The study of thrips fauna (Insecta:Thysanoptera) from the quercus-forests of the Romanian plain

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Summary:

The praticolous species *Chirothrips molestus* Priesner 1926 and the males of *Chirothrips hamatus* Trybom 1895 had now been first recorded in Romania. The analysis of thrips specific diversity pointed out a taxonomic spectrum of 20 species, generally praticolous, rarely arboricolous; 12 species were found in the herbaceous layer of Măgura forest, 8 species in Ogarca forest, 6 species in Ciofliceanca forest and only 4 species in Comana forest. The values of the structural and functional indices of the thrips populations revealed the typical microconditions of Quercus steppe-forests, investigated in 2002. The presence of some xero-thermophilous thrips species emphasises the thermophilous character of the steppe-forests from Romanian Plain.

Rezumat:

Studiul faunei de thripşi (Insecta:Thysanoptera) din quercetele din Câmpia Română

Semnalăm pentru prima dată în fauna României, specia *Chirothrips molestus* Priesner 1926 şi masculii de *Chirothrips hamatus* Trybom 1895, specii praticole. Analiza de ansamblu a diversităţii specifice a thripşilor a evidenţiat un spectru taxonomic alcătuit din 20 specii; în stratul ierbos al pădurii Măgura au fost semnalate12 specii, la Ogarca 8 specii, la Ciofliceanca 6 specii şi 4 specii la Comana, majoritatea praticole, rare arboricole.Valorile indicilor structurali şi funcţionali ai populaţiilor de thripşi reflectă caracteristicile microstaţionale ale quercetelor de silvostepă studiate în anul 2002. Prezenţa unor specii de thripşi xero-termofili, confirmă caracterul de termofilie al quercetelor din Câmpia Română.

Key words: *thysanoptera, herbaceous layer, Quercus stepp-forests.*

Introduction

ZIMMERMAN E.C. (1948) mentioned that the fauna in high wet forests was dominated by fungus-feeding and predatory Tubulifera, and the flower and foliage-feeding Terebrantia were commonest in the drier, lowland regions (in Lewis, 1973).

KUCHARCZYK H. (1990; 1994; 1999) had investigated thrips communities from deciduous and coniferous forests in Poland. The author reported 50 thrips species in ***Tilio-Carpinetum stachyetosum***, but all of them in vertical distribution of vegetation.

JENSER G. (1993) found 24 species in a ruderal area outside the oak forest, at 0.2 m height level.

Materials and methods

The thrips were collected from the herbaceous layer in the following Quercus-forests: Măgura, Ogarca, Comana (Giurgiu district) and Ciofliceanca (Călăraşi district).

Măgura forest – the trees were framed within the association ***Ceraso mahaleb-Quercetum pubescentis*** JAKUCS & FEKETE 1957, with the Mediterranean element *Cerasus mahaleb*. The tree layer was 20 m tall, with coverage of 70-75% ; the shrub layer of 3-4 m, with coverage of 5%, was dominated by *Fraxinus ornus*, *Crataegus monogyna* and *Cornus mas*. The herbaceous layer, the trophic niche of thrips, was 60 cm tall, with a coverage of 35-45% and was characterised by: *Asparagus verticillatum, Convolvulus cantabrica, Vicia narbonensis* (Mediterranean elements), *Vincetoxicum hirudinaria, Origanum vulgare, Carex spicata, Festuca valesiaca, Poa angustifolia, Allium rotundum*.

Ogarca forest – the trees were characterised by the association ***Quercetum cerris*** Georgescu, 1941, dominated by *Quercus cerris* and with rare

specimens of *Q. frainetto, Q. pubescentis* and *Q. pedunculiflora*, 35-40 years old, reaching a coverage of 85%. The shrub layer was 2.5-3 m tall, with 5% of coverage, and formed by: *Crataegus monogyna, Rosa canina, Prunus spinosa*. The herbaceous layer was 35-40 cm tall, with a coverage of 30-35%, formed in majority of xero-mesophilous elements: Festuca valesiaca, Brachypodium sylvaticum, Lithospermum purpurocaeruleum, Paoenia peregrina var. romanica, Lychis coronaria, Digitalis lanata, Muscari comosum, Prunella vulgaris, Thalictrum aquilegiifolium, T. lucidum, Tanacetum corymbosum, Hieracium pilosella, Potentilla recta, Geum urbanum, Poa angustifolia, Ornithogalum flavescens, Astragalus glycyphyllos, Carex spicata, Potentilla argentea, Polygonatum latifolium, Iris variegata, Lathyrus niger, elements which could influence the structure of thrips associations.

Ciofliceanca forest – the trees of 16-18 m tall, with a coverage of 75-80% were framed within the ***Quercetum pedunculiflorae*** Borza, 1937 association. The shrub layer was 6-8 m tall, dominated by *Crataegus monogyna,* with a coverage of 25-30%. Besides this, Prunus spinosa var. dasyphylla, Acer tataricum, Rosa dumentorum, Cornus sanguinea, Crataegus oxycantha, Rosa galica were present as well. The herbaceous layer was 60 cm tall, with a coverage of 55-60%, and formed by: *Dictamnus albus, Galium verum, Adonis vernalis, Carex praecox, Trifolium alpestre, Festuca valesiaca, Tanacetum corymbosum, Inula hirta,* Lithospermum purpurocaeruleum, *Euphorbia virgata,* Vinca herbacea, Melica altissima, Asparagus officinalis, *Hypericum perforatum, Dactylis polygama.*

