

# The Composition of Thysanoptera Species on *Stellaria media* (L.) Vill. in Different Biotopes under Hungarian Climatic Conditions

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Thysanoptera species were collected from *Stellaria media* in autumn, winter and spring in different biotopes, in Hungary. The total number of the sampled specimens was 5121. The most frequent species were (in order of frequency): *Thrips tabaci*, *T. atratus*, *Frankliniella intonsa*, *Aptinothrips rufus*, *T. minutissimus*, *T. nigropilosus* and *Anaphothrips obscurus*. The number of species as well as the composition of the species occurring on *S. media* depends on the characteristics of biotopes. The number of species considerably increased in spring from 15 to 43. Among them seven species occurred from autumn through winter till spring. *S. media* provides a suitable site for winter refuge, and an alternative food source for a few species, which hibernate under bark, fallen leaves and dry grass as well as in the soil, leaving their winter quarters move and accumulate temporarily on this plant. Specimens of *T. tabaci* capable of harbouring tomato spotted wilt virus occurred in every investigated biotopes.

Keywords: *Stellaria media*, Thysanoptera, tomato spotted wilt tospovirus.

Chickweed (*Stellaria media*) is found widely on every continent from Spitzbergen to the Subantarctic islands. While it is generally absent only from the most arctic regions and very dry areas, it is common in the tropics only at high elevations. It is a weed of grain fields, young pastures, lawns and gardens (Turkington et al., 1980). It grows from autumn until late spring or beginning of early summer, while it is green during winter under the snow under Hungarian climatic conditions. It provides temporary food sources for many arthropod species. Since it is known as food plant of a few species of Thysanoptera (Grevillius, 1910; Priesner, 1928; Jacot-Guillarmod, 1975; Dyadechko, 1977; Strykstra, 1989; Bitterlich and MacDonald, 1993) and host plant of the tomato spotted wilt *tospovirus* TSWV we began to study the composition of Thysanoptera species in different biotopes and in different seasons. The original goal was to size up the occurrence of *T. tabaci* on *S. media*. Meanwhile it became clear to us that many other species are found on *S. media* depending on the biotopes, so studies were carried out to establish the Thysanoptera species composition depending the characteristics of the biotopes.

## Materials and Methods

Thysanoptera species were sampled from 268 sites in autumn, winter and spring in different biotopes such as the surroundings of greenhouses and forcing beds, roadside verges and ruderal vegetations, pastured fields, arboretums, domestic gardens, skirt of

forest, cultivated fields, a park, a pastured field with hawthorn bushes, an abandoned alfalfa stand as well as an abandoned pear orchard. Earlier we had collected Thysanoptera from chickweed as opportunity was offered, and regular samplings were carried out between 1999 and 2000. The samples were placed in Berlese-funnels.

The infections of the tomato spotted wilt virus were detected by DAS-ELISA serological method.

Data of samples in different years were reduced referring to each biotope. Dominance (Berger-Parker-index), diversity (Shannon-diversity) and similarity (Jaccard-index, Renkonen-index) were accounted from data. Species diversity was calculated using the Shannon-index:

$$Sh = - \sum p_i \ln p_i$$

where  $p_i$  is the proportion of the individuals found in the  $i$ th species.

Site-to-site similarities were calculated by the Renkonen-index:

$$Re = \sum \min (p_{ij}, p_{ik})$$

where  $p_{ij}$  is the relative proportion of species 'i' in sample 'j'.

## Results

The total number of specimens sampled from *Stellaria media* was 5121, comprising 46 species (Table 1). The most frequent species were (in order of frequency): *Thrips tabaci*, *T. atratus*, *Frankliniella intonsa*, *Aptinothrips rufus*, *T. minutissimus*, *T. nigropilosus* and *Anaphothrips obscurus*.

In autumn 13 species moved to *Stellaria media*. The greater part of these species was found also in winter and in spring. The number of species somewhat changed and increased in winter, a few Phlaeothripidae species appeared, and no specimen of *Frankliniella occidentalis* was found.

The number of Thysanoptera species considerably increased in spring from 15 to 43. Among them the specimens of seven species occurred from autumn through winter till spring. A part of these species is zoophagous like the *Aeolothrips* species and *Haplothrips subtilissimus*. Some of them propagate on Poaceae species (*Aptinothrips*, *Chirothrips*, *Limothrips* species and *Cephalothrips monilicornis*), on deciduous trees or on different herbaceous plants. We did not find species particularly attached to *S. media* (Table 2).

The number of the species as well as the composition of the species occurring on *S. media* depends on the characteristics of biotopes. The number of species is the highest in the skirt of forest. High in domestic gardens, in roadside verges and in the surroundings of greenhouses and forcing beds, too. The most specimens were found in the surroundings of greenhouses and forcing beds, the least in the abandoned pear orchard.

