Matricaria chamomilla L. AS TROPHIC NICHE FOR THRIPS POPULATIONS (INSECTA: THYSANOPTERA)

BĂRBUCEANU Daniela, VASILIU-OROMULU Liliana, BĂRBUCEANU Mircea

Abstract. The collections carried out in May-June 2010 regarding the Thysanoptera fauna on *Matricaria chamomilla* L. from a grassland ecosystem from Scorniceşti, Olt County, show a rich specific diversity, namely 11 species. The number of species, the composition of the species as well as the number of individuals depend on the time of sampling. The Thysanoptera coenosis has been constantly composed of a characteristic species, *Haplothrips leucanthemi* and *Thrips tabaci,* so we can consider chamomile as a host plant for these species. *H. leucanthemi* presents the highest values of structural indicators and a relative abundance value of 70.96%, followed by *T. tabaci* with 22.26%. The Shannon-Wiener diversity index presented low values in the studied site. The geographical distribution of Thysanoptera indicates a dominance of the Euro-Siberian species, situation encountered in Thysanoptera coenoses from other types of ecosystems. Such studies reveal the importance of flowering plants, as a trophic niche in ensuring and preserving the biodiversity of species of this small order of insects.

Keywords: *Matricaria chamomilla*, Thysanoptera, specific diversity, ecological indices.

Rezumat. *Matricaria chamomilla* L. ca nişă trofică pentru populaţiile de tripşi (Insecta: Thysanoptera). Colectările efectuate în perioada mai-iunie 2010 privind fauna de tisanoptere de pe plantele de muşeţel dintr-un ecosistem de pajişte din Scorniceşti, judeţul Olt, relevă o diversitate specifică mare, de 11 specii. Numărul speciilor, compoziţia precum şi numărul indivizilor depind de perioada de colectare. Cenoza de tisanoptere a fost constant alcatuită din speciile *Haplothrips leucanthemi* şi *Thrips tabaci,* astfel încât putem considera muşeţelul ca plantă gazdă pentru aceste două specii. *H. leucanthemi* prezintă cele mai ridicate valori ale indicatorilor structurali şi o valoare a abundenţei relative de 70,96%, urmat de *T. tabaci* cu 22,26%. Indicele de diversitate Shannon-Wiener a avut valori mici în situl studiat. Distributia geografică a tisanopterelor de pe muşeţel indică o pondere mare a speciilor euro-siberiene, situaţie întânită în cenozele de Thysanoptera din alte tipuri de ecosisteme. Astfel de studii relevă importanţa plantelor cu flori, ca nişă trofică în asigurarea şi conservarea biodiversităţii speciilor din acest mic ordin de insecte.

Cuvinte cheie: *M. chamomilla*, Thysanoptera, diversitate specifică, indicatori ecologici.

INTRODUCTION

Matricaria chamomilla L. can be found all over Europe, temperate Asia, in North America and Australia, growing near roads, cereal crops and landfills. This Asteraceae species offers optimum life conditions to a group of delicate insects, less known – the Thysanoptera order. Over time, there have been several taxonomic studies on *Thrips* fauna inhabiting the organs of different host plants. KNECHTEL (1951), LEWIS (1973), SCHLIEPHAKE & KLIMT (1979), RASPUDIK et al. (2009) mention in their works thrips species on *M. chamomilla*, most often collected being the *Haplothrips leucanthemi* species.

The present study completes the list of host plants for Thysanoptera in Romania, as in the work of VASILIU OROMULU (2002) on the distribution of thrips species on different host plants *M. chamomilla* is not found.

This study is probably the first worldwide ecological research of Thysanoptera that have *M. chamomilla* as a host plant.

MATERIAL AND METHODS

The observations were carried out during May-June 2010 on inflorescences of *Matricaria chamomilla* in a lowland grassland ecosystem from Scorniceşti (Olt County). Collections were made during the flowering of chamomile, other herbaceous species being in bloom at the same time, so that not to influence the relationship between thrips species and host plants. In this way it can be established objectively the attachment of thrips species to the preferred plant. Ten (10) samples were collected every two weeks, and a sample consisted of 10 inflorescences. Adult individuals and larvae were collected from inflorescences and preserved in vials with AGA, a mixture of 60% ethyl alcohol (10 parts), glycerine (1 part) and glacial acetic acid (1 part). The thrips species was identified with the following keys of determination: KNECHTEL (1951), SCHLIEPHACKE & KLIMT (1979), STRASSEN (2003).