Comana forest – the trees of 25-30 m tall, with coverage of 90% were framed within the ***Fraxinus pallisae-angustifoliae-Quercetum roboris*** Popescu et al., 1979; dominated by *Quercus robur*, together with *Fraxinus angustifolia, F. pallisae, Carpinus betulus, Tilia tomentuosa* and *Acer campestre*. The shrub layer of 8 m tall, with a coverage of 10%, was formed by *Crataegus monogyna, Ligustrum vulgare* and *Sambucus nigra.*

The herbaceous layer was 40 cm tall, with a coverage of 25% formed by: *Asarum europaeum,* Galium odoratum, Sanicula europaea, *Carex divulsa, Brachypodium sylvaticum,* Galeobdolon luteum, Polygonatum latifolium, *Ornithogalum pyrenaicum, Mercurialis perennis, Euphorbia amygdaloides, Carex pilosa,* Carex remota, *Dactylis polygama, Carex sylvatica* and *Hedera helix.*

All the mentioned forests are not used for grazing.

The thrips were collected with a 30 cm Ø entomological sweep net from the grass layer. The necessary sample number was statistically determined.

Results and Discussions

Thrips populations were not so rich as quality, no as quantity, comparatively to those from other open ecosystems (pastures, shrublands). They were different among the investigated Quercus forests depending on the degree of vegetation structure development.

The density of the vegetal coverage, the dimension of the trees canopy plays a great role in the herbaceous layer development due to the quantity of light which penetrates through the foliage.

The taxonomical spectrum of herbaceous layer thrips was rich in Quercus forest and their communities were diversified, due to the specific microconditions.

Măgura forest is one of the three centres in Romania with climate of Mediterranean influence (beyond Iron Gates, Dobrudja). This particular climate was reflected in the structure of the thrips species spectrum.

The new records for the Romanian fauna were *Chirothrips molestus* Priesner, 1926 and the males of *Chirothrips hamatus** Trybom, 1895 (Table 1), mesophilous species sampled in 2002 summer when high rainfalls in this area occurred.

The thrips fauna of Măgura forest was influenced by the herbaceous layer composition, the southern exhibition of the site, and by the presence of termophilous elements: *Creasus mahaleb, Asparagus verticillatum, Convolvulus cantabrica* and *Vicia narbonensis.*

The single predator species was arboricolous *Aeolothrips melaleucus* in this thripscoenosis, all the other species were praticolous and phytophagous. *Melanthrips knechteli* was a rare species and *Bolothrips icarus* had been last mentioned in 1964.

The presence of xerothermic species: *Melanthrips knechteli, Melanthrips pallidior, Aptinothrips rufus, Chirothrips aculeatus, Bolothrips bicolor, Bolothrips icarus*, generally thermophilous species pointed out the thermophily of this site, thus the thrips species could be considered bioindicators for such type of steppe-forest (Table 1, 2).

Table 1. Thrips species in the herbaceous layer in *Qercus* steppe-forests from Romanian Plain

Ord. Thysanoptera
S/Ord. Terebrantia
Fam. Aeolothripidae

Species		Ecological characteristics	Geographical distribution
Aeolothrips fasciatus	Linnaeus, 1758	Coronilla varia, Plantago lanceolata, V-IX, me, fl, po, pr	HOL
Aeolothrips intermedius	Bagnall, 1934	Cardaria draba, Adonis vernalis, Anthemis tinctoria, IV-IX, me, fl, po, pr	WPAL
Aeolothrips melaleucus	Haliday, 1852	Quercus petraea; Malus pumilla; Carpinus betulus, Tilia cordata, V-IX, ar, fo, pr	HOL
Melanthrips knechteli	Priesner, 1936	Cerinthe minor, V-VIII, xt, fl, mo	SBM
Melanthrips pallidior	Priesner, 1919	Salvia pratensis; Ranunculus acer, V-VIII, xt, fl, po	TUR-EUR
		Fam. Thripidae	
Aptinothrips elegans	Priesner, 1924	Orlaya grandiflora, Lathyrus tuberosus, V-VIII, xt, gr, po	SBM
Aptinothrips rufus	Haliday, 1836	Cardaria draba, Vinca heobacea, IV-X, eu, te, xt, gr, po	COS
Aptinothrips stylifer	Trybom, 1894	Calamagrostis epigejos, Bromus erectus, IV-IX, eu, sk, me, gr, po	HOL
Chirothris aculeatus	Bagnall, 1927	Alopecurus pratensis, Poa nemoralis, IV-VIII, te, me, gr, po	WPAL
Chirothris hamatus	Trybom, 1895	Poacee, me, po	HOL
Chirothris molestuss	Priesner, 1926	Poacee, Alopecurus pratensis, me, po	PAL
Limothrips denticornis	(Haliday, 1836)	Poacee, IV-X, me, gr, po	EUS
Sericothrips bicornis	(Karny, 1909)	Lotus corniculatus; Achillea millefolium, Trifolium repens, V-X, me, fl, po	EUS
Taeniothrips picipes	(Zetterstedt, 1828)	Primula veris; Digitalis ambigua, IV-VIII, me, sk, fl, po	PAL
Thrips tabaci	Lindeman, 1889	comun, me, fl, fo, po, pr, SVV, SRN	COS
		S/Ord. Tubulifera	
		Fam. Phlaeothripidae	
Bolothrips bicolor	(Heeger, 1852)	Poacee, te, xt	PAL
Bolothrips icarus	(Uzel, 1895)	Bromus erectus, IV-X, te, xt, gr, po	HOL
Haplothrips leucanthemi	(Schrank, 1781)	Leucanthemum vulgare, V-VIII, me, fl, ol	EUS
Haplothrips niger	(Osborn, 1883)	Trifolium repens, Achillea setacea, V-VIII, me, fl, po	WEUS
Haplothrips setiger	Priesner, 1921	Senecio jacobaea, Taraxacum serotinum, V-X, me, fl, po	WPAL