The value of Berger-Parker dominance was the highest in the abandoned pear orchard, in the abandoned alfalfa stand and in the surroundings of greenhouses and forcing beds. The Shannon-diversity and the equitability were the best in the skirts of forest and

**Table 1**Thysanoptera species sampled from *Stellaria media* (Hungary, 1987–2000)

Species	No. of specimens
<b>Aeolothripidae</b>	
<i>Aeolothrips albicinctus</i> Haliday, 1836	2
<i>Aeolothrips intermedius</i> Bagnall, 1920	24
<i>Aeolothrips melaleucus</i> (Haliday, 1852)	1
<i>Aeolothrips versicolor</i> Uzel, 1895	1
<b>Thripidae</b>	
<i>Anaphothrips obscurus</i> (Müller, 1776)	119
<i>Aptinothrips elegans</i> Priesner, 1924	3
<i>Aptinothrips rufus</i> Haliday, 1836	350
<i>Aptinothrips stylifer</i> Trybom, 1894	32
<i>Baliothrips dispar</i> (Haliday, 1836)	1
<i>Bolacothrips jordani</i> Uzel, 1895	1
<i>Chirothrips aculeatus</i> Bagnall, 1927	5
<i>Chirothrips manicatus</i> (Haliday, 1836)	28
<i>Dendrothrips degeeri</i> Uzel, 1895	5
<i>Dendrothrips saltator</i> Uzel, 1895	3
<i>Dictyothrips betae</i> Uzel, 1895	2
<i>Frankliniella intonsa</i> (Trybom, 1895)	576
<i>Frankliniella occidentalis</i> Pergande, 1895	13
<i>Kakothrips robustus</i> Uzel, 1895	1
<i>Limothrips consimilis</i> Priesner, 1926	1
<i>Limothrips denticornis</i> (Haliday, 1836)	42
<i>Mycterothrips albidicornis</i> Knechtel, 1923	7
<i>Oxythrips</i> sp.	3
<i>Physothrips ulmifoliorum</i> (Haliday, 1836)	7
<i>Scolothrips longicornis</i> Priesner, 1926	2
<i>Sericothrips bicornis</i> (Karny, 1909)	10
<i>Taeniothrips inconsequens</i> (Uzel, 1895)	5
<i>Thrips angusticeps</i> Uzel, 1895	74
<i>Thrips atratus</i> (Haliday, 1836)	1265
<i>Thrips discolor</i> (Karny, 1907)	1
<i>Thrips flavus</i> Schrank, 1776	7
<i>Thrips fuscipennis</i> Haliday, 1836	1
<i>Thrips major</i> Uzel, 1895	2
<i>Thrips minutissimus</i> Linnaeus, 1758	197
<i>Thrips nigropilosus</i> Uzel, 1895	165
<i>Thrips physapus</i> Linnaeus, 1758	5
<i>Thrips tabaci</i> Lindeman, 1888	2094
<b>Phlaeothripidae</b>	
<i>Bolothrips bicolor</i> (Heeger, 1852)	3
<i>Cephalothrips monilicornis</i> (O.M. Reuter, 1880)	4
<i>Haplothrips acanthoscelis</i> (Karny, 1909)	2
<i>Haplothrips aculeatus</i> (Fabricius, 1803)	20
<i>Haplothrips hukkineni</i> Priesner, 1950	1
<i>Haplothrips kurdjumovi</i> Karny, 1913	9
<i>Haplothrips leucanthemi</i> (Schrank, 1781)	2
<i>Haplothrips minutus</i> (Uzel, 1815)	2
<i>Haplothrips subtilissimus</i> (Haliday, 1852)	20
<i>Haplothrips tritici</i> Kurdjumov, 1912	1
<b>Total:</b>	<b>5121</b>