In order to assess the diversity of the ecosystem, the Shannon-Weaver diversity index was calculated, using the formula improved by LLOYD and GHELARDI:

$$H(S)=\frac{K}{N}\left(N\log 10N - \sum_{p=1}^{S} Nr\log 10Nr\right)$$ where:

H = index; S = total number of species; K = 3, 321928; N = total number of individuals; Nr = total number of individuals in species r. (SIMIONESCU 1984; ŞCHIOPU 1997). Immature thrips were not used in the count.

RESULTS AND DISCUSSIONS

In the study on thrips populations inhabiting the inflorescences of *Matricaria chamomilla* there were tracked the following aspects: specific diversity, sex ratio, geographical distribution, ecological indicators, and predators.

a. Specific diversity

The numerical abundance reveals a total of 1 698 adults and 87 larvae, which belong to 11 species (Table 1). Three of them, *Frankliniella intonsa*, *Haplothrips leucanthemi* and *H. setiger* are mentioned by RASPUDIC et al., 2009 on *M. chamomilla,* in Croatia.

Of these species, most are primary consumers and polyphagous. Only one species belongs to the secondary consumers, the polyphagous *Aeolothrips intermedius.* Ecologically, the taxonomic spectrum of Thysanoptera on *Matricaria chamomilla* is dominated by typical floricolous forms. Thus, in chamomile inflorescences, *Haplothrips leucanthemi, Thrips tabaci, Haplothrips angusticornis, H. reuteri*, *H. setiger, Thrips pillichi, T. validus, Frankliniella intonsa* find optimal living conditions. One species is a gramineous form - *Limothrips denticornis* that preferentially grow on Poaceae. Moreover, in terms of hydric needs, most species are mesophilous, situation explicable by the collections performed in May and June, characterized by high humidity and moderate temperatures; except for the xerophilous species, *Frankliniella intonsa.*

The presence of numerous Terebrantia and Tubulifera larvae expresses the high level of renewal of thrips populations. Corresponding to the higher number of adults, Tubulifera larvae are much more numerous than the Terebrantia ones (Table 1).

Table 1. Specific diversity of Thysanoptera fauna on *M. chamomilla.*

Suborder	Family	Species	No. ind.	A (%)	Geographical distribution
Terebrantia	Aeolothripidae	*Aeolothrips intermedius* BAGNALL 1934	4♀♀	0.24	PAL
	Thripidae	*Frankliniella intonsa* (TRYBOM 1895)	1♀; 1♂	0.12	EUS
		Limothrips denticornis HALIDAY, 1836	1♀	0.06	EUS
		Thrips pillichi (PRIESNER 1924)	22 ♀♀; 1♂	1.35	WPAL
		T. tabaci (LINDEMAN, 1888)	378♀♀	22.26	COS
		T. validus UZEL, 1895	1♀	0.06	EUS
		Thrips sp.	1♀	0.06	-
		larve Terebrantia	33		-
Tubulifera	Phlaeothripidae	*Haplothrips angusticornis* (PRIESNER, 1921)	28/♀♀; 22♂♂	2.94	WPAL
		H. leucanthemi (SCHRANK 1781)	779♀♀; 426♂♂	70.96	EUS
		H. reuteri KARNY, 1907	12♀♀; 6♂♂	1.06	PON-MED
		H. setiger (PRIESNER, 1921)	13♀♀; 2♂♂	0.88	WPAL
		larve Tubulifera	54	-	-

Legend: COS=Cosmopolite; EUS=Euro-Siberian; PAL= Palaearctic; WPAL= West -Palaearctic; PON-MED = Ponto-Mediterranean.

b. Sex ratio

Table 1 notes the dominance of females in most thrips species, common situation for this group of insects.

We notice a more balanced sex ratio for the *Haplothrips leucanthemi* species, with an overall percentage of females of 64.6% and a sex-ratio value of 0.54. As shown in Fig. 1, sex ratio has close values at each collection date.

Moreover, LEWIS (1973) mentions that in many species with equal number of both species, females seem to prevail because of their much higher longevity.