The abbreviation of the explanations

Ecological characteristic: eu=eurioec; me=mesophilous; sk=skiophilous; te=termophilous; xt=xerothermic; ar=arboricolous; fl=floricolous; fo=folicolous; gr=graminicolous

Trophic relation: mo=monophagous; ol=oligophagous; po=poliphagous

Trophic spectrum: ph=phytophagous; pr=predator

Geographical distribution: COS = Cosmopolite; EUR = European; EUS = Euro-Siberian; HOL = Holarctic; PAL = Palaearctic; SBM = SubMediteranean; WPAL = West Palaearctic; WEUS = West Euro-Siberian; TUR-EUR = Turano-European

SRN = species resistant to the atmospheric polutants

SVV = virus vector species:
INSV, TSWV *Thrips tabaci* *

Table 2. The spatial distribution of thrips species

No.	Species	Măgura	Ogarca	Ciofliceanca	Comana
1.	*Aeolothrips intermedius*		+		+
2.	*Aeolothrips fasciatus*		+		
3.	*Aeolothrips melaleucus*	+	+		
4.	*Melanthrips pallidior*	+			
5.	*Melanthrips knechteli*	+			
6.	*Chirothrips aculeatus*	+		+	
7.	*Chirothrips hamatus*	+			
8.	*Chirothrips molestuss*	+			
9.	*Limothrips denticornis*	+		+	+
10.	*Aptinothrips elegans*			+	
11.	*Aptinothrips rufus*	+			+
12.	*Aptinothrips stylifer*	+	+		
13.	*Sericothrips bicornis*				+
14.	*Taeniothrips picipes*		+	+	
15.	*Thrips tabaci*		+		
16.	*Haplothrips leucanthemi*			+	
17.	*Haplothrips niger*	+	+	+	
18.	*Haplothrips setiger*		+		
19.	*Bolothrips bicolor*	+			
20.	*Bolothrips icarus*	+			

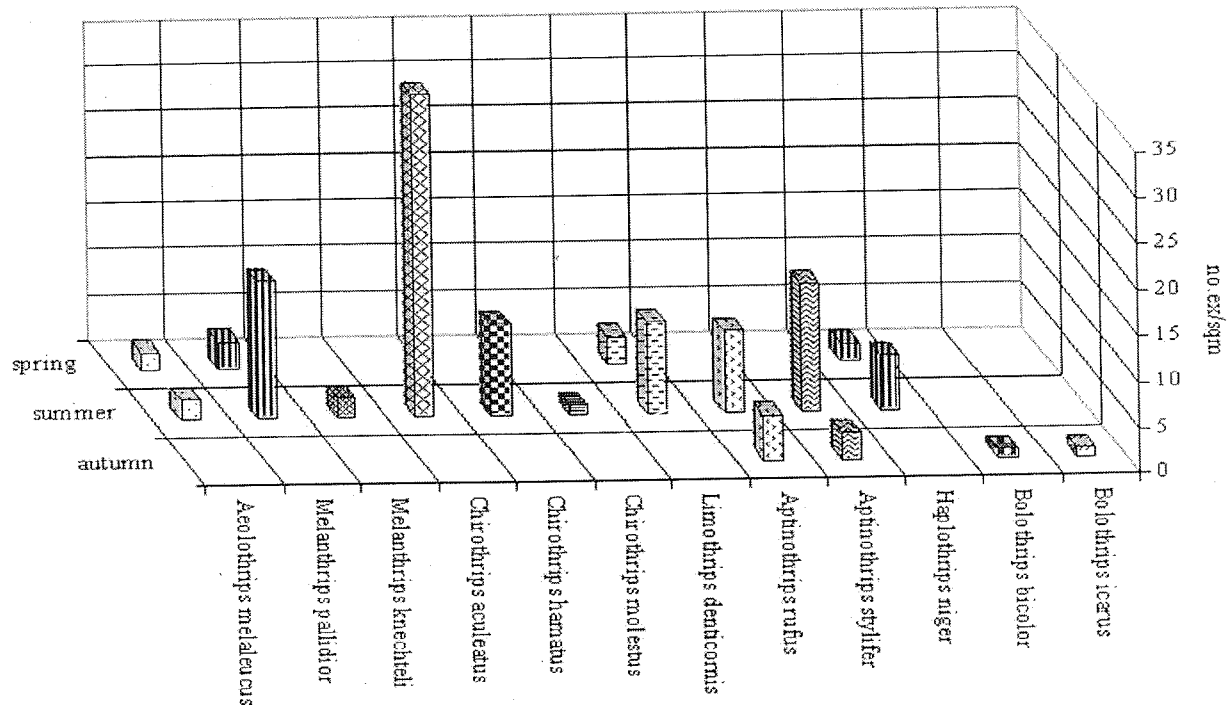

Fig. 1. Numerical density of thysanoptera fauna from herbaceous layer - Magura

The "basic nucleus" of thrips species was comprised of: *Mellanthrips pallidior, Chirothrips aculeatus* and *Aptinothrips stylifer,* generally similar to that from the pastures, to which also participate *Aeolothrips intermedius*, *Thrips physapus* and *Chirothrips manicatus*. The dominant thrips in Magura forest was *Chirothrips aculeatus* a typical praticolous, oportunistic species (Fig. 1).

