

## Thrips in Slovenia

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**Abstract:** This is an overview of our knowledge of thrips in Slovenia. It includes a check-list of species recorded, indicating the plants from which specimens have been taken and the collectors. Special attention is given to work on thrips during the last five years, focusing on some species of potential economical importance.

### Introduction

Up to now, 102 thrips species have been recorded in Slovenia, mostly due to the efforts of zur Strassen (1981, 1984) and Janežič (1991, 1992, 1993), who studied the occurrence of these insects mostly on various naturally occurring plants. Nevertheless, the list given here includes many economically important species, such as western flower thrips (*Frankliniella occidentalis*), onion thrips (*Thrips tabaci*), gladiolus thrips (*Thrips simplex*), privet thrips (*Dendrothrips ornatus*), pea thrips (*Kakothrips robustus*) and others. These, as well as some other species, are considered to be economically important or at least potentially economically important pests of agricultural plants in Slovenia.

### Recent investigations in Slovenia on economically important thrips

Since 1997 investigations on thrips in Slovenia were mainly connected with economically important species. So, bionomics of *Frankliniella occidentalis*, a species that was a quarantine pest at that time, was studied in the 1997-1999 period (Trdan *et al.*, 1999). Monitoring using sticky boards of light blue colour was performed at six locations in Slovenia in the vicinity of the greenhouses (1 m, 10 m, 20 m and 50 m). It was established that the occurrence of the pest in the continental part of the country is massive from June to August, medium in May and September and low in April and October. In the Primorje region of Slovenia (near the Adriatic sea) the mild climatic conditions enable the massive occurrence of the species in the open from May to September, and the medium one in April and October. At the seaside, the pest can be found even in December,

but in the inner land single specimens can be found as early as March and as late as November. In some Mediterranean countries *F. occidentalis* can be active in the open all the year round (Lacasa *et al.*, 1995), but in Slovenia it does not overwinter as an active adult. In spite of its massive occurrence in the vicinity of greenhouses during the warm period of the year (while its occurrence further from the greenhouses is rather exceptional) no serious feeding damage was observed (Trdan, 1999; Trdan and Jenser, 1999). This is not the case in some other Mediterranean countries (Klein *et al.*, 1995; Moleas *et al.*, 1996). *Thrips tabaci* is also common in Slovenia, so it is often cited as an autochthonous species, though there is no proof for that. Its most numerous occurrences are reported in the open, especially on edible onion crops (onion and leek being among the most mentioned and treated host plants) and on some ornamental plants. Because insecticides against this pest are used sometimes too often and not selectively, resistant populations developed and its control can present some problems to the growers. During recent years an increased occurrence of this thrips has been observed on cabbage. On these plants the outer parts of the head leaves develop uneven rough, bronzed areas. Such areas can merge and cover most of a damaged leaf (Trdan, 2001). The efficiency of insecticides against onion thrips and against other thrips species is difficult to study in the open, because these animals are so tiny and hidden. So, lately, laboratory studies are increasingly common. Since the efficiency of an insecticide depends on our knowledge of the bionomics of any given species, monitoring of the *Thrips tabaci* was performed in the 1999-2000 period. Sticky boards of light

blue colour were used in onion and leek. In this way, we expect to get useful data on part of the bionomics of this pest in Slovenia; additionally, laboratory studies on its life and development can also be of great use. One rearing method has been developed at the Institute of Phytomedicine (Trdan, 2000; Trdan and Milevoj, 2000). We know that Slovenia, due to its small agricultural acreage, cannot compete with other EU countries if only the quantity of the products is considered, so the importance of environmentally friendly agriculture is becoming increasingly important. Generally, the great majority of farmers will have no serious difficulties keeping to such ways of farming, since the use of pesticides is already quite modest. So we expect various ways of biological pest control will prevail in the future for thrips control (Milevoj, 1998). These have been experimental up to now (Zadravec and Bavec, 2001) and during the last years some biotechnical methods are being introduced also in thrips control (sticky boards of light blue colour) in order to reduce the number of these pests. At the Biotechnical Faculty (Agronomy Department), a project to develop a protocol for molecular identification of economically important thrips in Slovenia was started in 2000. Biochemical and molecular techniques are currently being widely used around the world to detect and identify harmful organisms (Babcock and Heraty, 2000), although thrips have been given less attention in this respect (Kraus *et al.*, 1999). The cooperation with the researchers from the Martin-Luther-University Halle-Wittenberg, Institute of Zoology and from the Leibniz Institute for Plant Biochemistry Haale/Saale (Germany) has been very helpful. The aim of the project is to develop a molecular key of economically important thrips, which could be of use not only for entomologists but also for phytomedicine and biology in general.

