountains in north and northeast. The band enjoys aforesaid climates except arid-desert (Asadi, 1997).

### Materials and Methods

In order to establish the occurrence of Thysanoptera species associated with cultivated wheat and barley, 55 farms of winter wheat and 27 farms of winter barley were randomly

sampled in different areas of the province during November to June 1996-1998 from the beginning of the vegetation period up to harvesting. Other gramineous and also cyperaceous plants, situated inside and/or around the farms of wheat and barley have been sampled for determining other hosts of dominant species.

Two general techniques were used for collecting thrips: 1- individuals occurring on stages before start of shooting were directly collected on the leaves, 2- beating leaves, sheaths and spikes was used for subsequent stages. A white tray 1080 cm<sup>2</sup> (27×40 cm) was used to catch thrips beaten or jarred on plants.

The relative abundance ( $RA_x$ ) and relative frequency ( $RF_x$ ) for species  $x$  was calculated using following equations (McCloskey *et al.*, 1998):

$$RA_x = \frac{\text{abundant value for species } x}{\text{sum of abundance values for all species}} \times 100$$

$$RF_x = \frac{\text{frequency value of species } x}{\text{sum of frequency values for all species}} \times 100$$

In order to establish the relation between altitude and population of dominant species (*H. tritici*), six non-irrigated wheat farms (variety: 'Tajan' Bow "s"/Nkt) in six different locations with the same climate (semi-arid) and different altitudes (Segher-Yelghi 8m, Ata-Abad 15m, Ouch-Tappeh 19 m, Gonbad 45 m, Maraveh-Tappeh 210 m, Gok-Darreh 750 m) were sampled once a week. A sample of 20 spikes was randomly collected from each site during the boot until harvesting stages in April to June 1998. The spikes were immediately put into polyethylene sacks. In laboratory, adults of wheat thrips were separated and counted in each sample using a stereomicroscope.

Differences in thrips attraction towards wheat and barley were statistically analyzed for dominant species by T-test. Population density data were also subjected to analysis of regression to obtain the regression equation between altitude as independent and pest population as dependent variables, respectively.

Most of collected adult thrips were mounted on microscope slides using Hoyer's medium. The first author collected and mounted all the specimens.

## Results and discussion

A total of 3022 specimens were collected during the two years survey. The determined materials include 32 species belonging to 16 genera. The species names, locality and date of collection, host(s) and distribution data for each species are given as follows. *Underlined*

reference indicates that mentioned species is reported on wheat and/or barley in that reference.

## I. Suborder Terebrantia

### 1. Family Aeolothripidae

#### *Aeolothrips collaris* Priesner

**Material examined** – Gonbad: Dashli-Borun, 20 m, 1♀, on wheat, 12.IV.1997; Incheh-Borun, 10 m, 1♂ 2♀, on barley, 13.V.1998. Gorgan: Shah-Kooh, 2260 m, 3♀, on wheat, 6.VI.1998. Kalaleh: Gok-Darreh, 750 m, 1♂ 4♀, on wheat, 12.V.1997; Maraveh-Tappeh, 210 m, 1♀, on barley, 12.V.1997; Mardom-Darreh, 730 m, 1♂ 3♀, on barley, 27.IV.1998.

**Hosts** – Flowers and leaves of various plants, probably omnivorous; larvae predatory.

**Distribution** – Indo-Mediterranean. In Iran: this species was reported as new species to Iran by Mortazawiha & Dern (1977) from Gorgan (Golestan province) based on one female on *Ricinus communis* L. Fars province (Minaei & Alich, 2000a, b; Minaei *et al.*, 2001), Golestan province (Alavi & zur Strassen, 2002; Alavi, 2004), Isfahan province (Ghahhari & Hatami, 2000), Kerman province (Kheyrandish Koshkoei *et al.*, 2000a; Teraz & Kheyrandish Koshkoei, 2002), Khorasan-e-Shomali province (Alavi & Kamali, 2003), Khuzestan province (Cheragian, 1996; Cheraghian & Hojat, 1998; Bagheri & Mosadegh, 2000; Bagheri *et al.*, 2002; Bagheri *et al.*, 2005b).

#### *Aeolothrips mongolicus* Pelikán

**Material examined** – Agh-Ghala: Agh-Ghala, 5 m, 2♀, on barley, 14.IV.1997; Ata-Abad, 15 m, 1♂ 1♀, on barley, 7.IV.1997; 1♀, on wheat, 16.IV.1997; 2♀, on barley, 12.IV.1998; 1♂ 3♀, on barley, 14.IV.1998; 1♂ 2♀, on wheat, 14.IV.1998; Ghan-Ghermeh, 100 m, 4♀, on barley, 8.IV.1997; Ouch-Tappeh, 19 m, 2♀, on wheat, 14.IV.1998. Gonbad: Bibi-Shirvan, 6♀, on barley, 28.IV.1998; Imer-Mollasari, 13m, 5♀, on barley, 21.IV.1998; Incheh-Borun, 10 m, 1♀, on *Phalaris minor* Retz., 13.V.1998; Oukhi-Tappeh, 15 m, 1♀, on barley, 13.V.1998. Gorgan: Chahar-Bagh, 2180 m, 1♂ 2♀, on wheat, 6.VI.1998; Shah-Kooh, 2260 m, 1♂ 2♀, on barley, 6.VI.1998; 1♂ 3♀, on wheat, 6.VI.1998. Kalaleh: Mardom-Darreh, 730 m, 1♀, on barley, 17.IV.1998.

**Hosts** – *Saxaul* sp., *Nitraria* sp., *Tamarix* sp.

**Distribution** – Eastern Palaearctic. In Iran: this species was reported for the first time in Iran by Cheraghian & Hojat (1998) on *Datura stramonium* L. from Ahwaz (Khuzestan province) (also, Cheraghian, 1996). Golestan province (Alavi, 2004), Khorasan-e-Shomali (Alavi & Kamali, 2003).

#### *Aeolothrips tenuicornis* Bagnall

**Material examined** – Kalaleh: Maraveh-Tappeh, 210 m, 1♀, on barley, 4.V.1998. Gonbad: Oukhi-Tappeh, 15 m, 1♀, on barley, 13.V.1998.

**Hosts** – Flowers of various plants.

**Distribution** – Europe, Near East. In Iran: *A. tenuicornis* was first reported from Iran by Mortazawiha & Dern (1977) who recorded the species from Damavand (Tehran province) based on one female and one male on flowers of *Persica vulgaris* Miller, and also from Ghom (Ghom province) based on one female and one male on *Eruca sativa* Lam. Fars province (Minaei & Alich 2000a, b; Minaei *et al.*, 2001; Minaei *et al.*, 2002), Khuzestan province (Cheraghian & Hojat, 1998; Bagheri *et al.*, 2005b).

#### *Melanthrips knechteli* Priesner

**Material examined** – Gorgan: Shah-Kooh, 2260 m, 1♀, on wheat, 6.VI.1998.

**Hosts** – Flowers of *Cerithe minor* L., *Rosmarinus* sp., *Thymus* sp.

**Distribution** – Mediterranean. In Iran: this species was reported as new record for Iran by Alavi (2000) from Golestan province.

#### *Melanthrips pallidior* Priesner

**Material examined** – Gorgan: Shah-Kooh, 2260 m, 1♀, on wheat, 6.VI.1998. Kalaleh: Gok-Darreh, 750 m, 3♀, on wheat, 12.V.1997.