The dynamics of the numerical and biomass densities had maximum values in summer as observed in other forest and pasture ecosystems (Vasiliu-Oromulu, L. 1995). In this season, the

age structure becomes more complex, the mortality is reduced, the flora diversity as trophic niche for thrips is higher and the physical factors have optimum values. The ratio between summer thrips density against that of the other seasons was of 10/1 (Table 3).

Species frequency was high in summer and lower in spring and autumn, when the number of specimens was not significant.

The energetical metabolism displayed high values, compared to other insects, the thrips being very active ones (VASILIU & BURLACU 1970).

liceanca and Comana forests, but lower then in Măgura forest. The predator trophic level was formed by the highest predator number among all sites: 37.5% (Table 1).

The identified thrips species were mesophilous (75 %) and skiophilous (25 %) none of them was thermo-xerophilous (Table 1).

The spatial structure of the thrips coenotic composition emphasized a new association formed by different species in comparison to the other Quercus forests (Table 2).

The seasonal numerical density presented a maximum (Fig. 2) in spring (94 ex/sqm) its curve

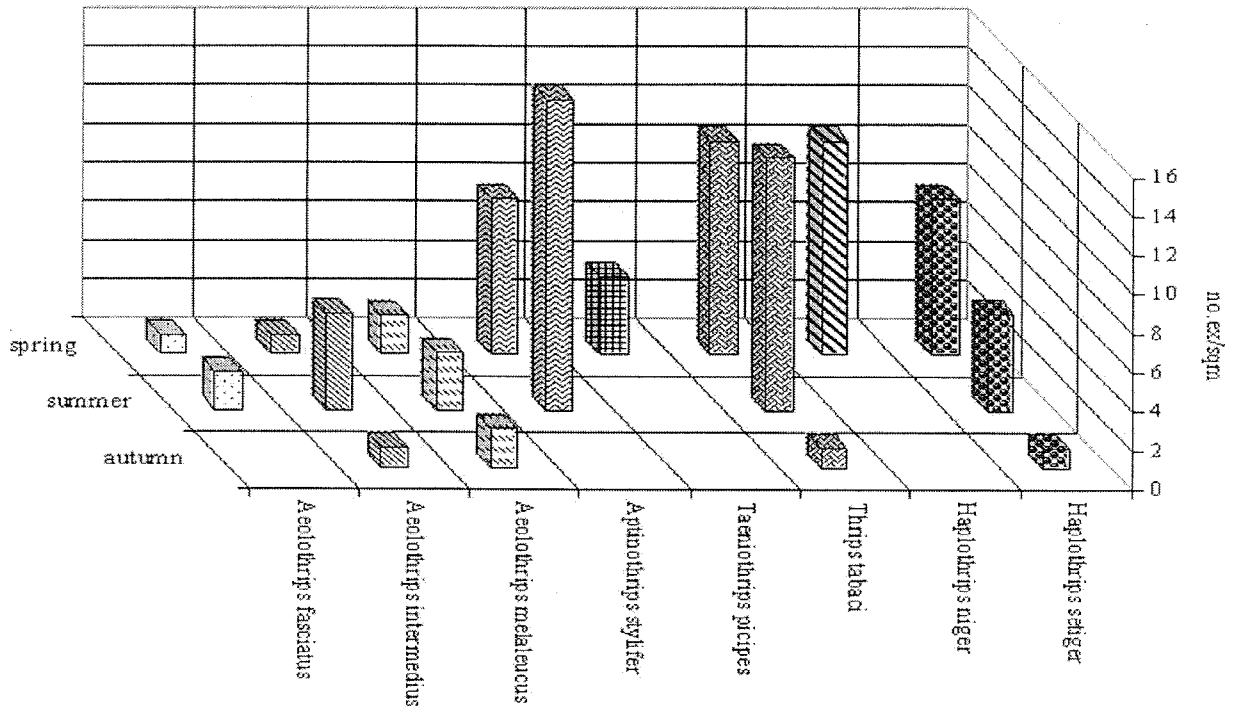

Fig. 2. Numerical density of thysanoptera fauna from herbaceous layer - Ogarca

The calculated value of Shannon Weaver diversity index was generally over 2, similar to those obtained in the mountains and hilly pastures of Germany and Romania, in different seasons (SCHLIEPHAKE 1980, VASILIU-OROMULU 1995). The Shannon Weaver diversity index ranged between 1.69-3.19. The thrips communities had these high values of diversity due to the coenotic equilibrium of this ecosystem.

The equitability, an index of comparative analysis of the site heterogeneity, varied between 84.27 %-98.55% depending on the season. The lower Shannon Weaver diversity values could be explained by the low values of equitability (Table 3).

Ogarca forest – The spatial dynamics showed that in 2002, the thrips communities displayed a structural net higher then that in Ciof-

decreasing towards summer (88 ex. /sqm) and autumn (10 ex./sqm).

Thrips tabaci and *Haplothrips niger* (Table 3) had during spring season the highest relative abundance (23.4%) which increased in summer (29.55%, respectivelly 36.36 %).

The species frequency in the samples ranged between 20% - 100% in all seasons.

The values of biomass density and energetical metabolism diminished from spring to autumn, similar to the numerical density curve.

The Shannon Weaver diversity index (Table 3) had a greater amplitude of values in comparison to Magura site (1.35 – 2.58%) and the equitability one varied between 52.38 % - 96.1% .

Ciofliceanca –forest.

The density of the vegetal cover is highest,

but non-uniform on area unit and variable from place to place.