### Conclusions

Compared to some other European countries where occurrence and importance of thrips has been given much attention during the last fifty years, most of our knowledge of these insects in Slovenia is based on data from zur Strassen (54 species) or Janežič (44 species), who studied

thrips in the beginning of the eighties and in the nineties. The results of their investigations are a good basis for practically oriented investigations of economically important species that have been intensified since 1997. Investigations on the bionomics of some species could help farmers to control economically important species, such as *F. occidentalis* and *T. tabaci*, and the development of a molecular identification key will make the world of thrips comparable with other topics of biology (virology, biotechnology, taxonomy, plant quarantine). In the future we also plan to investigate various ways of environmentally friendly control of economically important thrips in Slovenia.

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## Thrips species recorded in Slovenia

## Suborder Terebrantia

Species	First recorded	First reported	Host plant	Collector
<i>Aeolothrips albicinctus</i> Hal.	1981	1981	high grass	zur Strassen
<i>Aeolothrips astutus</i> Pr.	1991	1991	<i>Trifolium pratense</i>	Janežič
<i>Aeolothrips ericae</i> Bagn.	1981	1981	<i>Galium verum</i>	zur Strassen
<i>Aeolothrips fasciatus</i> (L.)	1981	1984	<i>Trifolium rubens</i>	zur Strassen
<i>Aeolothrips intermedius</i> Bagn.	1981	1981	<i>Spartium junceum</i>	zur Strassen
<i>Aeolothrips melaleucus</i> Hal.	1981	1984	<i>Ostrya carpinifolia</i>	zur Strassen
<i>Aeolothrips versicolor</i> Uzel	1993	1993	<i>Carpinus betulus</i>	Janežič
<i>Anaphothrips gracillimus</i> Pr.	1981	1981	high grass	zur Strassen
<i>Anaphothrips obscurus</i> (Müll)	1981	1981	high grass	zur Strassen
<i>Ankothrips niezabitoskii</i> (Sc)	1998	-	<i>Juniperus</i> sp.	Jenser
<i>Aptinothrips elegans</i> Pr.	1981	1981	grasses with dead leaves	zur Strassen
<i>Aptinothrips rufus</i> Hal.	1981	1981	grasses with dead leaves	zur Strassen
<i>Aptinothrips stylifer</i> Tryb.	1981	1984	grass of medium height	zur Strassen
<i>Ceratothrips ericae</i> Hal.	1981	1984	<i>Erica carnea</i>	zur Strassen
<i>Chirothrips aculeatus</i> Bagn.	1981	1981	high grass	zur Strassen
<i>Chirothrips manicatus</i> Halid.	1981	1984	half dried grasses	zur Strassen
<i>Dendrothrips degeeri</i> Uzel	1981	1984	<i>Fraxinus ornus</i>	zur Strassen
<i>Dendrothrips ornatus</i> Jabl.	1990	1991	<i>Tilia cordata</i>	Janežič
<i>Dendrothrips saltator</i> Uzel	1981	1981	<i>Pyrus communis</i>	zur Strassen
<i>Drepanothrips reuteri</i> Uzel	1981	1984	<i>Fraxinus ornus</i>	zur Strassen
<i>Firmothrips firmus</i> (Uzel)	1991	1992	<i>Ajuga reptans</i>	Janežič
<i>Frankliniella intonsa</i> (Tryb.)	1981	1984	<i>Rhinanthus</i> sp.	zur Strassen
<i>Frankliniella occidentalis</i> (Pe)	1992	1993	<i>Dianthus caryophyllus</i>	Janežič
<i>Frankliniella pallida</i> (Uzel)	1981	1984	<i>Trifolium rubens</i>	zur Strassen
<i>Frankliniella tenuicornis</i> (Uz)	1990	1991	<i>Iris pseudacorus</i>	Janežič
<i>Helio. haemorrhoidalis</i> (Bch.)	1970	1991	<i>Viburnum tinus</i>	Janežič
<i>Kakothrips robustus</i> (Uzel)	1991	1991	<i>Melilotus officinalis</i>	Janežič
<i>Limothrips cerealium</i> Hal.	1990	1991	<i>Triticum vulgare</i>	Janežič
<i>Limothrips consimilis</i> Pr.	1981	1981	high grass	zur Strassen
<i>Limothrips denticornis</i> Hal.	1981	1984	<i>Phleum pratense</i>	zur Strassen
<i>Melanthrips fuscus</i> (Sulz)	1992	1992	<i>Cardaria draba</i>	Janežič
[ <i>Melanthrips crataegi</i> Janežič] = <i>Melanthrips rivnayi</i> Pr	1991	1991	<i>Crataegus oxyacantha</i>	Janežič
<i>Mycterothrips albidicornis</i> Knl	1991	-	wood trees	Seljak
<i>Odontothrips confusus</i> Pr.	1981	1981	<i>Spartium junceum</i>	zur Strassen