**Hosts** – Flowers of various plants, preferably Cruciferae.

**Distribution** – Euro-Asian. In Iran: this species was reported as new to the fauna of Iran by Mortazawiha & Dern (1977), from Pahlawidege (previous name of Agh-Ghala, Golestan province) based on three females and one male on *Tulipa gesneriana* L., and also from Ewin (Tehran province) based on one female on flower of *Pyrus communis* L. Kerman province (Kheyrandish Koshkoei, 2000; Kheyrandish Koshkoei *et al.*, 2000a; Teraz & Kheyrandish Koshkoei, 2002), Khorasan-e-Shomali province (Alavi & Kamali, 2003), Khuzestan province (Cheraghian & Hojat, 1998).

***Rhipidothrips brunneus* Williams**

**Material examined** – Agh-Ghala: Agh-Ghala, 5 m, 7♀, on barley, 16.II.1997. Bandar-e-Torkaman: Gharanjik, 7 m, 1♀, on barley, 27.I.1997. Gonbad: Incheh-Borun, 10 m, 3♀, on *Phalaris minor*, 13.V.1998.

**Hosts** – Poaceae.

**Distribution** – Holarctic. In Iran: this species was recorded for the first time in Iran by Hassan-Zadeh Salmasi (1997) on onion from Azarbaijan-e-Sharghi province. Previously Gilasian (2000) has collected this species on wheat from Gorgan (Golestan province). Khuzestan province (Cheraghian, 1996; Cheraghian & Hojat, 1998).

***Rhipidothrips flavus* Tunç**

**Material examined** – Kalaleh: Maraveh-Tappeh, 210 m, 1♀, on wheat, 13.V.1997.

**Hosts** – Poaceae.

**Distribution** – Turkey. In Iran: this species was reported as new record for Iran by Alavi (2000) from Golestan province.

***Rhipidothrips gratiosus* Uzel**

**Material examined** – Agh-Ghala: Ata-Abad, 15 m, 3♀, on wheat, 12.IV.1998; 15♀, on *Avena ludoviciana* Durieu, 22.IV.1998. Ali-Abad: Ali-Abad, 140 m, 5♀, on barley, 14.IV.1998. Kalaleh: Gok-Darreh, 7 m, 1♀, on wheat, 12.V.1997.

**Hosts** – Poaceae.

**Distribution** – West Palaearctic. In Iran: this species was recorded as new species to Iran by Hassan-Zadeh Salmasi (1997) on onion from Azarbaijan-e-Sharghi province as “*gratiosus*”. Fars province (Minaei *et al.*, 2001), Kerman province (Kheyrandish Koshkoei *et al.*, 2000a).

**2. Family Thripidae*****Anaphothrips sudanensis* Trybom**

**Material examined** – Ali-Abad: Ali-Abad, 140 m, 1♀, on wheat, 26.I.1997.

**Hosts** – Poaceae.

**Distribution** – Semi-Cosmopolitan. In Iran: *A. sudanensis* was first reported from Iran by Alavi & Kamali (1995) from Bojnourd region (now in Khorasan-e-Shomali province).

Gilasian (2000) has also collected this species on wheat from Gorgan (Golestan province). Fars province (Minaei & Alich, 2000a; Minaei *et al.*, 2002), Golestan province (Gilasian *et al.*, 2000; Alavi & zur Strassen, 2002), Kerman province (Kheyrandish Koshkoei *et al.*, 2000a; Teraz & Kheyrandish Koshkoei, 2002), Khuzestan province (Behdad, 1996; Cheraghian & Hojat, 1998; Bagheri *et al.*, 2005a).

#### *Aptinothrips rufus* (Haliday)

**Material examined** – Agh-Ghala: Ghan-Ghermeh, 100 m, 2♀, on barley, 8. IV.1997. Ali-Abad: Ali-Abad, 140 m, 3♀, on wheat, 17.IV. 1997; 5♀, on barley, 14.IV.1998. Gonbad: Gonbad, 45 m, 1♀, on barley, 27.II.1997; Imer-Mollasari, 13 m, 2♀, on barley, 21.IV.1998; Oukhi-Tappeh, 15 m, 1♀, on wheat, 13.V.1998. Kord-Kooy: Jahan-Nama, 1300 m, 20♀, on barley, 19.V.1998.

**Hosts** – Poaceae.

**Distribution** – Cosmopolitan. In Iran: this species was reported from Iran for the first time by Mortazawiha & Dern (1977) based on three females collected from Karaj (Tehran province) on *Poa trivialis* L. Previously Gilasian (2000) has collected this species on wheat from Gorgan (Golestan province). Kerman province (Kheyrandish Koshkoei *et al.*, 2000a; Teraz & Kheyrandish Koshkoei, 2002), Khorasan-e-Shomali province (Alavi & Kamali, 2003).

#### *Chirothrips africanus* Priesner

**Material examined** – Gonbad: Oukhi-Tappeh, 15 m, 1♀, on barley, 13.V.1998.

**Hosts** – Poaceae.

**Distribution** – Indo-Mediterranean, North Africa. In Iran: this species was reported as new record for Iran by Alavi (2000) from Golestan province.

#### *Chirothrips manicatus* (Haliday)

**Material examined** – Kalaleh: Maraveh-Tappeh, 210 m, 1♀, on wheat, 24.IV.1997.

**Hosts** – Poaceae.

**Distribution** – Semi-Cosmopolitan. In Iran: this species was reported as new for the fauna of Iran by Alavi & Kamali (1995) from Bojnourd (now in Khorasan-e-Shomali province) based on one female and one male on leaves of *Cynodon dactylon* (L.) (also, Alavi & Kamali, 2003). Kerman province (Kheyrandish Koshkoei *et al.*, 2000a; Teraz &



Kheyrandish Koshkoei, 2002), Khuzestan province (Cheraghian, 1996; Cheraghian & Hojat 1998; Bagheri *et al.*, 2005a), Yazd province (Mohaghegh & Kheyrandish Koshkoei, 2002).

***Chirothrips molestus* Priesner**

**Material examined** – Kalaleh: Gok-Darreh, 750 m, 1♀, on wheat, 12.V.1997. Gorgan: Shah-Kooh, 2260 m, 1♀, on wheat, 6.VI.1998.

**Hosts** – Poaceae.

**Distribution** – Euro-Siberian. In Iran: this species was recorded as new to Iran fauna by Alavi & Kamali (1995) based on one female collected from Bojnourd (now in Khorasan-e-Shomali province) on leaves of *Cynodon dactylon* (also, Alavi & Kamali, 2003). Golestan province (Alavi, 2000).

***Collembolothrips mediterraneus* Priesner**

**Material examined** – Agh-Ghala: Ata-Abad, 15 m, 4♀, on barley, 14.IV.1998; Ghan-Ghermeh, 100 m, 1♀, on barley, 8.IV.1997; Ouch-Tappeh, 19 m, 1♀, on wheat, 14.IV.1998. Gonbad: Dashli-Borun, 20 m, 1♀, on wheat, 8.IV.1997; 1♀, on wheat, 12.IV.1997. Gorgan: Chahar-Bagh, 2180 m, 1♀, on wheat, 6.VI.1998. Kalaleh: Kalaleh, 160 m, 3♀, on wheat, 30.III.1997.

**Hosts** – Poaceae.

**Distribution** – Eastern Mediterranean. In Iran: this species was reported as a new record for Iran by Alavi (2000) from Golestan province.