The species spectrum of thrips communities was made up of fewer species comparatively to Magura and Ogarca forests. Some of these thrips are most distributed on *Limothrips denticornis* and *Haplothrips niger* from the herbaceous layer of the Quercus steppe-forest (Fig. 3).

the active life are dryness, the solar radiation, the wide temperature amplitude on the same day and the primary producers, which were favourable in Ciofliceanca forest, in 2002.

The Shannon Weaver index of diversity (Table 3) calculated for thrips populations from herbaceous layer of forest ranged between 47.84% - 88.14%, values reflecting a quantitative dispro-

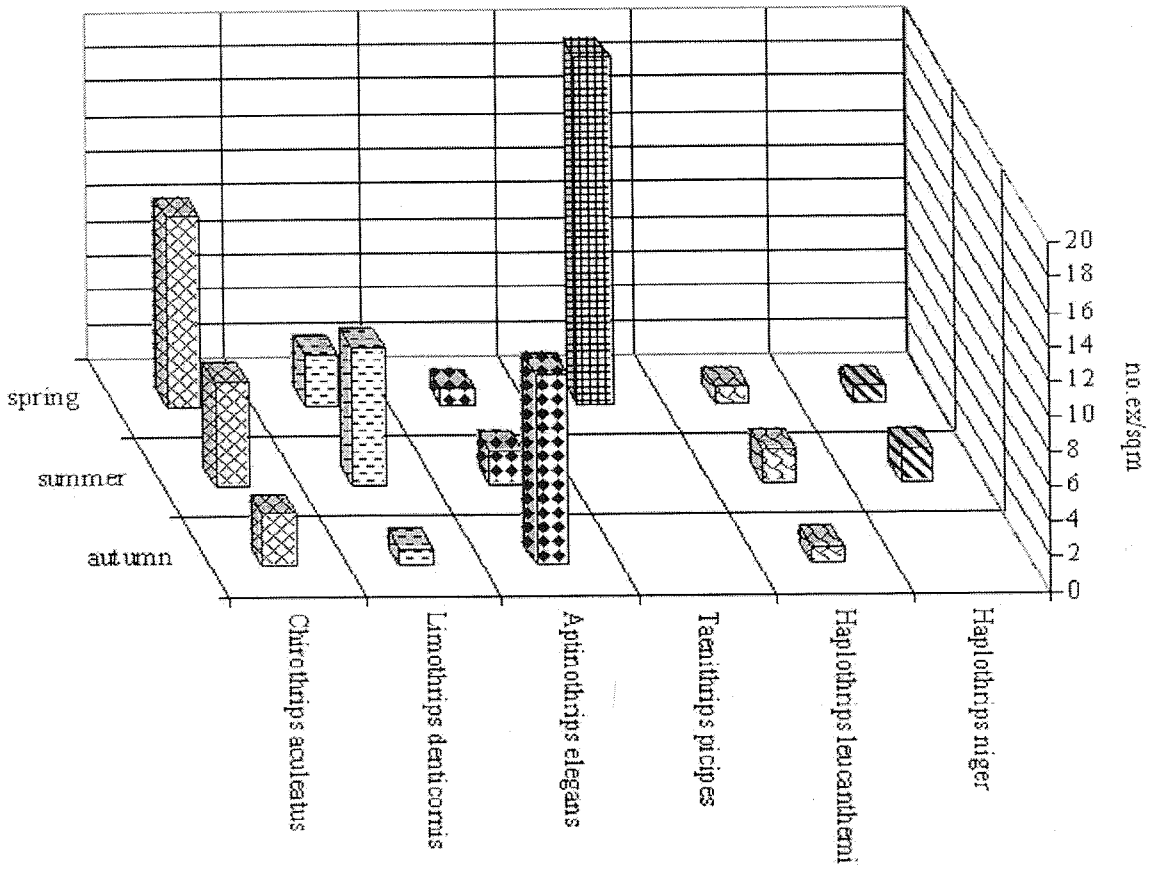

Fig. 3. Numerical density of thysanoptera fauna from herbaceous layer - Ciofliceanca

The graminicolous thrips species still had a high frequency in this thrips community. They favoured the developpment of local ecotypes of some graminicolous thrips species. The tendency of some thrips community ecological characteristics was from thermo-xerophilous type to mezo- and skiophilous ones. *Aptinothrips elegans* and *Chirothrips aculeatus* represented thermo-xerophilous elements, *Taeniothrips picipes* was skiophilous, the rest of the thrips community being mesophilous species (Table 1, 2).

The seasonal dynamics showed a decreasing curve from spring to autumn, in the case of numerical and biomass density.

The energetical metabolism had high values in spring, when the specimens emerged from hibernation were very active. The limiting factors for

portion of the participation of these species to the composition of the thrips communities, even though their number was large.

Comana –forest.

The mesophilous thrips represented 75% of all identified species, while the termophilous species had a low representation in this association. The analysed surfaces belonged zonally to the dry steppe-forest. The presence of typical for forest species was very rare, firstly because they were not generally very specific for this steppe and secondly, because the trees and shrubs had a dense distribution, causing the pasture species to be predominant.