Instead, in some cosmopolitan species, sex ratio varies in different regions depending on the temperature. For example, *Thrips tabaci* is represented only by parthenogenetic females in the temperate zone, this situation being found in all collections so far in our country. In *Frankliniella occidentalis*, pest and in Romanian greenhouses, higher temperatures in greenhouses favour the occurrence of a much larger number of females, sex ratio value being of 0.11 (BĂRBUCEANU & VASILIU-OROMULU, 2012).

c. Geographical distribution

The geographical distribution of thrips species on *Matricaria chamomilla* presents 4 Euro-Siberian, 3 W-Palearctic, 1 cosmopolite, 1 Palearctic, and 1 Ponto-Mediterranean species. We can notice a higher proportion of the Euro-Siberian species, a situation encountered, for example, in the vineyard ecosystem (VASILIU-OROMULU, 1998; VASILIU-OROMULU & BĂRBUCEANU, 2010) (Table 1).

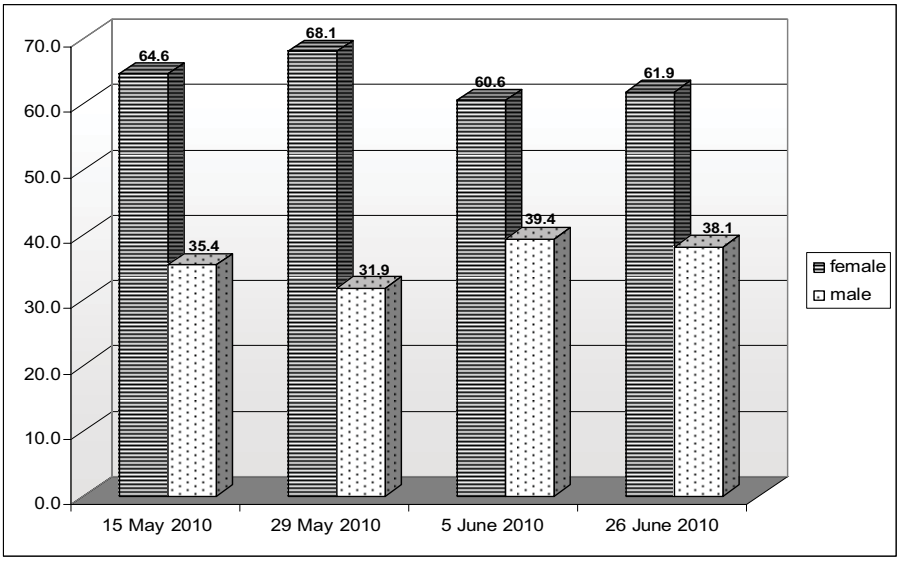

Figure 1. Sex ratio on *H. leucanthemi* species.

d. Ecological indices

At all four collection dates, the "specific nucleus" of the Thysanoptera association was formed by two species: *Haplothrips leucanthemi* and *Thrips tabaci* (Fig. 2; Table 2).

The highest specific diversity, 9 species, is found in the collection of 15 May, when the chamomile flowering is maximum. The trophic generous offer attracts many Terebrantia and Tubulifera species, thus the zoophagous *Aeolothrips intermedius* being also favoured. It is the collection with the highest values of thrips species numerical density: 757 individuals/inflorescence, situation also reflected in the values of dry biomass. Also, numerical density values prove negative binomial distribution of this group of insects. The species with an important role in establishing coenosis structure are *H. leucanthemi* and *T. tabaci*, with maximum values of frequency in samples. *Thrips pillichi* and *Haplothrips reuteri,* although with frequency values of 60% and 70%, respectively, have low values of relative abundance, thus they do not go beyond the status of accompanying species. The value of Shannon-Wiener diversity index of only 1.42 is influenced by low equitability. Thus, although the number of species involved in the coenosis structure is large, their numerical abundance is low, the two dominant species totalling 91.3% of the collected individuals.