***Eremiothrips taghizadehi* (zur Strassen)**

**Material examined** – Gonbad: Dashli-Broon, 20 m, 3♀, on wheat, 12.IV.1997; Oukhi-Tappeh, 15 m, 3♀, on barley, 13.V.1998. Kalaleh: Gok-Darreh, 750 m, 1♀, on wheat, 12.V.1997; Kalaleh, 160 m, 3♀, on wheat, 30.III.1997.

**Hosts** – *Dendrostellera lessertii* (Wikstr.).

**Distribution** – Iran. This species was described by zur Strassen (1975) based on two females and one male collected from Ewin (Tehran province) on flowering *D. lessertii*. Khuzestan province (Cheraghian & Hojat, 1998), Tehran province (Mortazawiha & Dern, 1977).

***Eremiothrips tamaricis* (zur Strassen)**

**Material examined** – Gonbad: Oukhi-Tappeh, 15 m, 1♀, on barley, 13.V.1998.

**Hosts** – *Tamarix* sp.

**Distribution** – Morocco, Iran. In Iran: this species was reported as a new record for Iran by Alavi (2000) from Golestan province. Khuzestan province (Bagheri & Alavi, 2006).

***Eremiothrips varius* (Bhatti)**

**Material examined** – Gonbad: Oukhi-Tappeh, 15 m, 5♂ 10♀, on barley, 13.V.1998.

**Hosts** – *Suaeda fruticosa* L.

**Distribution** – India, Iran. In Iran: this species was reported as a new record for Iran by Alavi (2000) from Golestan province. Khuzestan province (Bagheri *et al.*, 2002; Bagheri *et al.*, 2005a, c).

***Frankliniella tenuicornis* (Uzel)**

**Material examined** – Gonbad: Bibi-Shirvan, 20 m, 1♀, 28.IV.1998; Oukhi-Tappeh, 15 m, 1♀, 13.V.1998, all on barley.

**Hosts** – Poaceae.

**Distribution** – Holarctic. In Iran: *F. tenuicornis* was first reported from Iran by Alavi & Kamali (1995) from Bojnourd (now in Khorasan-e-Shomali province) based on four females on flowers of *Oryza sativa* L., and one female on flowering *Kochia* sp. (Alavi & Kamali, 2003). Fars province (Minaei & Alich, 2000a; Minaei *et al.*, 2002), Golestan province (Gilasian *et al.*, 2000; Alavi & zur Strassen, 2002; Alavi, 2004), Isfahan province (Etebari & Hesami, 2002), Marekazi province (Ghotbi *et al.*, 2003), Tehran province (Ghotbi *et al.*, 2003; Jalili Moghadam & Azmayesh Fard, 2004).

***Limothrips angulicornis* Jablonowski**

**Material examined** – Kalaleh: Agh-Ghaleh, 5 m, 1♀, on wheat, 12.V.1997. Gonbad: Incheh-Borun, 10 m, 8♀, on barley, 12.V.1997.

**Hosts** – Poaceae.

**Distribution** – Holarctic. In Iran: this species was reported as new for the fauna of Iran by Alavi & Kamali, (1995) from Bojnourd (now in Khorasan-e-Shomali province) based on one female on leaves of *Plantago major* L. (also, Alavi & Kamali, 2003). Gilasian (2000) has also collected this species on wheat and barley from Gorgan (Golestan province). Azarbaijan-

e-Gharbi province (Akbarzadeh Shoukat & Shayesteh, 2006), Kerman province (Kheyrandish Koshkoie *et al.*, 2000a), Khuzestan province (Cheraghian, 1996; Cheraghian & Hojat, 1998).

***Limothrips denticornis* (Haliday)**

**Material examined** – Kalaleh: Agh-Emam, 1100 m, 1♀, on wheat, 12.V.1997; Gok-Darreh, 750 m, 2♀, on wheat, 12.V.1997; Kalaleh: Maraveh-Tappeh, 210 m, 2♀, on barley, 12.V.1997; 4♀, on wheat, 24.IV.1997; 2♀, on wheat, 18.V.1998.

**Hosts** – Poaceae.

**Distribution** – Holarctic. In Iran: this species was reported as a new record for Iran by Alavi (2000) from Golestan province.

***Limothrips transcaucasicus* Savenko**

**Material examined** – Gorgan: Shah-Kooh, 2260 m, 1♀, on wheat, 6.VI.1998. Kalaleh: Gok-Darreh, 400 m, 5♀, on wheat, 12.V.1997; Kalaleh: Maraveh-Tappeh, 210 m, 4♀, on wheat, 24.IV.1997; 2♀, on barley, 4.V.1998; Mardom-Darreh, 730 m, 1♀, on wheat, 27.IV.1998; 2♀, on barley, 27.IV.1998. Kord-kooy: Jahan-Nama, 1300 m, 7♀, on barley, 19.V.1998.

**Hosts** – Poaceae.

**Distribution** – Transcaucasia, Turkey. In Iran: this species was reported as a new record for Iran by Alavi (2000) from Golestan province.

***Neohydatothrips gracilicornis* (Williams)**

**Material examined** – Ali-Abad: Ali-Abad, 140 m, 3♀, on wheat, 26.I.1997. Gonbad: Gonbad, 45 m, 1♀, on wheat, 12.III.1997. Gorgan: Araghi-Mahalleh, 38 m, 2♀, on wheat, 6.II.1997; Hashem-Abad, 7 m, 2♀, on wheat, 24.XII.1996. Kord-Kooy: Kord-Kooy, 5 m, 1♀, on barley, 14.I.1997.

**Hosts** – Fabaceae, Pinaceae.

**Distribution** – Palaearctic. In Iran: *N. gracilicornis* was first reported from Iran by Mortazawiha & Dern (1977) who recorded the species from Ewin (Tehran province) based on one female on *Medicago sativa* L. Golestan province (Gilasian *et al.*, 2000; Alavi & zur Strassen 2002), Khorasan-e-Shomali province (Alavi & Kamali, 2003), Mazandaran province (Cheraghian & Barimani Varandi, 2000).

***Sitothrips arabicus* Priesner**

**Material examined** – Agh-Ghala: Agh-Ghala, 5 m, 1♀, on wheat, 14.IV.1997; Anbar-Olum, 8 m, 3♀, on wheat, 14.IV.1997; Ata-Abad, 15 m, 5♀, on barley, 12.IV.1998; 6♀, on *Aegilops cylindrica* Host, 2.IV.1998; 20♀, on *Alopecurus myosuroides* Hudson, 22.IV.1998; Ghan-Ghermeh, 100 m, 4♀, on barley, 8.IV.1997; Ouch-Tappeh, 19 m, 2♀, on wheat, 14.IV.1998. Ali-Abad: Ali-Abad, 140 m, 14♀, 17.IV.1997; 4♀, 14.IV.1998, all on barley. Bandar-e-Torkaman: Bandar-e-Torkaman, 19 m, 1♀, on wheat, 22.IV.1997; Gomishan, 23 m, 2♀, on barley, 16.IV.1997. Gonbad: Bibi-Shirvan, 20 m, 1♀, on wheat, 17.IV.1997, 5♀, on barley, 25.IV.1998; Gonbad, 45 m, 2♀, on wheat, 8.IV.1997; 1♀, on wheat, 12.IV.1997; Imer-Mollasari, 13 m, 5♀, on barley, 21.IV.1998. Kalaleh: Agh-Emam, 1100 m, 1♀, on wheat, 12.V.1997; Damdam, 1♀, on barley, 12.V.1997; Maraveh-Tappeh, 210 m, 1♀, on wheat, 12.V.1997; Mardom-Darreh, 730 m, 2♀, on barley, 27.IV.1998.

