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## Distribution of Thysanoptera species and their host plants in Croatia

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### ABSTRACT

Sampling of thrips species and their host plants were carried out from 1993 to 1996 on 111 localities in Croatia. Samples of thrips were taken from 235 different plant species. 33 thrips species from suborder Terebrantia and 14 thrips species from suborder Tubulifera were found in research. The most abundant species were onion thrips (*Thrips tabaci*) and flower thrips (*Frankliniella intonsa*), which were found on host plants from 30 and 29 botanical families, respectively. Six new species for Croatia was recorded: *Aeolothrips melaleucus*, *Oxythrips bicolor*, *Stenothrips graminum*, *Thrips linarius*, *Liothrips vaneeckei*, and *Poecilothrips albopictus*.

**Key words:** thrips, Thysanoptera, host plants, sampling, Croatia

### RESARJI (Thysanoptera) IN NJIHOVE GOSTITELJSKE RASTLINE NA HRVAŠKEM

#### IZVLEČEK

V obdobju 1993-1996 smo na 111 lokacijah na Hrvaškem vzročili resarje (Thysanoptera) na različnih vrstah gostiteljskih rastlin. Vzorce resarjev smo nabrali na 235 vrstah rastlin. 33 vrst resarjev, najdenih v raziskavi, je pripadalo podredu Terebrantia, 14 vrst pa podredu Tubulifera. Najbolj razširjeni vrsti sta bili tobakov resar (*Thrips tabaci*), ki smo ga našli na rastlinskih vrstah iz 30 botaničnih družin, in resar *Frankliniella intonsa*, ki je bil ugotovljen na gostiteljskih rastlinah iz 29 botaničnih družin. V raziskavi smo potrdili razširjenost 6 vrst resarjev, ki na Hrvaškem dotlej še niso bile najdene: *Aeolothrips melaleucus*, *Oxythrips bicolor*, *Stenothrips graminum*, *Thrips linarius*, *Liothrips vaneeckei* in *Poecilothrips albopictus*.

**Ključne besede:** resarji, Thysanoptera, gostiteljske rastline, vzorčenje, Hrvaška

## 1 INTRODUCTION

The order Thysanoptera is homogenous group of insects with characteristic wings – they have long fringe and very poor nervature. The adults are only few mm long and their detection is not easy. Up to date, more than 5000 species from two suborders - Terebrantia and Tubulifera - and 8 families – Merothripidae, Aeolothripidae, Heterothripidae, Adiheterothripidae,

Thripidae, Uzelothripidae, Fauriellidae, and Phlaeothripidae, are described. 93 % of species belong to the families Thripidae and Phlaeothripidae (Mound, 1997) and their representatives are also the most common in Croatia and its neighbouring countries (Trdan *et al.*, 2003). The most important pests from Thysanoptera order – e.g. *Frankliniella occidentalis*

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(Pergande), *Thrips tabaci* Lindeman, *Thrips palmi* Karny and *Scirtothrips dorsalis* Hood - belong to Thripidae family (Mound, 1997). In Croatia, up to now thrips fauna was investigated by Kovačević (1964), zur Strassen (1981, 1984), Ciglar *et al.* (1984, 1990), Šimala (1991), Raspudić (1996) and Andjus (1997).

Knowledge on host plants of thrips is important, since many polyphagous species and viruses they transmit can survive on different wild-growing plants also out of growing season of the plants (in most cases the cultivated plants), in which these pests caused the highest

damage (Jenser *et al.*, 2007). Until now, in Croatia and in some of its neighbouring countries many authors investigated distribution of Thysanoptera and their host plants: Jenser (1986, 1990), Jenser and Tusnádi (1989), Jenser and Balogh (1992), Masten (1983), Ciglar *et al.* (1984, 1990), Janežič (1991), Šimala (1991), Janežič and Maček (1993), Raspudić (1999), and Trdan (2002, 2003). The aim of this research was to identify thrips species and their host plants in Croatia, since the previous data from the same country was connected only with the individual thrips species.

## 2 MATERIALS AND METHODS

Monitoring of thrips fauna was carried out in Croatia from 1993 to 1996. Total of 662 samples – most of them were collected outdoors - from 235 different plant species were taken from 111 localities. Thrips sampling was done using standard thysanopterological instruments (Raspudić, 1996; Trdan, 2002). The samples were taken from agricultural crops, plants in the garden, channels, meadows, bushes and forests. Determination of thrips was carried out in the Entomological

Laboratory (Josip Juraj Strossmayer University in Osijek, Faculty of Agriculture) on the base of 1058 permanent slides. Determination was made according to morphological keys of Jenser (1982), Okumura and Papp (1991), and Moritz (1994). Determination of plant species was done by Prof. Ana Skender (Josip Juraj Strossmayer University in Osijek, Faculty of Agriculture), according to morphological keys of Ehrendorfer (1973) and Domac (1994).