**Table 2**Thysanoptera species sampled from *Stellaria media* in different seasons

Autumn (October–November)	Winter (December–February)	Spring (March–May)
<u>Anaphothrips obscurus</u>	<u>Anaphothrips obscurus</u>	Aeolothrips albicinctus
<u>Aptinothrips rufus</u>	<u>Aptinothrips rufus</u>	Aeolothrips intermedius
<u>Aptinothrips stylifer</u>	<u>Aptinothrips stylifer</u>	Aeolothrips melaleucus
Dendrothrips degeeri	Bolacothrips jordani	Aeolothrips versicolor
Frankliniella occidentalis	Frankliniella intonsa	<u>Anaphothrips obscurus</u>
Mycterothrips albidicornis	Limothrips denticornis	Aptinothrips elegans
Sericothrips bicornis	Sericothrips bicornis	<u>Aptinothrips rufus</u>
<u>Thrips atratus</u>	Physothrips ulmifoliorum	<u>Aptinothrips stylifer</u>
<u>Thrips flavus</u>	<u>Thrips atratus</u>	Baliothrips dispar
<u>Thrips nigropilosus</u>	<u>Thrips flavus</u>	Chirothrips aculeatus
Thrips physapus	<u>Thrips nigropilosus</u>	Chirothrips manicatus
<u>Thrips tabaci</u>	<u>Thrips tabaci</u>	Dendrothrips degeeri
Haplothrips aculeatus	Haplothrips aculeatus	Dendrothrips saltator
	Haplothrips kurdjumovi	Dictyothrips betae
	Haplothrips subtilissimus	Frankliniella intonsa
		Frankliniella occidentalis
		Kakothrips robustus
		Limothrips consimilis
		Limothrips denticornis
		Mycterothrips albidicornis
		Oxythrips sp.
		Physothrips ulmifoliorum
		Scolothrips longicornis
		Thrips angusticeps
		<u>Thrips atratus</u>
		Thrips discolor
		<u>Thrips flavus</u>
		Thrips fuscipennis
		Thrips inconsequens
		Thrips major
		Thrips minutissimus
		<u>Thrips nigropilosus</u>
		Thrips physapus
		<u>Thrips tabaci</u>
		Bolothrips bicolor
		Cephalothrips monilicornis
		Haplothrips acanthoscelis
		Haplothrips aculeatus
		Haplothrips hukkineni
		Haplothrips kurdjumovi
		Haplothrips minutus
		Haplothrips subtilissimus
		Haplothrips tritici
<b>Total: 13</b>	<b>15</b>	<b>43</b>

The underlined species occurred in all three seasons

in the roadside verges. The value of Jaccard-index varied between 0.16 and 0.56. On the basis of Jaccard-index the specific similarity was the highest among the species composition in domestic gardens and in the surroundings of greenhouses and forcing beds (0.56), then among the species composition in domestic gardens and in the park (0.54), which are moderate similarities. Between the other biotopes a moderate or a low similarity was shown. The value of Renkonen-index varied between 0.16 and 0.83. On the basis of Renkonen-index the similarity was the highest among the assemblages sampled from the abandoned alfalfa stand and the abandoned pear orchard (0.83), then among the assemblages sampled from the pastured field with hawthorn bushes and the park (0.82) which are relative high similarities. This was caused mainly because of the high dominance (relative frequency) values of *Thrips atratus* at the given sites. The similarities between samples from other biotopes vary (Table 3).

**Table 3**

Characteristics of the Thysanoptera assemblages sampled from *Stellaria media* in different biotopes

Biotopes	No. of species	No. of specimens	Berger-Parker-index	Shannon-diversity	Maximum diversity	Equitability
Skirt of forest	30	711	0.26	2.14	3.40	0.63
Pastured field	12	770	0.38	1.44	2.48	0.57
Pastured field with hawthorn bushes	8	490	0.48	1.21	2.07	0.58
Roadside verges	17	244	0.21	2.12	2.83	0.74
Domestic garden	19	307	0.32	1.95	2.94	0.66
Parc	15	233	0.47	1.35	2.70	0.49
Arboretum	13	221	0.44	1.53	2.56	0.60
Surrounding of forcing bed	17	1332	0.71	0.99	2.83	0.34
Cultivated field	12	461	0.47	1.36	2.48	0.54
Abandoned alfalfa stand	12	247	0.71	1.07	2.48	0.43
Abandoned pear orchard	9	105	0.80	0.78	2.19	0.35

*Aptinothrips rufus*, *Thrips atratus* and *T. tabaci* were present in each biotope. *A. rufus* was dominant in skirts of forest and in roadside verges, *Frankliniella intonsa* in pastured fields, *T. atratus* in the abandoned pear orchard and alfalfa stand, in the pastured field with hawthorn bushes, in the park and in arboretum. *T. tabaci* occurred in all biotopes but was the dominant species in the domestic gardens, surroundings of greenhouses and forcing beds, in cultivated fields (Table 4).