**Hosts** – Poaceae.

**Distribution** – Mediterranean, Transcaucasia, Turkey. In Iran: this species was reported coincidentally as a new record from Iran by Minaei & Alichy (2000a) from Fars province on barley and Gilasian *et al.* (2000) from Gorgan (Golestan province) on wheat and barley. Fars province (Minaei *et al.*, 2002), Kerman province (Kheyrandish Koshkoei, 2000; Kheyrandish Koshkoei *et al.*, 2000a), Khorasan-e-Shomali (Alavi & Kamali, 2003), Khuzestan province (Bagheri & Alavi, 2006).

***Stenothrips graminum* Uzel**

**Material examined** – Agh-Ghala: Ata-Abad, 15 m, 2♀, on wheat, 14.IV.1998. Gonbad: Imer-Mollasari, 13 m, 5♂ 6♀, on barley, 21.IV.1998. Gorgan: Gorgan, 150 m, 2♂ 2♀, on wheat, 12.IV.1998.

**Hosts** – Poaceae.

**Distribution** – West Palaearctic. In Iran: the species was reported coincidentally as a new record to Iran fauna by Alavi (2000) and Gilasian *et al.* (2000) from Golestan province on wheat and barley.

***Thrips major* Uzel**

**Material examined** – Ali-Abad: Ali-Abad, 140 m, 3♀, on wheat, 26.I.1997.

**Hosts** – Flowers of various plants.

**Distribution** – Palaearctic. In Iran: this species was reported as new for Iran fauna by Mortazawiha & Dern (1977) based on one female collected from Ewin (Tehran province) on *Pyrus communis*. Fars province (Minaei & Alich, 2000a; Minaei *et al.*, 2002), Golestan province (Gillasian *et al.*, 2000; Alavi, 2004), Kerman province (Kheyrandish Koshkoei *et al.*, 2000a), Khorasan-e-Shomali province (Alavi & Kamali, 2003), Khuzestan province (Bagheri & Alavi, 2006), Tehran provinces (Jalili Moghadam & Azmayesh Fard, 2004).

***Thrips meridionalis* (Priesner)**

**Material examined** – Ali-Abad: Ali-Abad, 140 m, 1♀, on wheat, 26.I.1997. Gorgan: Hashem-Abad, 7 m, 1♀, on barley, 24.XII.1996; Shah-Kooh, 2260 m, 4♀, on wheat, 6.VI.1998.

**Hosts** – Flower inhabiting, on a wide range of plant species including deciduous trees and shrubs.

**Distribution** – Mediterranean, Caucasia, Central Asia. In Iran: *T. meridionalis* was first reported from Iran by Priesner (1954) who recorded the species from Shiraz mountains (Fars province) based on six females collected on flowers of *Prangos ferulacea* (L.). Fars province (Minaei & Alich, 2000a; Minaei, 2002; Minaei *et al.*, 2002; Alemansour & Fallahzadeh, 2004), Golestan province (Mortazawiha & Dern, 1977; Gilasian *et al.*, 2000), Kerman province (Kheyrandish Koshkoei *et al.*, 2000a; Teraz & Kheyrandish Koshkoei, 2002), Khorasan-e-Shomali province (Alavi & Kamali, 2003), Khuzestan province (Cheraghian & Hojat, 1998), Lorestan province (Jafari & Fallahzadeh, 2004), Tehran province (Mortazawiha & Dern, 1977; Jalili Moghadam & Azmayesh Fard, 2004), Yazd province (Mohaghegh & Kheyrandish Koshkoei, 2002).

***Thrips minutissimus* Linnaeus**

**Material examined** – Gonbad: Gonbad, 45 m, 2♀, on wheat, 25.III.1997. Gorgan: Araghi-Mahalleh, 38 m, 1♀, on wheat, 6.II.1997; Marzan-Kalateh, 100 m, 4♀, on barley, 7.IV.1997.

**Hosts** – Flowers of various plants, particularly of deciduous trees.

**Distribution** – Europe, Western Asia. In Iran: this species was reported coincidently as a new record for Iran by Alavi (2000) and Gilasian *et al.*, (2000) from Golestan province (also, Alavi, 2004). Fars province (Minaei, 2002; Minaei *et al.*, 2002), Khorasan-e-Shomali province (Alavi & Kamali, 2003).

***Thrips tabaci* Lindeman**

**Material examined** – Agh-Ghala: Agh-Ghala, 5 m, 1♀, 16.II.1997, 1♀, 14.IV.1997, all on barley. Gonbad: Gonbad, 45 m, 3♀, 27.II.1997, 2♀, 12.III.1997, 1♀, 25.III.1997, 1♀, 5.IV.1997, all on wheat; 3♀, on barley, 27.II.1997; Incheh-Borun, 10 m, 3♀, on *Phalaris minor*, 13.V.1998. Gorgan: Araghi-Mahalleh, 38 m, 4♀, on wheat, 4♀, on barley, 18.XII.1996; 2♀, on wheat, 6.II.1997; Hashem-Abad, 7 m, 5♀, on barley, 24.XII.1996; Shah-Kooh, 2260 m, 5♀, on wheat, 6.VI.1998. Kord-Kooy: Jahan-Nama, 1300 m, 10♀, on barley, 19.V.1998; Kord-Kooy, 5 m, 2♀, on barley, 14.I.1997; Yasaghi, 12 m, 5♀, on barley, 20.XII.1996.

**Hosts** – Polyphagous on large numbers of plants.

**Distribution** – Cosmopolitan. In Iran: *T. tabaci* was first reported from Iran by Afshar (1938) on tobacco, cotton, cucumber, potato, onion and cabbage. *T. tabaci* is wide-spread in Iran and has been reported from most of areas in Iran (Salavatian, 1959; Farahbakhsh, 1961; Shojai, 1971; Zahedi, 1992; Modarres Awal, 1994), Azarbaijan-e-Gharbi province (Akbarzadeh Shokat & Rezwani, 1998; Akbarzadeh Shoukat & Shayesteh, 2006), Azarbaijan-e-Sharghi province (Hassan-Zadeh Salmasi, 1997; Mashhadi Jafarlo & Malkeshi, 2000; Mansouri, *et al.*, 2004; Taghizadeh *et al.*, 2004), Fars province (Javan Moghadam *et al.*, 2000; Noori *et al.*, 2000; Minaei *et al.*, 2002; Alemansour & Fallahzadeh, 2004), Gilan province (Etebari *et al.*, 2000), Golestan province (Gilasian, 2000; Alavi & zur Strassen, 2002; Mojeni, 2002; Alavi, 2004; Khormaly, 2004), Hamadan province (Khanjani & Mirab Baluo 2005a, b), Isfahan province (Seyedoleslami & Naderi, 1993; Etebari & Hesami, 2002; Kalafchi *et al.*, 2002; Saeidi *et al.*, 2002), Kerman province (Moharramipour *et al.*, 2000; Teraz & Kheyrandish Koshkoei, 2002), Khorasan-e-Janubi province (Moodi, 2002; Shahrokhi, & Rahimi, 2003; Rahimi *et al.*, 2004), Khorasan-e-Razavi province (Noori *et al.*, 2000; Javan Moghadam *et al.*, 2000), Khorasan-e-Shomali province (Alavi & Kamali, 2003), Khuzestan province (Cheraghian, 1996; Cheraghian & Hojat, 1998; Bagheri & Mosadegh, 2000; Bagheri *et al.*, 2002; Bagheri *et al.*, 2005b, c), Lorestan province (Jafari & Fallahzadeh, 2004), Markazi province (Yousefi & Abbasifar, 2004), Mazandaran province (Farahbakhsh, 1961), Tehran province (Davatchi, 1949; Farahbakhsh, 1961; Shojai, 1989; Javan Moghadam *et al.*, 2000; Mirkarimi, 2000; Noori *et al.*, 2000; Hosseininia & Malkeshi, 2004; Jalili Moghadam & Azmayesh Fard, 2004; Khani *et al.*, 2004), Yazd province (Mohaghegh & Kheyrandish Koshkoei, 2002).