## 3 RESULTS

Results on determination of thrips species and their host plants are presented in chapters 3.1 and 3.2, in which Thysanoptera and their host plant species are presented at family levels.

### 3.1 Suborder Terebrantia

#### 3.1.1 Family Aeolothripidae

##### 3.1.1.1 *Aeolothrips intermedius* Bagnall, 1934

Apiaceae: *Daucus carota* L.  
Asteraceae: *Cirsium arvensis* (L.) Scop., *Helianthus annuus* L., *Centaurea cristata* Bartl.  
Brassicaceae: *Sinapis arvensis* L., *Rorippa austriaca* (Cr.) Bess., *Raphanus sativus* L.  
Caprifoliaceae: *Sambucus nigra* L.  
Chenopodiaceae: *Beta vulgaris* L. var. *saccharifera* Lange,  
Fabaceae: *Trifolium campestre* Schreb, *Glycine max* (L.) Merr., *Trifolium pratense* L., *Phaseolus vulgareus* L., *Trifolium repens* L.  
Iridaceae: *Gladiolus gandavensis* van Houtte.  
Papaveraceae: *Papaver rhoeas* L., *Papaver somniferum* L.  
Poaceae: *Zea mays* L.  
Polygonaceae: *Rumex obtusifolius* L.  
Punicaceae: *Punica granatum* L.  
Rosaceae: *Rosa canina* L.  
Solanaceae: *Nicotiana tabacum* L.

##### 3.1.1.2 *Aeolothrips melaleucus* Haliday, 1852

Caprifoliaceae: *Sambucus ebulus* L.  
Corylaceae: *Corylus avellana* L.  
Fabaceae: *Glycine max* (L.) Merr.  
Punicaceae: *Punica granatum* L.  
Rosaceae: *Prunus persica* (L.) Batsch  
Vitaceae: *Vitis vinifera* L.

##### 3.1.1.3 *Aeolothrips ericae* Bagnall, 1920

Poaceae: *Zea mays* L.

##### 3.1.1.4 *Melanthrips pallidior* Priesner, 1919

Chenopodiaceae: *Spinacia oleracea* L.  
Brassicaceae: *Raphanus sativus* L., *Rorippa austriaca* (Cr.) Bess.

##### 3.1.1.5 Aeolothripidae larvae

Apiaceae: *Daucus carota* L.  
Asteraceae: *Cirsium arvense* (L.) Scop., *Tripleurospermum inodorum* (L.) C.H. Schultz  
Brassicaceae: *Raphanus landra* Moretti  
Fabaceae: *Coronilla varia* L., *Medicago sativa* L., *Trifolium repens* L., *Dorycnium herbaceum* Vill., *Melilotus alba* Med.  
Poaceae: *Avena sativa* L., *Zea mays* L., *Sorghum bicolor* (L.) Moench.  
Polygonaceae: *Rumex crispus* L., *Polygonum lapathifolium* L.  
Rubiaceae: *Galium mollugo* L.