**Table 4**Dominant Thysanoptera species occurring on *Stellaria media* in different biotopes

Biotopes	Dominant species	
Skirt of forest	<i>Aptinothrips rufus</i>	26.16%
	<i>Thrips minutissimus</i>	21.09%
	<i>Thrips tabaci</i>	19.12%
	<i>Anaphothrips obscurus</i>	10.68%
	<i>Thrips atratus</i>	6.18%
Pastured field	<i>Frankliniella intonsa</i>	38.70%
	<i>Thrips tabaci</i>	37.92%
	<i>Thrips nigropilosus</i>	7.79%
	<i>Thrips atratus</i>	6.10%
Pastured field with hawthorn bushes	<i>Thrips atratus</i>	48.57%
	<i>Thrips tabaci</i>	34.89%
	<i>Frankliniella intonsa</i>	9.18%
	<i>Thrips nigropilosus</i>	4.48%
Roadside verge	<i>Aptinothrips rufus</i>	21.31%
	<i>Thrips atratus</i>	17.62%
	<i>Thrips tabaci</i>	17.21%
	<i>Thrips minutissimus</i>	14.75%
	<i>Thrips nigropilosus</i>	13.93%
Domestic garden	<i>Thrips tabaci</i>	32.24%
	<i>Thrips atratus</i>	29.64%
	<i>Aptinothrips rufus</i>	8.79%
	<i>Thrips nigropilosus</i>	8.46%
Park	<i>Thrips atratus</i>	47.63%
	<i>Thrips tabaci</i>	33.47%
	<i>Aptinothrips rufus</i>	10.72%
Arboretum	<i>Thrips atratus</i>	44.34%
	<i>Frankliniella intonsa</i>	22.17%
	<i>Thrips tabaci</i>	20.81%
Surroundings of greenhouse and forcing bed	<i>Thrips tabaci</i>	71.69%
	<i>Thrips atratus</i>	15.69%
	<i>Frankliniella intonsa</i>	6.68%
Cultivated field	<i>Thrips tabaci</i>	47.72%
	<i>Thrips atratus</i>	26.46%
	<i>Frankliniella intonsa</i>	16.91%
Abandoned alfalfa stand	<i>Thrips atratus</i>	71.65%
	<i>Thrips tabaci</i>	11.33%
	<i>Aptinothrips rufus</i>	8.09%
Abandoned pear orchard	<i>Thrips atratus</i>	80.95%
	<i>Thrips tabaci</i>	9.52%
Total	<i>Thrips tabaci</i>	40.89%
	<i>Thrips atratus</i>	24.70%
	<i>Frankliniella intonsa</i>	11.24%
	<i>Aptinothrips rufus</i>	6.83%

## Discussion

*Stellaria media* provides a suitable site for winter refuge and an alternative food source for a few species. Only a fraction of the species (15 species) dwells through the winter on *S. media*. Among them seven species, *Anaphothrips obscurus*, *Aptinothrips rufus*, *A. stylifer*, *Thrips atratus*, *T. flavus*, *T. nigropilosus* and *T. tabaci* stay and feed on *S. media* from autumn till spring. The data figured in Table 2. clearly demonstrate that these species could hibernate as adults on different plants, in this case on *S. media*. The overwhelming majority of the species, 26 species appeared only in spring. A part of the specimens of these species e.g. *Aeolothrips*, *Chirothrips*, *Cephalothrips*, *Dendrothrips*, and *Haplothrips* species hibernate under bark, fallen leaves, dry grass and in moss. Leaving their winter quarters move and accumulate on this plant. The adults, the 1st and 2nd instar larvae of *Taeniothrips inconsequens* live in the flower of their breeding host as pear, apple and *Fraxinus* spp. The second instar larva moves into the soil, where it develops and hibernates as prepupa and pupa. After emergence the adults fly to the trees, but they stay and feed for only a short time on different herbaceous plants e.g. on *Galium mollugo*, *Narcissus angustifolius*, *Petasites albus*, *Primula veris*, *Stellaria media*, *Vicia pannonica* (Priesner, 1928; Zawirska, 1988; Teulon et al., 1994; Jenser, 1996, 1999). We have found it on *S. media*. Adults and larvae of *Thrips minutissimus* propagate on the leaves of *Quercus* species, *Fagus sylvatica* or in the flowers of apple. The second instar larva moves into the soil and it emerges in the next spring. The adults were found also on herbaceous plants e.g. on *Capsella bursa-pastoris*, *Euphorbia esula*, *Galium schultesii* in spring (Priesner, 1928; Jenser, 1996, 1999). According to our data before they fly to their deciduous breeding host, the males and females stay and feed on different herbaceous plants, in this case on *S. media*.

Specimens of *Thrips tabaci* occurred from autumn till spring on *S. media*, in every investigated biotopes. It was the dominant species in domestic garden, in the surroundings of greenhouse and forcing bed, as well as in the cultivated field. It is able to harbour the tomato spotted wilt virus in winter, additionally we also detected TSWV in *S. media*. This fact has a role in the outbreak of the epidemic of TSWV.

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