## II. Suborder Tubulifera

### Family Phlaeothripidae

#### *Cephalothrips monilicornis* (O. M. Reuter)

**Material examined** – Gorgan: Chahar-Bagh, 2180 m, 3♀, on barley, 6.VI.1998.

**Hosts** – Poaceae.

**Distribution** – Holarctic. In Iran: this species was reported as new for the fauna of Iran by Alavi & Kamali (2003) from Bojnourd region (now in Khorasan-e-Shomali province) based on two females on flowering *Carum carvi* L.

#### *Haplothrips aculeatus* (Fabricius)

**Material examined** – Agh-Ghala: Ghan-Ghermeh, 100 m, 3♀, on barley, 8.IV.1997; Ghare-Tappeh, 13 m, 1♀, on wheat, 8.IV.1997. Ali-Abad: Ali-Abad, 140 m, 1♀, on wheat, 26.I.1997. Gonbad: Gonbad, 45 m, 4♀, on wheat, 9.IV.1997. Gorgan: Hashem-Abad, 7 m, 4♀, on barley, 24.XII.1996; Marzan-Kalateh, 100 m, 1♀, on barley, 7.IV.1997. Kord-Kooy: Yasaghi, 12 m, 1♂ 4♀, on wheat, 8.IV.1997. Ramian: Dar-Kalateh, 97 m, 5♀, on wheat, 19.IV.1997.

**Hosts** – Poaceae.

**Distribution** – Palaearctic. In Iran: this species was reported coincidentally as a new record for Iran by Alavi (2000) and Gilasian *et al.* (2000) from Golestan province, and also Kheyrandish Koshkoei *et al.* (2000b) from Kerman region (Kerman province). Fars province (Minaei & Alich, 2001).

#### *Haplothrips reuteri* (Karny)

**Material examined** – Gorgan: Chahar-Bagh, 2180 m, 1♀, on wheat, 6.VI.1998; Shah-Kooh, 2260 m, 1♀, on wheat, 6.VI.1998.

**Hosts** – Flowers of various plants.

**Distribution** – Mongolo-Mediterranean. In Iran: *H. reuteri* was first reported from Iran by Priesner (1954) who recorded the thrips from Shiraz (Fars province) based on two females in flowers of *Althaea* sp., and one female in the flower of *Amygdalus spartioides* Spach. Fars province (Minaei & Alich, 2001), Ghazwin province (Mortazawiha & Dern, 1977), Ghom province (Mortazawiha & Dern, 1977), Kerman province (Kheyrandish Koshkoei, 2000; Kheyrandish Koshkoei, *et al.*, 2000b; Moharrampour *et al.*, 2000; Teraz & Kheyrandish

Koshkoei, 2002), Khorasan-e-Janubi province (Rahimi *et al.*, 2003; Rahimi *et al.*, 2004), Khorasan-e-Shomali province (Alavi & Kamali, 2003), Khuzestan province (Cheraghian & Hojat, 1998; Bagheri *et al.*, 2002; Bagheri *et al.*, 2005c), Lorestan province (Jafari & Fallahzadeh, 2004), Mazandaran province (Cheraghian & Barimani Varandi, 2000), Tehran province (Mortazawiha & Dern, 1977; Jalili Moghadam & Azmayesh Fard, 2004), Zanjan province (Mortazawiha & Dern, 1977), Yazd province (Mohaghegh & Kheyrandish Koshkoei, 2002).

### ***Haplothrips tritici* (Kurdjumov)**

**Material examined** – Agh-Ghala: Agh-Ghala, 5 m, 1♀, on wheat, 14.IV.1997; Anbar-Olum, 8 m, 1♂ 2♀, on wheat, 14.IV.1997; Ata-Abad, 15 m, 1♀, 7.IV.1997, 1♂ 2♀, 12.IV.1998, 1♂ 2♀, 14.IV.1998, all on barely; 1♀, 16.IV.1997, 2♂ 5♀, 14.IV.1998, all on wheat; Ghan-Ghermeh, 100 m, 2♀, on barley, 8.IV.1997; Ouch-Tappeh, 19 m, 1♀, on wheat, 14.IV.1998. Bandar-e-Torkaman: Gomishan, 23 m, 1♀, on wheat, 16.IV.1997; Gharanjik, 7 m, 1♀, on wheat, 8.IV.1997. Gonbad: Bibi-Shirvan, 20 m, 1♀, on barley, 28.IV.1998; Gonbad, 45 m, 1♀, 9.IV.1997, 2♂, 15.IV.1997, all on wheat; Imer-Mollasari, 13 m, 2♂ 7♀, on barley, 21.IV.1998; Incheh-Borun, 10 m, 4♂ 2♀, on barley, 13.V.1998. Gorgan: Chahar-Bagh, 2180 m, 1♂ 1♀, on wheat, 6.VI.1998; 2♀, on barley, 6.V.1998; Marzan-Kalateh, 100 m, 1♀, on barley, 7.IV.1997; Shah-Kooh, 2260 m, 2♀, on wheat, 6.VI.1998; 1♂ 2♀, on *Avena ludoviciana*, 22.IV.1998; 1♀, on *Aegilops cylindrica*, 22.IV.1998; 5♀, on *Secale cereale*, 22.IV.1998. Kalalah: Agh-Emam, 1100 m, 1♂, on wheat, 12.V.1997; Gok-Darreh, 750 m, 1♀, on wheat, 12.V.1997; Maraveh-Tappeh, 210 m, 3♂, on barley, 4.VI.1998.

**Hosts** – Poaceae.

**Distribution** – West Palaearctic. In Iran: *H. tritici* was first reported from Iran by Davatchi (1949) on wheat from Tehran (Tehran province), Yazd (Yazd province), Rafsanjan and Kerman (Kerman province). Azarbaijan-e-Gharbi province (Farahbakhsh, 1961; Behdad, 1982), Azarbaijan-e-Sharghi province (Farahbakhsh, 1961; Behdad, 1982; Hassan-Zadeh Salmasi, 1997), Chaharmahal-Bakhtiary province (Behdad, 1982; Rowshandel, 2002), Fars province (Minaei & Alich, 2001), Isfahan province (Bagheri & Radjabi, 2000; Behdad, 1982), Kerman province (Davatchi, 1954; Behdad, 1982; Kheyrandish Koshkoei, 2000; Takaloozadeh & Zohdi, 2000; Teraz & Kheyrandish Koshkoei, 2002), Kermanshah province (Farahbakhsh, 1961; Behdad, 1982), Khorasan-e-Shomali province (Alavi & Kamali, 2003), Khuzestan province (Behdad, 1982; Cheraghian, 1996; Cheraghian & Hojat, 1998),



Kordestan province (Kamangar & Radjabi, 2000), Lorestan province (Shekarian & Rajabi, 2004), Tehran province (Farahbakhsh, 1961; Behdad, 1982; Azmayesh Fard & Faridi, 1993), Semnan province (Behdad, 1982), Yazd province (Davatchi, 1954; Behdad, 1982; Mohaghegh & Kheyrandish Koshkoei, 2002; Teraz & Kheyrandish Koshkoei, 2002), Zanjan province (Azmayesh Fard & Faridi, 1993).