**3.1.2 Family Thripidae**3.1.2.1 *Aptinothrips rufus* (Haliday, 1836)Fabaceae: *Coronilla varia* L.Poaceae: *Bromus* sp., *Melica transsilvanica* Schur,  
*Triticum aestivum* L., *Lolium perenne* L.3.1.2.2 *Aptinothrips stylifer* Trybom, 1894Brassicaceae: *Capsella bursa-pastoris* (L.) Med.Fabaceae: *Medicago sativa* L.Malvaceae: *Malva sylvestris* L.Poaceae: *Triticum aestivum* L.Solanaceae: *Petunia hybrida*3.1.2.3 *Anaphothrips obscurus* (O.F. Müller, 1776)Ranunculaceae: *Clematis vitalba* L.3.1.2.4 *Ceratothrips ericae* (Haliday, 1836)Apiaceae: *Anethum graveolens* L., *Daucus carota* L.Asteraceae: *Inula britannica* L., *Inula crithmoides* L., *Calendula officinalis* L.,Cichoriaceae: *Crepis setosa* Hall.f. *Taraxacum officinale* Web., *Crepis biennis* L., *Cichorium intybus* L., *Sonchus arvensis* L., *Lactuca sativa* L., *Picris* sp., *Picris hieracioides* L., *Chondrilla juncea* L., *Sonchum arvensis* L., *Sonchus* sp.Convolvulaceae: *Convolvulus arvensis* L.Cucurbitaceae: *Cucurbita pepo* L.Dipsacaceae: *Scabiosa ochroleuca* L.Iridaceae: *Gladiolus gandavensis* van HoutteLamiaceae: *Nepeta cataria* L.Poaceae: *Zea mays* L., *Deschampsia flexuosa* (L.) Trin.Rosaceae: *Spirea salicifolia* L.Verbanaceae: *Vitex agnus castus* L.3.1.2.5 *Chirothrips aculeatus* Bagnall, 1927Fabaceae: *Trifolium repens* L.Poaceae: *Lolium perenne* L.3.1.2.6 *Chirothrips manicatus* Haliday, 1836Asteraceae: *Erigeron annuus* L.Brassicaceae: *Sinapis arvensis* L.Lamiaceae: *Nepeta pannonica* L.Malvaceae: *Malva alcea* L.Poaceae: *Dactylis glomerata* L., *Calamagrostis epigeios* (L.) Roth, *Zea mays* L., *Lolium perenne* L., *Sorghum halepense* (L.) Pers., *Sorghum bicolor* (L.) Moench, *Festuca heterophylla* Lam., *Deschampsia flexuosa* (L.) Trin.Rosaceae: *Malus* sp.3.1.2.7 *Drepanothrips reuteri* Uzel, 1895Asteraceae: *Artemisia vulgaris* L.3.1.2.8 *Frankliniella intonsa* (Trybom, 1895)Apiaceae: *Daucus carota* L., *Anethum graveolens* L.Apocynaceae: *Nerium oleander* L.Asteraceae: *Matricaria chamomilla* L., *Centaurea cyanus* L., *Achillea millefolium* L., *Calendula officinalis* L., *Erigereon annuus* (L.) Pers., *Helianthus annuus* L., *Cirsium arvense* (L.) Scop., *Tagetes patulus* L., *Serratula tinctoria* L., *Solidago gigantea* Ait., *Centaurea jacea* L., *Leucanthemum irtutianum* DC, *Artemisia vulgaris* L., *Dahlia* sp., *Cinia* sp.Brassicaceae: *Brassica napus* var. *oleifera* DC., *Cardaria draba* (L.) Desv., *Sinapis arvensis* L., *Rorippa sylvestris* (L.) Bess, *Raphanus landra* Moretti, *Raphanus raphanistrum* L., *Capsella bursa-pastoris* (L.) Med., *Cheiranthus cheiri* (L.)Caryophyllaceae: *Melandrium album* (Mill.) Garcke, *Lychnis flos-cuculi* L., *Moenchia mantica* (L.) Bartl., *Sambucus nigra* L. *Sambucus ebulus* L., *Dianthus* sp.Chenopodiaceae: *Beta vulgaris* var. *saccharifera* LangeCichoriaceae: *Taraxacum officinale* Web., *Crepis tectorum* L., *Crepis jacquini* Tausch, *Cichorium intybus* L.Convolvulaceae: *Convolvulus arvensis* L.Cucurbitaceae: *Cucumis melo* L., *Cucumis sativus* L., *Cucurbita pepo* L.Cupressaceae: *Tuja* sp.Fabaceae: *Phaseolus vulgaris* L., *Trifolium pratense* L., *Trifolium repens* L., *Trifolium campestre* Schreb., *Astragalus glycyphyllos* L., *Pisum sativum* L., *Melilotus officinalis* (L.) Pall., *Lathyrus tuberosus* L., *Vicia grandiflora* Scop., *Glycine max* (L.) Merr, *Mentha* sp., *Medicago sativa* L., *Vicia cracca* L., *Trifolium arvense* L.Geraniaceae: *Pelargonium* spp.Hypericaceae: *Hypericum perforatum* L.Iridaceae: *Gladiolus gandavensis* van HoutteLamiaceae: *Salvia officinalis* L., *Vicia cracca* L., *Medicago sativa* L., *Scutellaria hastifolia* L., *Stachys annua* (L.)Liliaceae: *Allium* sp., *Lilium* sp., *Colchicum autumnale* L.Lytraceae: *Lytrum salicaria* L.Malvaceae: *Malva alcea* L.Onagraceae: *Fuschia* sp.Papaveraceae: *Papaver rhoeas* L.

Poaceae: *Hordeum murinum* L., *Triticum aestivum* L., *Zea mays* L.  
Polyonaceae: *Polygonum lapathifolium* L.  
Plantaginaceae: *Plantago altissima* L., *Plantago major* L.  
Ranunculaceae: *Ranunculus acris* L., *Ranunculus repens* L., *Ranunculus arvensis* L., *Clematis recta* L.  
Rosaceae: *Rosa* sp., *Potentilla reptans* L., *Rosacarina* L., *Potentilla inclinata* Vill., *Rubus* sp., *Fragaria* sp.  
Saxifragaceae: *Hydrangea hortensis* Sieb.  
Scrophulariaceae: *Antirrhinum majus* L., *Linaria vulgaris* Mill.  
Solanaceae: *Solanum tuberosum* L., *Lycopersicon esculentum* Mill., *Nicotiana tabacum* L., *Capsicum annuum* L., *Petunia hybrida*  
Violaceae: *Viola tricolor* L.