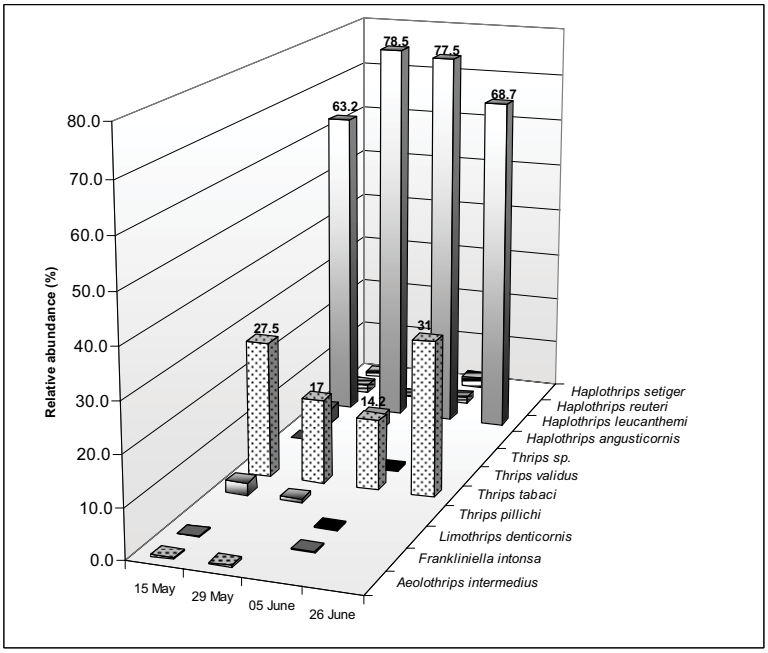

Figure 2. Relative abundance (%) of thrips species on *M. chamomilla.*

On 29 May, the association of Thysanoptera was composed of six species, *Haplothrips leucanthemi* and *Thrips tabaci*, as eudominant and euconstant species, having the largest weight in using trophic resources. *Aeolothrips*

intermedius, Thrips pillichi, Haplothrips angusticornis, H. reuteri, H. setiger species are accompanying species. Low equitability value, 28.44, has repercussions upon the diversity index - 0.98, the lowest during all collection period.

On 5 June collection, the populations of Thysanoptera association belonged to 8 species, indicating a high specific diversity, with a specific nucleus formed by *Haplothrips leucanthemi* and *Thrips tabaci* species; only the first species has a maximum sample frequency, while *T. tabaci* proved attachment to this trophic substrate only in 60% of the samples. The other species have sporadic presence, recording frequency values below 40%. Equitability and diversity index have low values.

At the end of chamomile flowering season, namely the collection of 26 June, the Thysanoptera coenosis was composed only of the characteristic species of *H. leucanthemi* and *T. tabaci*, with the lowest values of numerical abundance of all collections and a low diversity index value.

The xerophilous *Frankliniella intonsa*, known as "the thrips of inflorescences" due to its presence in considerable number in the inflorescences of several species, has a sporadic presence, the species being disadvantaged by the wet microclimate during the two collection months.

Haplothrips leucanthemi is a mesophilous floricultural polyphagous species, known in the literature as having a special attachment to the inflorescences of *Leucanthemum vulgare*, from where its name is derived. KNECHTEL (1951) mentions its presence on the inflorescences of *M. chamomilla.* This study highlights large populations of this species in chamomile inflorescences; thus, *M. chamomilla* can be considered a host plant. As shown in Figure 2 and Table 2, at all collection dates, "daisy thrips" overwhelmingly dominate the other species of the Thysanoptera association.

Table 2. The structural indices of the thrips populations on *M. chamomilla*.