Among the 32 recognized species, *H. tritici* was the most frequent and abundant thrips (table 1). It was found in 63 samples out of 215 totally (RF = 29.3%) and represented by 1922 individuals out of 3022 (RA = 63.4%). It was also accounted for 70.2% and 55.7% of obtained materials, and found in 35.2% and 21.1% of samples in wheat and barley, respectively. *Sitothrips arabicus* was the second most frequent and abundant species which was found in 9.6% and 14.4% of samples, and accounted for 13.5% and 20.1% of obtained materials in wheat and barley, respectively (table 1). It is worth mentioning that 17 species (53.12%) were found on both wheat and barley, 8 species (25%) only on wheat and 7 species (21.87%) only on barley. Also, 14 species, which are not known as graminivorous, were found on wheat and barely, of which *T. tabaci* was more abundant and frequent than others. It was followed by *A. mongolicus* (table 1). Furthermore, difference in preference between wheat and barley was statistically verified for *H. tritici*. It was significant at the statistical level of 5%.

Composition of species population was different in various areas. Nine species, i.e. *C. manicatus*, *C. molestus*, *L. denticornis*, *L. transcaucasicus*, *M. knechteli*, *M. pallidior*, *R. flavus*, *C. monilicornis* and *H. reuteri* are distributed only in the mountainous areas of northeast and south, whereas twelve species, i.e. *A. sudanensis*, *C. africanus*, *E. tamaricis*, *E. varius*, *F. tenuicornis*, *L. angulicornis*, *N. gracilicornis*, *S. graminum*, *T. major*, *T. minutissimus*, *R. brunneus* and *H. aculeatus* are distributed only at low altitude central and coastal areas. The remaining eleven species, i.e. *A. rufus*, *C. mediterraneus*, *E. taghizadehi*, *S. arabicus*, *T. meridionalis*, *T. tabaci*, *A. collaris*, *A. mongolicus*, *A. tenuicornis*, *R. gratosius* and *H. tritici* are spread in the whole of Golestan province.

*H. tritici* was also found on four weed plants: *Aegilops cylindrical*, *Avena ludoviciana*, *Phalaris minor* and *Secale cereale*. In lower and higher altitude areas, *A. ludoviciana* and *S. cereale* contained more population of *H. tritici* than the others.

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Although *H. tritici* is a widespread species in Golestan province, its population was not the same in all areas. Regression analysis showed a non-linear relation ( $y = 42.65 + 0.33x - 0.0002x^2$ ) between population of the thrips ( $y$ ) and altitude ( $x$ ) on 20 spikes of wheat. The components of regression are shown in table 2. There is a strong correlation ( $r^2 = 16.8$ ) between area, altitude, and the population of thrips. This indicates that with increasing altitude, the population density of thrips increases. The highest numbers of adults on a spike were observed in the northeast areas of Golestan province which comprises mountainous and plateau areas with altitudes between 400–3000 m (e.g. Gok-Darreh, 750 m). The average number of adult thrips may reach about 23 individuals per wheat spike, whereas in other areas that have altitudes lower than 400 m (generally named Gorgan & Gonbad plain), the population decreases gradually to the western areas with gradual decline in altitude. In the western (coastal) areas (e.g. Segher-Yelghi, 8 m), the average of adult number of the thrips reaches 9 individuals per wheat spike at the most.

**Table 2.** Components of regression equation between altitude and abundance of *Haplothrips tritici* on 20 spikes of wheat in Golestan province, 1996-1998.

Parameter	Value	T-value	95% Confidence limits
a	42.65	1.74	-6.53 to 91.83
b	0.33	1.09	-0.27 to 0.93
c	-0.00020	-0.54	-0.00098 to 0.00056
$r^2$	16.8%	12.40	4.77

Amongst 9 species that Cheraghian (1996) has listed from Ahwaz (Khuzestan province) (6 species only on wheat: *Agrostothrips atricorpus* (Girault), *A. meridionalis* (Bagnall), *C. manicatus*, *Haplothrips tolerabilis* Priesner, *L. angulicornis*, *Melanthrips fuscus* (Sulzer), and 3 species on both wheat and barley: *H. tritici*, *R. brunneus*, *T. tabaci*), there are 4 species i.e. *A. atricorpus*, *A. meridionalis*, *M. fuscus* and *H. tolerabilis* that are not seen in Golestan list.

Gilasian (2000), during a faunistic study of Thysanoptera on ornamental and crop plants in Gorgan (Golestan province) has collected 11 species (8 species only on wheat: *A. meridionalis*, *A. sudanensis*, *A. rufus*, *Chirothrips kurdistanus* zur Strassen, *H. aculeatus*, *Haplothrips cerealis* Priesner, *R. brunneus*, *S. arabicus*, and 3 species on both wheat and barley: *L. angulicornis*, *S. graminum*, *T. tabaci*), of which 3 species i.e. *A. meridionalis*, *C. kurdistanus* and *H. cerealis* are not seen in our list. In a similar study by Kheyrandish

Koshkoei (2000) in Kerman (Kerman province), 4 species (*H. reuteri*, *M. pallidior*, *S. arabicus* on wheat, and *H. tritici* on both wheat and barley) were collected that all are found in our study too.

Jafari & Fallahzadeh (2004) have collected 8 species on wheat from Lorestan province including *Frankliniella pallida* (Uzel), *Odontothrips confusus* Priesner, *Thrips vuilleti* (Bagnall), *T. meridionalis*, *T. tabaci*, *Tenothrips* sp., *H. cerealis* and *H. reuteri*. Among them, 5 species, i.e. *F. pallida*, *O. confusus*, *T. vuilleti*, *H. cerealis* and *Tenothrips* sp. are not seen in our list.

*Haplothrips niger* (on barley), *M. fuscus* (on wheat) and *Aeolothrips intermedius* (on both wheat and barley) are other species that have been reported from Fars province (Minaei & Alich, 2001; Minaei *et al.*, 2001) but were not collected in our study.

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#### References

- Afshar, J. (1938) *Pests of summer crops, vegetables, industrial plants, and pastures in Iran and their control*. 124 pp. General Office of Agriculture, Tehran. [In Persian].
- Akbarzadeh Shoukat, G. & Shayesteh, N. (2006) Thrips species found in West Azarbaijan (Orumieh) vineyards, and seasonal abundance of the predominant species (*Rubiothrips vitis*). *Journal of Agricultural Science and Technology* 8, 133-139.
- Akbarzadeh Shokat, G. & Rezvani, A. (1998) Two new records of thrips from vineyards of West Azarbaijan. *Proceedings of the 13<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 111.
- Alavi, J. (2000) Faunistic study of Thysanoptera on wheat and barley in Golestan province. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 227.
- Alavi, J. (2004) Preliminary study on thrips (Thysanoptera) fauna of olive in Golestan province. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 110.
- Alavi, J. & Kamali, K. (1995) A survey of phytophagous and predaceous Thysanoptera of Bojnourd. *Proceedings of the 12<sup>th</sup> Iranian Plant Protection Congress*, p. 340.