3.1.2.9 *Frankliniella occidentalis* (Pergande, 1895)

Araceae: *Cala palustris* L.  
Apiaceae: *Capsicum annuum* L.  
Asteraceae: *Helianthus annuus* L., *Chrysanthemum sinense* L.  
Brassicaceae: *Brassica oleracea* var. *botrytis* L.  
Caryophyllaceae: *Stellaria media* (L.) Vill.  
Cichoriaceae: *Taraxacum officinale* Web.  
Fabaceae: *Galega officinalis* L.  
Geraniaceae: *Pelargonium peltatum* L.  
Onagraceae: *Plobium hirsutum* L.  
Rosaceae: *Rosa* sp., *Fragaria* sp.  
Solanaceae: *Solanum melongena* L., *Capsicum annuum* L.

3.1.2.10 *Frankliniella pallida* (Uzel, 1895)

Cichoriaceae: *Cichorium intybus* L.  
Fabaceae: *Lathyrus tuberosus* L.  
Poaceae: *Zea mays* L.  
Rubiaceae: *Galium verum* L.  
Scrophulariaceae: *Verbascum nigrum* L.

3.1.2.11 *Frankliniella tenuicornis* (Uzel, 1895)

Asteraceae: *Calendula officinalis* L., *Inula helenium* L.  
Chenopodiaceae: *Beta vulgaris* var. *saccharifera* Lange  
Fabaceae: *Trifolium repens* L., *Medicago sativa* L., *Glycine max* (L.) Merr.  
Iridaceae: *Gladiolus gandavensis* van Houtte.  
Poaceae: *Zea mays* L.  
Solanaceae: *Nicotiana tabacum* L., *Capsicum annuum* L.

3.1.2.12 *Kakothrips robustus* (Uzel, 1895)

Fabaceae: *Lathyrus tuberosus* L., *Vicia cracca* L., *Coronilla varia* L., *Coronilla varia* L., *Medicago sativa* L. *Limothrips cerealium* Haliday, 1836  
Asteraceae: *Cirsium arvensis* (L.) Scop.  
Convolvulaceae: *Convolvulus arvensis* L.  
Poaceae: *Hordeum murinum* L., *Avena sterilis* L., *Triticum aestivum* L., *Avena sativa* L.

3.1.2.13 *Limothrips denticornis* (Haliday, 1836)

Asteraceae: *Cirsium arvensis* (L.) Scop.  
Brassicaceae: *Sinapis arvensis* L.  
Fabaceae: *Vicia cracca* L.  
Poaceae: *Hordeum vulgare* L., *Triticum aestivum* L.

3.1.2.14 *Odontothrips confusus* Priesner, 1926

Fabaceae: *Coronilla varia* L.

3.1.2.15 *Odontothrips loti* (Haliday, 1852)

Asteraceae: *Achillea millefolium* L., *Medicago sativa* L.  
Fabaceae: *Coronilla varia* L., *Medicago sativa* L., *Dorycnium herbaceum* Vill.

3.1.2.16 *Oxythrips bicolor* (O.M. Reuter, 1879)

Asteraceae: *Helichrysum italicum* (Roth) Mill. corr. Guss., *Inula candida* (L.) Cass, *Inula conyza* DC.  
Cichoriaceae: *Scolymus hispanicus* L.  
Dipsacaceae: *Cephalaria leucantha* (L.) Schrad.  
Lamiaceae: *Nepeta cataria* L.  
Poaceae: *Zea mays* L.  
Rosaceae: *Rubus hirtus* W. et K.  
Scrophulariaceae: *Linaria vulgaris* Mill.

3.1.2.17 *Stenothrips graminum* Uzel, 1895

Poaceae: *Triticum aestivum* L.

3.1.2.18 *Sericothrips bicornis* (Karny, 1910)

Fabaceae: *Trifolium repens* L.

3.1.2.19 *Thrips flavus* Schrank, 1776

Asteraceae: *Serratula tinctoria* L., *Helianthus annuus* L.

3.1.2.20 *Thrips linarius* Uzel, 1895.

Asteraceae: *Leucanthemum ircutianum* DC  
Caprifoliaceae: *Sambucus nigra* L.  
Rosaceae: *Rosa canina* L.