15 May 2010	**Σ**	**x**	**No.ind./ inflorescence**	**s^2**	**STDEV**	**s'**	**mg.dry matter/m^2**	**A%**	**C%**	**p_i log p_i**
Aeolothrips intermedius	2	0.2	2	0.4	0.6	0.06	0.20	0.3	10	-0.007
Frankliniella intonsa	1	0.1	1	0.1	0.3	0.03	0.10	0.1	10	-0.004
Thrips sp.	1	0.1	1	0.1	0.3	0.03	0.10	0.1	10	-0.004
T. pillichi	19	1.9	19	4.3	2.1	0.21	1.90	2.5	60	-0.040
T. tabaci	208	20.8	208	184.4	13.6	1.36	20.80	**27.5**	100	-0.154
Haplothrips angusticornis	23	2.3	23	13.3	3.7	0.37	2.30	3.0	40	-0.046
H. leucanthemi	483	48.3	483	863.8	29.4	2.94	48.30	**63.8**	100	-0.125
H. reuteri	13	1.3	13	2.5	1.6	0.16	1.30	1.7	70	-0.030
H. setiger	7	0.7	7	0.7	0.8	0.08	0.70	0.9	50	-0.019
Σ	**757**	76	**757**	1436.9	37.9	3.79	**75.70**	100.0		-0.428
29 May 2010		**H(S)**	**=1.42**		**Hmax**	**=3.46**	**E%**	**=41.14**		
Aeolothrips intermedius	2	0.2	2	0.4	0.6	0.06	0.20	0.4	10	-0.010
Thrips pillichi	4	0.4	4	0.7	0.8	0.08	0.40	0.8	20	-0.017
T. tabaci	82	8.2	82	12.0	3.5	0.35	8.20	**17.0**	100	-0.131
Haplothrips angusticornis	14	1.4	14	9.6	3.1	0.31	1.40	2.9	40	-0.045
H. leucanthemi	379	37.9	379	76.8	8.8	0.88	37.90	**78.5**	100	-0.083
H. reuteri	1	0.1	1	0.1	0.3	0.03	0.10	0.2	10	-0.006
H. setiger	1	0.1	1	0.1	0.3	0.03	0.10	0.2	10	-0.006
Σ	**483**	48	**483**	120.2	11.0	1.10	**48.30**	100.0		-0.266
5 June 2010		**H(S)**	**=0.98**		**Hmax**	**=3.46**	**E%**	**=28.44**		
Frankliniella intonsa	1	0.1	1	0.1	0.3	0.03	0.10	0.3	10	-0.008
Limothrips denticornis	1	0.1	1	0.1	0.3	0.03	0.10	0.3	10	-0.008
Thrips tabaci	46	4.6	46	81.2	9.0	0.90	4.60	**14.2**	60	-0.120
T. validus	1	0.1	1	0.1	0.3	0.03	0.10	0.3	10	-0.008
Haplothrips angusticornis	13	1.3	13	9.6	3.1	0.31	1.30	4.0	40	-0.056
H. leucanthemi	251	25.1	251	355.9	18.9	1.89	25.10	**77.5**	100	-0.086
H. reuteri	4	0.4	4	0.7	0.8	0.08	0.40	1.2	20	-0.024
H. setiger	7	0.7	7	1.1	1.1	0.11	0.70	2.2	40	-0.036
Σ	**324**	32	**324**	278.9	16.7	1.67	**32.40**	100.0		-0.345
26 June 2010		**H(S)**	**=1.15**		**Hmax**	**=3.46**	**E%**	**=33.14**		
Thrips tabaci	42	4.2	42	39.3	6.3	0.63	4.20	**31.3**	50	-0.158
Haplothrips leucanthemi	92	9.2	92	66.8	8.2	0.82	9.20	**68.7**	80	-0.112
Σ	**134**	13	**134**	31.2	5.6	0.56	**13.40**	100.0		-0.270
		H(S)	**=0.90**		**Hmax**	**=3.46**	**E%**	**=25.93**		

e. Predators

Thrips are attacked by predators and parasitoids that contribute to the maintenance of the balance between species in natural ecosystems. The collection of 29 May highlighted the presence of two young predatory larvae of *Chrysopa*. According to LEWIS (1973), chrysopidae larvae are amongst the most voracious predators of thrips, hence their importance in controlling thrips populations.

CONCLUSIONS

The component populations of the Thysanoptera association on *M. chamomilla* belong to 11 species, which denotes a rich diversity of the coenosis inhabiting a single host plant.

The species constantly participating in the coenosis structure are *Haplothrips leucanthemi* and *Thrips tabaci*, with the highest values of ecological indicators and a relative abundance of 70.96% and 22.26%, respectively.

Sex ratio of *H. leucanthemi* species is an expression of female dominance, situation typical to Thysanoptera.

The highest densities of individuals/inflorescence for *H. leucanthemi* species were recorded in May, during the period of chamomile maximum blooming.

Such studies reveal the importance of flowering plants as a trophic niche in ensuring and preserving the biodiversity of species of this small order of insects.

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Bărbuceanu Daniela
University of Piteşti, Faculty of Sciences,
Târgu din Vale St. 1, 110040, Piteşti, Romania.
E-mail: daniela_barbuceanu@yahoo.com

Vasiliu-Oromulu Liliana
Institute of Biology, Bucharest,
Spl. Independentei 296, Bucharest, Romania.
E-mail: liliana_oromulu@yahoo.com

Bărbuceanu Mircea
University of Piteşti, Faculty of Sciences,
Târgu din Vale St. 1, 110040, Piteşti, Romania.
E-mail: mircea_barbuceanu@yahoo.com

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