<i>Odontothrips loti</i> (Hal.)	1990	1991	<i>Trifolium repens</i>	Janežič
<i>Odontothrips meridionalis</i> Pr.	1990	1991	<i>Spartium junceum</i>	Janežič
<i>Odontothrips paraconfusus</i> Pel	1981	1984	<i>Dorycnium herbaceum</i>	zur Strassen
<i>Odontothrips phaleratus</i> (Hal.)	1981	1984	low pasture plants	zur Strassen
<i>Oxythrips bicolor</i> (Reut)	1992	1992	<i>Picea abies</i> .	Janežič
<i>Oxythrips ulmifoliorum</i> Hal.	1981	1984	<i>Rosa glauca</i>	zur Strassen
<i>Parthenothrips dracaenae</i> Hgr	1998	-	<i>Dracaena</i> sp.	Trdan & Jenser
<i>Pezothrips dianthi</i> (Pr.)	1991	1991	<i>Dianthus caryophyllus</i>	Janežič
<i>Prosopothrips vej dovskyi</i> Uzel	1981	1984	low alpine plants	zur Strassen
<i>Rubiothrips ferrugineus</i> (Uzel)	1981	1984	<i>Stellaria holostea</i>	zur Strassen
<i>Rubiothrips silvarum</i> (Pr.)	1981	1981	<i>Galium verum</i>	zur Strassen
<i>Sericothrips bicornis</i> (Ky)	1981	1984	<i>Lotus corniculatus</i>	zur Strassen
<i>Taeniothrips inconsequens</i> Uz	1991	1991	<i>Anemone nemorosa</i>	Janežič
<i>Taeniothrips picipes</i> (Zett.)	1981	1984	<i>Urtica dioica</i>	zur Strassen
<i>Tenothrips discolor</i> (Ky)	1991	1991	<i>Centaurea jacea</i>	Janežič
<i>Tenothrips frici</i> Uzel	1981	1981	<i>Hippocrepis comosa</i>	zur Strassen
<i>Thrips albopilosus</i> Uzel	1990	1991	<i>Humulus lupulus</i>	Janežič
<i>Thrips angusticeps</i> Uzel	1990	1991	<i>Solanum dulcamara</i>	Janežič
<i>Thrips atratus</i> Hal.	1981	1984	<i>Stellaria holostea</i>	zur Strassen
<i>Thrips calcaratus</i> Uzel	1991	1991	<i>Tilia cordata</i>	Janežič
<i>Thrips euphorbiae</i> Knech	1990	1991	<i>Urtica dioica</i>	Janežič
<i>Thrips flavus</i> Schr	1965	1991	<i>Dianthus caryophyllus</i>	Janežič
<i>Thrips fuscipennis</i> Hal.	1990	1991	<i>Achillea millefolium</i>	Janežič
<i>Thrips juniperinus</i> L.	1981	1984	<i>Juniperus communis</i>	zur Strassen
<i>Thrips major</i> Uzel	1991	1991	<i>Clematis vitalba</i>	Janežič
<i>Thrips meridionalis</i> (Pr.)	1981	1984	<i>Rosa glauca</i>	zur Strassen
<i>Thrips minutissimus</i> L.	1991	1992	<i>Anemone nemorosa</i>	Janežič
<i>Thrips nigropilosus</i> Uzel	1981	1984	<i>Fraxinus ornus</i>	zur Strassen
<i>Thrips origani</i> Pr.	1982	1991	<i>Origanum vulgare</i>	Janežič
<i>Thrips physapus</i> L.	1981	1981	yellow Asteraceae	zur Strassen
<i>Thrips pillichi</i> Pr.	1990	1991	<i>Tanacetum vulgare</i>	Janežič
<i>Thrips sambuci</i> Heeg.	1990	1991	<i>Sambucus nigra</i>	Janežič
<i>Thrips simplex</i> (Morison)	1991	1991	<i>Gladiolus</i>	Janežič
<i>Thrips tabaci</i> Lind.	1981	1981	<i>Galium verum</i>	zur Strassen
<i>Thrips trehernei</i> Pr.	1981	1984	<i>Taraxacum officinale</i>	zur Strassen
<i>Thrips urticae</i> Fabr.	1990	1991	<i>Urtica dioica</i>	Janežič
<i>Thrips validus</i> Uzel	1981	1984	<i>Leontodon</i> sp.	zur Strassen
<i>Thrips verbasci</i> (Pr.)	1990	1992	<i>Verbascum nigrum</i>	Janežič
<i>Thrips vulgatissimus</i> Hal.	1992	1992	<i>Petasites albus</i>	Janežič