3.1.2.21 *Thrips major* Uzel, 1895

Asteraceae: *Leucanthemum ircutianum* DC, *Matricaria chamomilla* L., *Inula helenium* L., *Centaurea cristata* Bartl.,

- Centaurea jacea* L., *Serratula tinctoria* L., *Cirsium canum* (L.) All.
- Boraginaceae: *Lithospermum arvense* L.  
 Brassicaceae: *Lunaria rediviva* L.  
 Caryophyllaceae: *Lychnis flos-cuculi* L.  
 Cichoriaceae: *Picris hieracioides* L., *Cichorium intybus* L.  
 Convolvulaceae: *Convolvulus arvensis* L.  
 Cucurbitaceae: *Cucumis sativus* L.  
 Fabaceae: *Trifolium pratense* L., *Phaseolus vulgaris* L.  
 Liliaceae: *Allium scorodoprasum* L.  
 Lythraceae: *Lythrum salicaria* L.  
 Malvaceae: *Malva sylvestris* L.  
 Poaceae: *Triticum aestivum* L.  
 Ranunculaceae: *Ranunculus arvensis* L., *Ranunculus acris* L.  
 Rubiaceae: *Galium mollugo* L., *Galium palustre* L.
- 3.1.2.22 *Thrips minutissimus* Linnaeus, 1758  
 Asteraceae: *Leucanthemum ircutianum* DC., *Leucanthemum triviale* (Gaud.) Horvatić  
 Iridaceae: *Gladiolus gandavensis* van Houtte  
 Oleaceae: *Olea sativa* (Hoffmg. et Lk.) Fiori
- 3.1.2.23 *Thrips nigropilosus* Uzel, 1895  
 Asteraceae: *Acer campestre* L.  
 Cichoriaceae: *Sonchus arvensis* L., *Teraxacum officinale* Web.
- 3.1.2.24 *Thrips physapus* Linnaeus, 1758  
 Asteraceae: *Leucanthemum ircutianum* DC., *Calandula officinalis* L., *Carduus nutans* L., *Centaurea jacea* L., *Centaurea scabiosa* L., *Eupatorium cannabinum* L., *Helianthus annuus* L.  
 Brassicaceae: *Sinapis arvensis* L., *Sinapis arvensis* L.  
 Cichoriaceae: *Crepis biennis* L., *Tragopogon pratensis* L.  
 Cucurbitaceae: *Cucurbita pepo* L.  
 Papaveraceae: *Papaver rhoeas* L.  
 Plantaginaceae: *Plantago* sp.  
 Ranunculaceae: *Ranunculus arvensis* L.  
 Rosaceae: *Rubus* sp.  
 Urticaceae: *Urtica dioica* L.
- 3.1.2.25 *Thrips fuscipennis* Haliday, 1836  
 Asteraceae: *Leucanthemum triviale* (Gaud.) Horvatić, *Tanacetum vulgare* L.  
 Brassicaceae: *Brassica napus* var. *oleifera* DC.  
 Caprifoliaceae: *Sambucus nigra* L.  
 Rosaceae: *Rubus idaeus* L., *Rosa* sp.  
 Saxifragaceae: *Hydrangea hortensis* Sieb.  
 Solanaceae: *Capsicum annuum* L.
- 3.1.2.26 *Thrips tabaci* Lindeman, 1888  
 Apiaceae: *Daucus carota* L., *Anethum graveolens* L., *Eryngium amethystinum* L.  
 Asteraceae: *Achillea millefolium* L., *Leucanthemum ircutianum* DC., *Calystegia sepium* (L.) R.Br., *Centaurea cyanus* L., *Matricaria discoidea* DC., *Cirsium arvense* (L.) Scop., *Solidago gigantea* Ait., *Helianthus annuus* L., *Erigeron annuus* L., *Chrysanthemum* spp., *Solidago irgaurea* L., *Tripleurospermum indorum* (L.) C.H.Schultz., *Inula conyza* DC., *Conyza canadensis* (L.) Cronq., *Artemisia absinthium* L., *Inula crithmoides* L., *Tagetes patulus* L.  
 Brassicaceae: *Capsella bursa-pastoris* (L.) Med., *Sinapis arvensis* L.  
 Boraginaceae: *Echium plantagineum* L.  
 Cactaceae: *Cactus* sp.  
 Caprifoliaceae: *Sambucus nigra* L., *Sambucus ebulus* L.  
 Chenopodiaceae: *Beta vulgaris* . var. *saccharifera* Lange  
 Cichoriaceae: *Crepis setosa* Hall. f.  
 Convolvulaceae: *Calystegia sepium* (L.) R.Br.  
 Cucurbitaceae: *Cucurbita pepo* L.  
 Dipsacaceae: *Cephalaria leucantha* (L.) Schrad.  
 Fabaceae: *Medicago sativa* L., *Dorycnium herbaceum* Vill., *Spartium junceum* *Glycine max* (L.) Merr., *Medicago falcata* L., *Lotus corniculatus* L., *Vicia* sp., *Trifolium repens* L., *Genista tinctoria* L., *Melilotus alba* Med.  
 Iridaceae: *Gladiolus gandavensis* van Houtte  
 Lamiaceae: *Lavandula latifolis* Med., *Origanum vulgare* L.  
 Liliaceae: *Allium cepa* L., *Allium* sp.  
 Malvaceae: *Malva sylvestris* L.  
 Moraceae: *Ficus carica* L.  
 Oleaceae: *Olea sativa* (Hoffmg. et Lk.) Fiori  
 Plantaginaceae: *Plantago altissima* L.  
 Poaceae: *Triticum aestivum* L., *Zea mays* L., *Sorghum bicolor* (L.) Moench., *Sorghum halepense* (L.) Pers.  
 Polygonaceae: *Rumex crispus* L.  
 Punicaceae: *Punica granatum* L.  
 Ranunculaceae: *Nigella arvensis* L.  
 Resedaceae: *Reseda lutea* L.  
 Rosaceae: *Filipendula vulgaris* Moench, *Rubus hirtus* W. et K., *Fragaria vesca* L., *Rosa* sp.  
 Rubiaceae: *Galium verum* L., *Galium mollugo* L.