The spatial dynamics showed lowest species numbers and specimens in this forest, due to the large tree coverage, which canopy reduced the

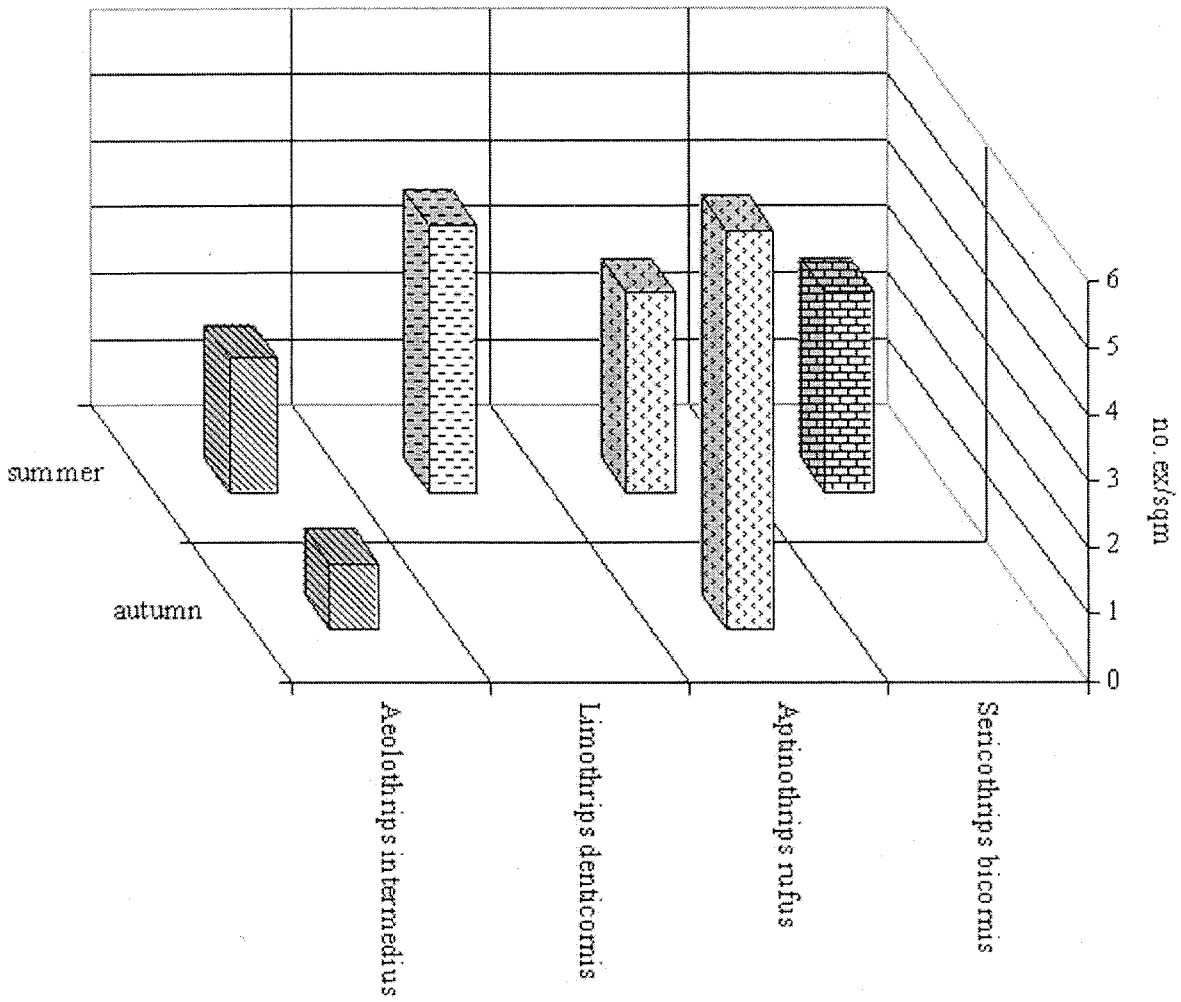

Fig. 4. Numerical density of thysanoptera fauna from herbaceous layer- Comana

degree of lightness (Fig. 4, Table 1, 2).

The structural and functional indices revealed (Table 3) low values, characteristic for microconditions of this site.

The species composing the thysanoptera association that characterized all the analysed forests have very different environmental requirments. Generally, we noticed a dominance of species with a domain of preference ranging from xero-thermophilous (Magura forest with 75%, Ciofliceanca 33,3%, Comana 25% and Ogarca 0%) to mesophilous (Ogarca and Comana forest 75% , Magura 41.6% and Ciofliceanca 37.5%), that is due to the existence of a varied microconditions of these sites.

The spatial dynamics of the annual numerical density displayed a decreasing curve from Magura to Ogarca, Ciofliceanca and Comana.

The structure of the thrips spectrum showed a slight similarity among the different studied Quercus forests. The temporal dynamics presented a pick during summer in Magura forest and in spring in Cioflicenca and Comana forests.

*Special thanks to my assistant, Florentina DUMITRESCU, for collecting the new species for Romanian fauna.

Conclusions

- The thrips fauna of the herbaceous layer from the Quercus steppe-forests of Romanian Plain, consisted of 20 species, and was organized in two trophic levels: the primary consumers (17 species) and secondary consumers (3 species);
- The association ***Ceraso mahaleb-Quercetum pubescentis*** from Măgura forest had the richest structural net of the thrips communities; *Melanthrips knechteli, Melanthrips pallidior, Aptinothrips elegans, Aptinothrips rufus, Bolothrips bicolor, Bolothrips icarus,* these thermophilous species were considered as bioindicators for this forest thermophily;
- The structural and functional indices of thrips populations reached maximum values in herbaceous layer of the Măgura forest, followed by that of Oga-

rca, Ciofliceanca and Comana forests;

• Two new records for the Romanian fauna were found at Măgura: *Chirothrips molestus* species and males of *Chirothrips hamatus* species. The *Bolothrips icarus* species was found in Măgura forest in 2002, its last record in Romania being in Constanța and Ilfov districts, in 1964.

• The analysis of the thrips geographical distribution showed the dominance of the Palaearctic elements folowed by Holarctic ones. The presence of the Mediterranean elements, with different specificity degrees, is also an important element.