## Suborder Tubulifera

Species	First recorded	First reported	Host plant	Collector
<i>Bolothrips bicolor</i> (Heeg)	1981	1984	grass on rocks	zur Strassen
<i>Bolothrips cingulatus</i> (Ky)	1981	1984	half dried grasses	zur Strassen
<i>Bolothrips insularis</i> Bagn.	1981	1981	grasses with dead leaves	zur Strassen
<i>Cephalothrips monilicornis</i> Rtr	1981	1981	half dried grasses	zur Strassen
<i>Cryptothrips nigripes</i> (Rtr)	1981	1984	dead branches <i>Ostrya</i>	zur Strassen
<i>Haplothrips acanthoscelis</i> Ky	1992	1993	<i>Diantus barbatus</i>	Janežič
<i>Haplothrips aculeatus</i> (Fabr.)	1990	1992	<i>Hordeum distichum</i>	Janežič
<i>Haplothrips andresi</i> Pr.	1981	1984	<i>Fraxinus ornus</i>	zur Strassen
<i>Haplothrips angusticornis</i> Pr.	1990	1991	<i>Achillea millefolium</i>	Janežič
<i>Haplothrips crassicornis</i> (Jn)	1981	1984	semi-dry grassland	zur Strassen
<i>Haplothrips distinguendus</i> Uz.	1990	1991	<i>Knautia arvensis</i>	Janežič
<i>Haplothrips helianthemii</i> Oett.	1981	1984	<i>Taraxacum officinale</i>	zur Strassen
<i>Haplothrips juncorum</i> Bagn.	1991	1991	<i>Symphytum officinale</i>	Janežič
<i>Haplothrips kurdjumovi</i> Ky	1992	-	plants generally	Seljak
<i>Haplothrips leucanthemi</i> (Sck)	1990	1991	<i>Chrysanthemum leucanthemum</i>	Janežič
<i>Haplothrips niger</i> (Osborne)	1990	1991	<i>Trifolium repens</i>	Janežič
<i>Haplothrips pannonicus</i> Fáb.	1981	1984	mixed vegetation	zur Strassen
<i>Haplothrips reuteri</i> (Ky)	1990	1992	<i>Centaurea jacea</i>	Janežič
<i>Haplothrips setiger</i> Pr.	1991	1991	<i>Knautia arvensis</i> ( ) Coult.	Janežič
<i>Haplothrips setigeriformis</i> Fáb	1981	1984	<i>Trifolium repens</i>	zur Strassen
<i>Haplothrips subtilissimus</i> (Hal.)	1992	1992	<i>Cardaria draba</i> ( ) Desv.	Janežič
<i>Haplothrips tritici</i> Kurdj.	1990	1991	<i>Triticum vulgare</i>	Janežič
<i>Hoplothrips corticis</i> (De Geer)	1981	1984	dead branches <i>Quercus</i>	zur Strassen
<i>Hoplothrips fieldsi</i> J. Crawford	1981	1984	<i>Ostrya carpinifolia</i> Scop.	zur Strassen
<i>Liothrips austriacus</i> (Ky)	1981	1984	<i>Fraxinus ornus</i>	zur Strassen
<i>Liothrips pragensis</i> Uzel	1981	1984	<i>Quercus pubescens</i>	zur Strassen
<i>Lispthrips crassipes</i> Jablon.	1981	1984	<i>Rosa glauca</i> Pourret	zur Strassen
<i>Phlaeothrips bispinoides</i> Bag.	1981	1984	<i>Fagus sylvatica</i>	zur Strassen
<i>Phlaeothrips coriaceus</i> Hal.	1991	1991	<i>Tilia cordata</i> Mill.	Janežič