Rutaceae: *Ruta graveolens* L.  
 Saxifragaceae: *Hydrangea hortensis* Sieb.  
 Scrophulariaceae: *Verbascum sinuatum* L., *Verbascum sinuatum* L.  
 Solanaceae: *Lycopersicon esculentum* Mill.

3.1.2.27 *Taeniothrips atratus* (Haliday, 1836)  
 Caryophyllaceae: *Melandrium album* (Mill.) Garcke.  
 Geraniaceae: *Pelargonium* spp.  
 Lamiaceae: *Lavandula latifolia* Med., *Stachys annua* (L.)  
 Poaceae: *Dactylis glomerata* L.  
 Solanaceae: *Solanum tuberosum* L.

3.1.2.28 *Taeniothrips vulgarissimus* (Haliday, 1836)  
 Corylaceae: *Corylus avellana* L.

3.1.2.29 *Taeniothrips inconsequens* (Uzel, 1895)  
 Asteraceae: *Artemisia absinthium* L., *Centaurea diffusa* Lam.  
 Cichoriaceae: *Picris hieracioides* L.  
 Lamiaceae: *Stachys palustris* L.  
 Poaceae: *Lolium perenne* L.  
 Ranunculaceae: *Clematis flammula* L.

3.1.2.30 Thripidae larvae  
 Aceraceae: *Acer campestre* L.  
 Apiaceae: *Daucus carota* L.  
 Asteraceae: *Leucanthemum triviale* (Gaud.) Horvatić, *Matricaria chamomilla* L., *Inula britannica* L., *Inula helenium* L., *Arctium lappa* L.  
 Boraginaceae: *Echium vulgare* L.  
 Brassicaceae: *Raphanus landra* Moretti, *Raphanus raphanistrum* L., *Rorippa sylvestris* (L.) Bess.  
 Caryophyllaceae: *Lychnis flos-cuculi* L.  
 Chenopodiaceae: *Beta vulgaris* var. *saccharifera* Lange  
 Cichoriaceae: *Taraxacum officinale* Web.  
 Convolvulaceae: *Convolvulus arvensis* L.  
 Fabaceae: *Medicago sativa* L., *Melilotus officinalis* (L.) Pall., *Vicia* sp., *Vicia grandiflora* Scop., *Medicago sativa* L., *Glycine max* (L.) Merr., *Lathyrus tuberosus* L., *Trifolium pratense* L., *Medicago falcata* L., *Lotus corniculatus* L., *Trifolium pratense* L.  
 Malvaceae: *Malva sylvestris* L.  
 Oleaceae: *Ligustrum vulgare* L.  
 Piniaceae: *Pinus* sp.  
 Poaceae: *Triticum aestivum* L., *Avena sativa* L., *Hordeum vulgare* L., *Zea mays* L., *Sorghum bicolor* (L.) Moench.  
 Ranunculaceae: *Ranunculus acris* L.  
 Rosaceae: *Rubus* sp.

Rubiaceae: *Galium mollugo* L.

### 3.2 Suborder Tubulifera

#### 3.2.1 Family Phlaeothripidae

3.2.1.1 *Bolothrips icarus* (Uzel, 1895)  
 Caryophyllaceae: *Melandrium album* (Mill.) Garcke  
 Lamiaceae: *Mentha pulegium* L.  
 Malvaceae: *Malva sylvestris* L.  
 Plantaginaceae: *Plantago altissima* L.  
 Poaceae: *Festuca heterophylla* Lam.  
 Ranunculaceae: *Clematis flammula* L.