Table 3. The structural and functional indices of the thrips populations

Site - season	x/sqm	S^2	S	S^1	CV	w.w./sqm	d.w./sqm	energ. metab.	A%	C%	pi	log pi	pi log pi		
Ogarca-spring															
Aeolothrips fasciatus	2	0,2	0,4	0,04	224	2	0,2	0,04	2,13	20	0,021	-1,672	-0,036		
Aeolothrips intermedius	2	0,2	0,4	0,04	224	2	0,2	0,04	2,13	20	0,021	-1,672	-0,036		
Aeolothrips melaleucus	4	0,3	0,5	0,05	137	3	0,4	0,08	4,26	40	0,043	-1,371	-0,058		
Aptinothrips stylifer	16	2,3	1,5	0,15	95	13	1,6	0,32	17,02	80	0,170	-0,769	-0,131		
Taeniothrips picipes	8	1,2	1,1	0,11	137	6	0,8	0,16	8,51	40	0,085	-1,070	-0,091		
Thrips tabaci	22	7,2	2,7	0,27	122	18	2,2	0,44	23,40	60	0,234	-0,631	-0,148		
Haplothrips niger	22	8,7	2,9	0,29	134	18	2,2	0,44	23,40	60	0,234	-0,631	-0,148		
Haplothrips setiger	16	6,8	2,6	0,26	163	13	1,6	0,32	17,02	40	0,170	-0,769	-0,131	H(S)	2,58
Σ	**94**	27	13	1,27	1458	**75**	**9,4**	**1,88**	100	360	0,979	-8,585	-0,778	Hmax	3,00
summer														E%	86,10
Aeolothrips fasciatus	4	0,3	0,5	0,05	137	3,20	0,40	0,08	4,55	40	0,045	-1,342	-0,061		
Aeolothrips intermedius	10	1,5	1,2	0,12	122	8,00	1,00	0,20	11,36	60	0,114	-0,944	-0,107		
Aeolothrips melaleucus	6	0,8	0,9	0,09	149	4,80	0,60	0,12	6,82	40	0,068	-1,166	-0,080		
Aptinothrips stylifer	32	3,7	1,9	0,19	60	25,60	3,20	0,64	36,36	100	0,364	-0,439	-0,160		
Thrips tabaci	26	2,3	1,5	0,15	58	20,80	2,60	0,52	29,55	100	0,295	-0,530	-0,156		
Haplothrips niger	10	3,0	1,7	0,17	173	8,00	1,00	0,20	11,36	40	0,114	-0,944	-0,107	H(S)	1,35
Σ	**88**	12	7,8	0,78	700	**70,40**	**8,80**	**1,76**	100	240	0,591	-3,893	-0,408	Hmax	2,58
autumn														E%	52,38
Aeolothrips intermedius	2	0,2	0,4	0,04	224	1,60	0,20	0,04	20	20	0,200	-0,699	-0,140		
Aeolothrips melaleucus	4	0,3	0,5	0,05	137	3,20	0,40	0,08	40	40	0,400	-0,398	-0,159		
Thrips tabaci	2	0,2	0,4	0,04	224	1,60	0,20	0,04	20	20	0,200	-0,699	-0,140		
Haplothrips niger	2	0,2	0,4	0,04	224	1,60	0,20	0,04	20	20	0,200	-0,699	-0,140	H(S)	1,92
Σ	**10**	0,9	1,9	0,19	808	**8,00**	**1,00**	**0,20**	100	100	1,000	-2,495	-0,579	Hmax	2,00
Ciofliceanca-spring														E%	96,10
Chirothrips aculeatus	22	3,7	1,9	0,19	87	17,60	2,20	0,44	29,73	80	0,297	-0,527	-0,157		
Limothrips denticornis	6	0,8	0,9	0,09	149	4,80	0,60	0,12	8,11	60	0,081	-1,091	-0,088		
Aptinothrips elegans	2	0,2	0,4	0,04	224	1,60	0,20	0,04	2,70	20	0,027	-1,568	-0,042		
Taenithrips picipes	40	4,0	2,0	0,20	50	32,00	4,00	0,80	54,06	20	0,541	-1,568	-0,042		
Haplothrips leucanthemi	2	0,2	0,4	0,04	224	1,60	0,20	0,04	2,70	20	0,027	-1,568	-0,042		
Haplothrips niger	2	0,2	0,4	0,04	224	1,60	0,20	0,04	2,70	20	0,027	0,000	0,000	H(S)	1,24
Σ	**74**	9,1	6,2	0,62	957	**59,20**	**7,40**	**1,48**	100	220	1,000	-6,322	-0,372	Hmax	2,58
summer														E%	47,84
Chirothrips aculeatus	12	1,7	1,3	0,13	109	9,6	1,2	0,24	30	60	0,300	-0,523	-0,157		
Limothrips denticornis	16	0,8	0,9	0,09	56	12,8	1,6	0,32	40	100	0,400	-0,398	-0,159		
Aptinothrips elegans	4	0,3	0,5	0,05	137	3,2	0,4	0,08	10	40	0,100	-1,000	-0,100		
Haplothrips leucanthemi	4	0,3	0,5	0,05	137	3,2	0,4	0,08	10	40	0,100	-1,000	-0,100		
Haplothrips niger	4	0,3	0,5	0,05	137	3,2	0,4	0,08	10	40	0,100	-1,000	-0,100	H(S)	2,05
Σ	**40**	3,4	3,8	0,38	575	**32**	**4,0**	**0,80**	100	280	1,000	-3,921	-0,616	Hmax	2,32
														E%	88,14
autumn															
Chirothrips aculeatus	6	0,8	0,9	0,09	149	4,8	0,6	0,12	18,75	80	0,2	-0,727	-0,136		
Limothrips denticornis	2	0,2	0,4	0,04	224	1,6	0,2	0,04	6,25	60	0,1	-1,204	-0,075		
Aptinothrips elegans	22	7,7	2,8	0,28	126	17,6	2,2	0,44	68,75	20	0,7	-0,163	-0,112		