- Alavi, J. & Kamali, K.** (2003) The fauna of Thysanoptera in Bojnourd region of Khorasan province, Iran. *Thrips* 2, 25-40.
- Alavi, J. & zur Strassen, R.** (2002) Faunistic study of Thysanoptera on soybean in Golestan province. *Proceedings of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, 181-182.
- Alemansour, H. & Fallahzadeh, M.** (2004) Notes on the Thysanoptera fauna of olive orchards in Fars province. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 103.
- Asadi, M. A.** (1997) *A view on new climate classification in Iran, and Golestan situation in there*. 29 pp. Golestan Soil and Water Engineering Service Company, Gorgan. [In Persian].
- Azmayesh Fard, P. & Faridi, B.** (1993) Study on damage and population density of wheat thrips on three varieties of wheat and two variety of barley in Karaj and Zanjan. *First Iranian Congress on Crop Production and Breeding*, p. 25. [In Persian].
- Bagheri, S. Alavi, J.** (2006) New records of 20 species Thysanoptera on forest and rangeland plants for Iran and Khuzestan province. *Proceedings of the 17<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 78.
- Bagheri, S., Alavi, J. & Behnamfar, K.** (2005a) Collection and identification of 16 species to Thysanoptera, family Thripidae on some medicinal plants in Khuzestan province and introduction of 1 new species for Iran. *Abstracts Book of the 2<sup>nd</sup> Symposium of Medicinal Plants*, p. 52.
- Bagheri, S., Alavi, J. & Mohammadi, R.** (2005b) Collection and identification of 8 species predator Thysanoptera on some medicinal plants in Khuzestan province and introduction of 2 new species for Iran. *Abstracts Book of the 2<sup>nd</sup> Symposium of Medicinal Plants*, p. 51.
- Bagheri, S., Alavi, J. & Yousef Naanaie, S.** (2005c) Study of Thysanoptera species associated with forest and range plants with report of 2 new species in Khuzestan province. *Iranian Journal of Forest and Range Protection Research* 2(2), 171-190. [In Persian with English summary].
- Bagheri, S. & Mosadegh, M. S.** (2000) Natural enemies of *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) of onion fields in Khuzestan. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 250.

- Bagheri, S., Mosadegh, M. S. & Kamali, K.** (2002) A survey on the biology of *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) on onions in the north of Khuzestan province, Iran. *Proceedings of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 68.
- Behdad, E.** (1982) *Pests of field crops in Iran*. 589 pp. Sepehr Publishing. [In Persian].
- Behdad, E.** (1996) *Iran phytomedicine encyclopaedia, plant Pests and diseases, weeds*. 3153 pp. Yadbood Publishing. [In Persian].
- Borrer, D. J., Triplehorn, C. A. & Johnson, N. F.** (1989) *An introduction to the study of insects*. 6<sup>th</sup> ed. 875 pp. Saunders College Publishing.
- Cheraghian A.** (1996) A faunistic study of Thysanoptera in Ahwaz region. M. Sc. Thesis, College of Agriculture, Shahid-Chamran University, Ahwaz, Iran, 118 pp. [In Persian with English summary].
- Cheraghian, A. & Barimani Varandi, H.** (2000) First record of three species of Thysanoptera in the north of Iran. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 297.
- Cheraghian, A. & Hojat, S. H.** (1998) A faunistic study of Thysanoptera in Ahwaz region. *Proceedings of the 13<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 211.
- Czencz, K.** (1994) Importance and development of species spectrum of winter wheat damaging thrips in Hungary. *Mededelingen van de Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen Universiteit Gent (Belgium)* 59(2a), 227- 233.
- Davatchi, A.** (1949) *Important pests of field crops and methods of their control*. 295 pp. Bongahe Schimiai, Tehran. [In Persian].
- Davatchi, A.** (1954) *Insect pests in Iran: grasshoppers and other pests of cereals*. 1<sup>st</sup> ed. 245 pp. Tehran University Press. [In Persian].
- Etebari, K. & Hesami, Sh.** (2002) Thysanoptera fauna of grape orchards in Isfahan, Iran. *Proceedings of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 182.
- Farahbakhsh, Gh.** (1961) *A checklist of economically important insects and other enemies of plants and agricultural products in Iran*. 153 pp. Department of Plant Protection, Tehran.
- Ghahhari, H. & Hatami, B.** (2000) Study on natural enemies of whiteflies (Homoptera: Aleyrodidae) in Isfahan province. *Journal of Entomological Society of Iran* 20(1), 1-24. [In Persian with English summary].

- Gilasian, E.** (2000) Faunistic study of Thysanoptera in ornamental and crop plants and the biology of dominant species in Gorgan region. M. Sc. Thesis, College of Agriculture, Tarbiat Modarres University, Tehran, Iran, 148 pp. [In Persian with English summary].
- Gilasian, E., Moharramipour, S. & Alavi, J.** (2000) One genus and five species of Thysanoptera as new records for Iran fauna. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 341.
- Hassan-Zadeh Salmasi, M.** (1997) Collecting and identifying insect fauna of onion fields in East Azarbaijan province of Iran. *Agricultural Science* 6(3-4), 21-42. [In Persian with English summary].
- Hosseini, A. & Malkeshy, S. H.** (2004) Comparison of chemical, biological and integrated methods for control of *Thrips tabaci* Lindeman on carnation under greenhouse conditions. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 300.
- Jafari, R. & Fallahzadeh, M.** (2004) Faunistic study of Thysanoptera on wheat in Lorestan province. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 106.
- Jalili Moghadam, M. & Azmayesh Fard, P.** (2004) Thrips of ornamental plants in Tehran and Mahallat. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 160.
- Javan Moghadam, H., Noori, P., Hosseini, S. M. & Amin, Gh.** (2000) Control of *Thrips tabaci* (Lind.) using seed disinfection method. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 38.
- Kalafchi, M., Ebadi, R. & Mobli, M.** (2002) A study of population density and damage of onion thrips (*Thrips tabaci* Lind.) on onion cultivars in Isfahan. *Proceedings of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, 68-69.
- Kamangar, S. & Rajabi, G. R.** (2000) Effect of commonly used insecticides against Sunn pest (*Eurygaster integriceps* Put.) on the reduction of population density of wheat thrips (*Haplothrips tritici* Kurd.). *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 9.
- Khani, M., Haghiri, A., Naghdibadi, A. & Yazdani, D.** (2004) Notes on the fauna of medicinal plants in Tehran province. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 108.