3.2.1.2 *Cryptothrips nigripes* (O. M. Reuter, 1880)  
 Avagaceae: *Jucca* sp.

3.2.1.3 *Cephalothrips monilicornis* O.M. Reuter 1885  
 Asteraceae: *Helianthus annuus* L.  
 Brassicaceae: *Lunaria rediviva* L.  
 Chenopodiaceae: *Beta vulgaris* var. *saccharifera* Lange.  
 Cucurbitaceae: *Cucurbita pepo* L. *Picris* sp.  
 Dipsacaceae: *Scabiosa* sp.  
 Fabaceae: *Vicia cracca* L., *Phaseolus vulgaris* L., *Glycine max* (L.) Merr.  
 Poaceae: *Zea mays* L., *Triticum aestivum* L., *Lolium perenne* L., *Trifolium pratense* L., *Avena sativa* L., *Sorghum halepense* (L.) Pers.  
 Ranunculaceae: *Ranunculus arvensis* L.  
 Scrophulariaceae: *Linaria vulgaris* Mill.

3.2.1.4 *Haplothrips aculeatus* (Fabricius, 1803)  
 Apiaceae: *Daucus carota* L.  
 Asteraceae: *Cirsium arvensis* (L.) Scop., *Erigeron annuus* L.  
 Cichoriaceae: *Cichorium intybus* L.  
 Fabaceae: *Phaseolus vulgaris* L., *Medicago sativa* L.  
 Poaceae: *Zea mays* L., *Triticum aestivum* L., *Avena sativa* L., *Dactylis glomerata* L.

3.2.1.5 *Haplothrips leucanthemi* (Schrank, 1781)  
 Asteraceae: *Leucanthemum irtutianum* DC., *Matricaria chamomilla* L.  
 Fabaceae: *Trifolium pratense* L., *Glycine max* (L.) Merr.

3.2.1.6 *Haplothrips minutus* (Uzel, 1895)  
 Asteraceae: *Erigeron annuus* L., *Tagetes patulus* L., *Solidago gigantea* Ait.  
 Caryophyllaceae: *Lychnis flos-cuculi* L.  
 Cichoriaceae: *Cichorium intybus* L.  
 Cucurbitaceae: *Cucumis sativus* L.  
 Fabaceae: *Lathyrus tuberosus* L., *Medicago sativa* L., *Trifolium repens* L.