Site - season	x/sqm	S^2	S	S^1	CV	w.w./sqm	d.w./sqm	energ. metab.	A%	C%	pi	log pi	pi log pi		
Haplothrips leucanthemi	2	0,2	0,4	0,04	224	1,6	0,2	0,04	6,25	20	0,1	-1,204	-0,075	H(S)	1,32
Σ	**32**	8,9	4,6	0,46	722	**25,6**	**3,2**	**0,64**	100	180	1	-3,298	-0,399	Hmax	2,00
Comana-summer														E%	66,22
Aeolothrips intermedius	4	0,3	0,5	0,05	137	3,2	0,4	0,08	14,29	80	0,143	-0,845	-0,121		
Limothrips denticornis	8	0,7	0,8	0,08	105	6,4	0,8	0,16	28,57	60	0,286	-0,544	-0,155		
Aptinothrips rufus	10	1,0	1,0	0,10	100	8,0	1,0	0,20	35,71	20	0,357	-0,447	-0,160		
Sericothrips bicornis	6	0,3	0,5	0,05	91	4,8	0,6	0,12	21,43	20	0,214	-0,669	-0,143	H(S)	1,92
Σ	**28**	2,3	2,9	0,29	433	**22,4**	**2,8**	**0,56**	100	180	1,000	-2,505	-0,579	Hmax	2,00
autumn														E%	96,21
Aeolothrips intermedius	2	0,2	0,4	0,04	224	1,6	0,2	0,04	14,29	20	0,143	-0,845	-0,121		
Aptinothrips rufus	12	0,2	0,4	0,04	37	9,6	1,2	0,24	85,71	100	0,143	-0,845	-0,121	H(S)	0,80
Σ	**14**	0,4	0,9	0,09	261	**11,2**	**1,4**	**0,28**	100	120	0,286	-1,690	-0,2415	Hmax	1,00
Magura-spring														E%	80,21
Aeolothrips melaleucus	4	0,8	0,9	0,09	224	3,2	0,4	0,1	20	20	0,2	-0,699	-0,140		
Melanthrips pallidior	6	0,3	0,5	0,05	91	4,8	0,6	0,1	30	60	0,3	-0,523	-0,157		
Limothrips denticornis	6	0,8	0,9	0,09	149	4,8	0,6	0,1	30	40	0,3	-0,523	-0,157		
Haplothrips niger	4	0,8	0,9	0,09	224	3,2	0,4	0,1	20	20	0,2	-0,699	-0,140	H(S)	1,97
Σ	**20**	2,7	3,2	0,32	688	**16,0**	**2,0**	**0,4**	100	140	1,0	-2,444	-0,593	Hmax	2,00
summer														E%	98,55
Aeolothrips melaleucus	4	0,3	0,5	0,05	137	3,20	0,40	0,080	1,92	40	0,019	-1,716	-0,033		
Melanthrips pallidior	30	5,5	2,3	0,23	78	24,00	3,00	0,600	14,42	100	0,144	-0,841	-0,121		
Melanthrips knechteli	4	0,3	0,5	0,05	137	3,20	0,40	0,080	1,92	40	0,250	-0,602	-0,151		
Chirothrips aculeatus	70	10,5	3,2	0,32	46	56,00	7,00	1,400	33,65	100	0,337	-0,473	-0,159		
Chirothrips hamatus	20	2,5	1,6	0,16	79	16,00	2,00	0,400	9,62	80	0,096	-1,017	-0,098		
Chirothrips molestus	2	0,2	0,4	0,04	224	1,60	0,20	0,040	0,96	20	0,010	-2,017	-0,019		
Limothrips denticornis	20	1,0	1,0	0,10	50	16,00	2,00	0,400	9,62	100	0,096	-1,017	-0,098		
Aptinothrips rufus	18	3,2	1,8	0,18	99	14,40	1,80	0,360	8,66	60	0,087	-1,063	-0,092		
Aptinothrips stylifer	28	0,7	0,8	0,08	30	22,40	2,80	0,560	13,46	100	0,135	-0,871	-0,117		
Haplothrips niger	9,2	2,7	1,6	0,16	137	7,36	0,92	0,184	5,77	60	0,058	-1,239	-0,071	H(S)	3,19
Σ	**205,2**	27	14	1,4	1017	**164,16**	**20,52**	**4,104**	100	700	1,231	-10,856	-0,960	Hmax	3,32
autumn														E%	95,96
Aptinothrips rufus	10	0,5	0,7	0,07	71	8,0	1,0	0,20	50	80	0,5	-0,301	-0,151		
Aptinothrips stylifer	6	0,3	0,5	0,05	91	4,8	0,6	0,12	30	60	0,3	-0,523	-0,157		
Bolothrips bicolor	2	0,2	0,4	0,04	224	1,6	0,2	0,04	10	20	0,1	-1,000	-0,100		
Bolothrips icarus	2	0,2	0,4	0,04	224	1,6	0,2	0,04	10	20	0,1	-1,000	-0,100	H(S)	1,69
Σ	**20**	1,2	2,1	0,21	609	**16,0**	**2,0**	**0,40**	100	180	1,0	-2,824	-0,507	Hmax	2,00
														E%	84,27

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