- Khanjani, M. & Mirab Baluo, M.** (2005a) A study on pests of garlic in Hamadan. *Proceeding of National Congress in Sustainable Development of Medicinal Plants*, 243-244.
- Khanjani, M. & Mirab Baluo, M.** (2005b) A study on some pests of Bu-Ali Sina medical garden in Hamadan. *Proceeding of National Congress in Sustainable Development of Medicinal Plants*, 245-246.
- Kheyrandish Koshkoei, M.** (2000) Faunistic survey of Thysanoptera in Kerman and study of population density of active species on rose. M. Sc. Thesis, College of Agriculture, Tarbiat Modarres University, Tehran, Iran, 137 pp. [In Persian with English summary].
- Kheyrandish Koshkoei, M., Moharramipour, S. & Kamali, K.** (2000a) A report on Thysanoptera suborder Terebrantia in Kerman and records of four new species for Iran fauna. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 355.
- Kheyrandish Koshkoei, M., Moharramipour, S. & Kamali, K.** (2000b) A report on Thysanoptera suborder Tubulifera in Kerman and records of three new species for Iran fauna. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 354.
- Khormaly, S.** (2004) Preliminary study on watermelon pests (insects) in Gonbad and Minoodasht. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 297.
- Mansouri, S. M., Ebadi, R. & Mobli, M.** (2004) Comparison of population density and injury of onion thrips (*Thrips tabaci* Lind.) on selected self and polycross genotypes of onion in Isfahan. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 354.
- Mashhadi Jafarlo, M. & Malkeshi, S. H.** (2000) Survey on efficiency of predator bugs *Orius* spp. for control of tobacco thrips, *Thrips tabaci* L. in onion fields in East Azarbaijan province. *Proceeding of The Second National Conference on Optimum Utilization of Chemical Fertilizers and Pesticides in Agriculture, Karaj*, p. 12.
- McCloskey, W. B., Baker, P. B. & Sherman W.** (1998) Survey of cotton weeds and weed control practices in Arizona upland cotton fields. p. 7 in J. Silvertooth (Ed.) *Cotton: a College of Agriculture Report for 1998*, University of Arizona. Available on: <http://cals.arizona.edu/pubs/crops/az1006/az10066a.htm> (accessed 15 June 2006).

- Minaei, K.** (2002) The finding of five species of Thysanoptera on oak and hawthorn in forests in Fars province. *Proceedings of the 2<sup>nd</sup> National Plant Protection Conference on Forests and Rangelands*, p. 3.
- Minaei, K. & Alich, M.** (2000a) Faunistic study of the order Thysanoptera in Fars province. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 336.
- Minaei, K. & Alich, M.** (2000b) The first record of the presence of predatory thrips (Thysanoptera) in Fars province. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 337.
- Minaei, K. & Alich, M.** (2001) Thrips of the genus *Haplothrips* (Thys.: Phlaeothripidae) from Shiraz region. *Journal of Entomological Society of Iran* 20(2), 33-45. [In Persian with English summary].
- Minaei, K., Alich, M. & Ahmadi, A. A.** (2001) The thrips family Aeolothripidae (Thysanoptera: Terebrantia) in the Fars province. *Iran Agricultural Research* 20(1), 53-66.
- Minaei, K., Alich, M. & Asadi, Gh.** (2002) Introduction to species of Thripidae (Thysanoptera: Thripidae) in Shiraz region. *Agricultural Science* 12(3), 61-66. [In Persian with English summary].
- Mirkarimi, A.** (2000) Evaluation of damage of cotton thrips to different cotton varieties in Varamin. *Proceeding of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 237.
- Modarres Awal, M.** (1994) *List of agricultural pests and their natural enemies in Iran*. 1<sup>st</sup> ed. 364 pp. Ferdowsi University Press.
- Mohaghegh, H. & Kheyrandish Koshkoei, M.** (2002) The first faunistic study of Thysanoptera in Yazd area. *Proceedings of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, 182-183.
- Moharramipour, S., Kheyrandish Koshkoei, M. & Kamali, K.** (2000) Population dynamics of thrips species on rose in Kerman province, Iran. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 146.
- Mojeni, T. D.** (2002) Study on population dynamics of *Thrips tabaci* L. in the cotton fields of Golestan province. *Proceedings of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 45.
- Moodi, S.** (2002) Studies on fauna of Chinese date (*Zizyphus jujuba*) in Birjand area. *Proceeding of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 111.

- Mortazawiha, A., & Dern, R.** (1977) Ein Beitrag zur Thysanopterenfauna des Irans. *Entomologie et Phytopathologie Appliquees* 45, 8-13. [In German with Persian summary].
- Noori, P., Javan Moghadam, H, Hosseini, S. M. & Amin, G. A.** (2000) Population fluctuation of *Thrips tabaci* Lind. on cotton in cotton growing area of Iran. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 36.
- Priesner, H.** (1954) On some Thysanoptera from Persia. *Annals and Magazine of Natural History Series* 12<sup>th</sup>, 7(73), 49-57.
- Rahimi, H., Moodi, S. & Yazdani, E.** (2003) Identification and introducing insect pests and their natural enemies in Saffron crop in the south of Khorasan, Iran. *Proceedings of the 3<sup>rd</sup> National Symposium on Saffron, Mashhad*, 157-167. [In Persian with English summary].
- Rahimi, H., Moodi, S. & Yazdani, E.** (2004) Insect and mite pests and their natural enemies in saffron fields in the south of Khorasan. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 161.
- Rowshandel, S.** (2002) Biology of *Haplothrips tritici* Kord., economic importance and its host plants in Chaharmahal-Bakhtiari province. *Proceedings of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 17.
- Saeidi, Z., Rezvani, A. & Nourbakhsh, S. H.** (2002) An investigation on bean thrips's fauna and evaluation of economic importance of dominant species on native bean variety in Lordegan. *Proceedings of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 56.
- Salavatian, M.** (1959) List of pests of cotton, kenaf, flax, sugarbeet, sugarcane, tobacco, sesame and castor beans. *Entomologie et Phytopathologie Appliques* 18, 62-75.
- Seyedoleslami, H. & Naderi, A.** (1993) Seasonal population fluctuation of important potato sucking insect pests and their natural enemies in the Daran district of Isfahan province. *Proceedings of the 11<sup>th</sup> Plant Protection Congress of Iran*, p. 147.
- Shahrokhi, M. B. & Rahimi, H.** (2003) Pests and diseases of Saffron. pp. 137-148 in Kafi, M. (Ed.) *Saffron production and processing*. 279 pp. Center of Excellence for Agronomy, Faculty of Agriculture, Ferdowsi University Press. [In Persian].
- Shekarian, B. & Rajabi, G. R.** (2004) Investigation on the E.I.L. and E.T. of *Haplothrips tritici* K. in wheat fields of Lorestan province. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 351.

- Shojai, M.** (1971) The importance of research on pests of tobacco in Iran. *The First Iranian Tobacco and Cigarette Seminar, Rezayeh*. pp. 174-182. Iranian Tobacco Company. [In Persian].
- Shojai, M.** (1989) *Entomology (ethology, social and natural enemies)*. Vol. 3, 2<sup>nd</sup> ed. 406 pp. Tehran University Press. [In Persian].
- Taghizadeh, M., Hosseini, S. M., Mojeni, T. D. & Amin, G.** (2004) Seed disinfection using some insecticides in the control of onion thrips (*Thrips tabaci* Lind.) in Moghan area. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 225.
- Takaloozadeh, H. & Zohdi, H.** (2000) Study of biology of *Haplothrips tritici* Kur. (Phlaeothripidae) in Kerman. *Proceedings of the 14<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 15.
- Teraz, A. & Kheyrandish Koshkoei, M.** (2002) The first faunistic investigation of Thysanoptera in Jiroft. *Proceedings of the 15<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 184.
- Yousefi, M. & Abbasifar, A. R.** (2004) Evaluation of thrips damage (*Thrips tabaci* Lindeman) in different onion cultivars in Markazi province. *Proceedings of the 16<sup>th</sup> Iranian Plant Protection Congress, Vol. I, Pests*, p. 406.
- Zahedi, K.** (1992) *Summer crops and ornamental plants pests and control in Iran*. 2<sup>nd</sup> ed. 143 pp. Iran University Press. [In Persian].
- zur Strassen, R.** (1975) Eremophile Blütenbewohner der Fransenflüglergattung *Ascirtothrips* Priesner 1964 (Insecta: Thysanoptera). *Senckenbergiana Biologica* 56(4-6), 257-282. [In German with English summary].

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