- Trifolium pratense* L. *Glycine max* (L.) Merr.
- Liliaceae: *Lilium* sp., *Allium* sp.
- Oleaceae: *Olea sativa* (Hoffmg. et Lk.) Fiori
- Pinaceae: *Pinus* sp.
- Poaceae: *Zea mays* L., *Avena sativa* L., *Lolium perenne* L., *Hordeum vulgare* L., *Triticum aestivum* L.
- Polygonaceae: *Rumex sanguineus* L.
- 3.2.1.7 *Haplothrips niger* (Osborn, 1883)
- Asteraceae: *Matricaria chamomilla* L.
- Caryophyllaceae: *Melandrium album* (Mill.) Garcke
- Fabaceae: *Vicia cracca* L.
- Plantaginaceae: *Plantago altissima* L.
- 3.2.1.8 *Haplothrips setiger* Priesner, 1921
- Asteraceae: *Matricaria chamomilla* L.
- Poaceae: *Triticum aestivum* L.
- 3.2.1.9 *Haplothrips tritici* Kudjumov, 1912
- Asteraceae: *Matricaria chamomilla* L.
- 3.2.1.10 *Liothrips vaneekkei* Priesner, 1920
- Asteraceae: *Helianthus annuus* L., *Chrysanthemum* spp., *Achillea millefolium* L.
- Cichoriaceae: *Sonchum arvensis* L.
- Fabaceae: *Trifolium pratense* L., *Trifolium repens* L., *Lathyrus tuberosus* L., *Glycine max* (L.) Merr.
- Fagaceae: *Quercus pubescens* Willd.,
- Liaceae: *Colchicum autumnale* L.
- Onagraceae: *Epilobium hirsutum* L.
- Plantaginaceae: *Plantago* sp., *Plantago lanceolata* L.
- Poaceae: *Zea mays* L. *Hordeum murinum* L., *Triticum aestivum* L., *Avena sativa* L., *Lolium perenne* L., *Sorghum halepense* (L.) Pers.
- Rosaceae: *Rubus* sp.
- Solanaceae: *Nicotiana tabacum* L.
- 3.2.1.11 *Neoheergeria verbasci* (Osborn, 1886)
- Asteraceae: *Centaurea jacea* L.
- Brassicaceae: *Capsella bursa-pastoris* (L.) Med.
- Polygonaceae: *Rumex obtusifolius* L.
- Poaceae: *Avena sativa* L.
- 3.2.1.12 *Phlaeothrips coriaceus* Haliday, 1836
- Poaceae: *Triticum aestivum* L.
- 3.2.1.13 *Poecilothrips albopictus* Uzel, 1895
- Rosaceae: *Malus* sp.
- 3.2.1.14 *Xylaplothrips fuliginosus* Schille, 1910
- Apiaceae: *Daucus carota* L.
- Asteraceae: *Leucanthemum ircutianum* DC, *Matricaria chamomilla* L., *Achillea millefolium* L., *Centaurea cristata* Bartl., *Centaurea jacea* L., *Inula crithmoides* L., *Helichrysum italicum* (Roth) Mill. corr. Guss, *Tanacetum vulgare* L.
- Brassicaceae: *Sinapis arvensis* L.
- Caprifoliaceae: *Sambucus ebulus* L.
- Cichoriaceae: *Crepis biennis* L.
- Corylaceae: *Carpinus betulus* L.
- Dipsacaceae: *Cephalaria leucantha* (L.) Schrad.
- Plantaginaceae: *Plantago lanceolata* L.
- Solanaceae: *Nicotiana tabacum* L.
- 3.2.1.15 Phlaeothripidae larvae
- Apiaceae: *Daucus carota* L.
- Asteraceae: *Triticum aestivum* L., *Matricaria chamomilla* L., *Centaurea cyanus* L., *Achillea millefolium* L., *Inula candida* (L.) Cass.
- Dipsacaceae: *Scabiosa* sp.
- Fabaceae: *Trifolium repens* L.
- Malvaceae: *Malva sylvestris* L.
- Plantaginaceae: *Plantago lanceolata* L.
- Pintaceae: *Pinus* sp.
- Poaceae: *Triticum aestivum* L, *Agropyron pungens* (Pers.) Roem. et Schult, *Zea mays* L. *Avena sativa* L, *Hordeum vulgare* L.

#### 4 DISCUSSION AND CONCLUSIONS

Thrips species determined in the investigation belong to the three families: Aeolothripidae, Thripidae, and Phlaeothripidae. The presence of thrips from those three families was confirmed by Mound et al. (1976.) in most European countries. The host plants of thrips determined in the investigations belongs to 49 botanical families.

Thrips species from Aeolothripidae family were presented on 32 % of botanical families within our research, mostly on families Fabaceae, Asteraceae and

Brassicaceae. *Aeolothrips intermedius* – important predator of thrips and mites (Trdan et al., 2005), which was found on host plants from 15 different botanical families, was the most abundant species from Aeolothripidae family.

Thrips specimens from Thripidae family were the most abundant; they were from 14 genera and 30 species. They were presented on 89 % of botanical families within our research. Genus *Thrips* with 10 species, and the most abundant species *T. tabaci*, were determined

on 30 botanical families with the highest number on Asteraceae and Fabaceae. The second most abundant thrips species was *Frankliniella intonsa*. This species was presented on 32 % of examined samples, on 29 botanical families, mainly on Asteraceae and Fabaceae, followed by Brassicaceae, Caryophyllaceae, Rosaceae, Lamiaceae, and Ranunculaceae. Both Thysanoptera species are also known as widely distributed insects in Slovenia (Trdan, 2003), Serbia (Andjus and Trdan, 2005ab), Hungary (Jenser and Czencz, 1988) and in many other European countries with continental climate, while only *Thrips tabaci* is known as important pest of some vegetable plants (Trdan *et al.*, 2007).

Family Phlaeothripidae was presented with 9 genera and 14 species. Their representatives, which do not belong among important pest species in Croatia, their neighbouring countries and also some Mediterranean

countries (Garcia-Fayos and Goldarazena, 2008), were presented on 27 plant families, mainly on Poaceae (40 %), Asteraceae (33 %), and Fabaceae (26 %). The most abundant species from Phlaeothripidae family, which representatives are potential pollinator of their host plants, was *Haplothrips minutus*, which was found in host plants from 10 botanical families.

On the basis of results of present study we can conclude that the majority of Thysanoptera species are polyphagous. This characteristic allow them survival in different agroecosystems, where some of these insects perform the permanent threat to cultivated plants. Therefore the knowledge on host plants of thrips species is highly advantageous in research work as well as in implementation of sustainable methods of thrips control (e.g. trap crops [Buitenhuis *et al.*, 2007], intercrops [Trdan *et al.*, 2006] etc.) in food production systems.

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