

THE INVERTEBRATE FAUNA ASSOCIATED OF THE WHEAT AGROECOSYSTEM IN AMZACEA

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ABSTRACT

Species composition, the abundance and the domination of the invertebrate fauna associated with agroecosystem of two wheat fields in the Amzacea district, Constanta County (south-eastern Romania) in 2005y. A total of 1553 specimens of invertebrates representing 56 taxons were recorded. *Haplothrips triticii* Kurdj. Colembolla, Lumbricidae, Enchitreidae and *Anoxia villosa* were eudominants. The group of dominants consisted of *Macrosiphum avenae* F., Formicidae, *Harpalus pubescens* and Aranea, *Opatrum sabulosum* L., Brachycera. *Anoxia villosa* recorded a density of 3-16 larvae/mp. The ratio between the total phytophagous and the useful fauna (zoophagous and pantophagous) was 1.87:1.

Key words: invertebrate fauna, wheat field, Amzacea

INTRODUCTION

Winter wheat (*Triticum aestivum* L.) is the major crop with large cultivation area in Constanta County. It plays a significant role in economic stability of the country. It is cultivated over 35.000 hectares with an average production of 4000 tons/ha. The wheat agroecosystem is reach in harmful, beneficial and indifferent species. Many publications are dedicated to studies on the fauna of wheat agroecosystem in Romania. There were been assessed the detailed researches in connection with the ecological indices of wheat fauna complex in the Dolj County (Margarit et al., 1987), the harmful fauna from the wheat culture in Oltenia (Luca et al., 2002), the population dynamics and attack evolution of wheat pests, the useful entomofauna and the integrated pest control in Transylvania conditions (Malschi, 2003, 2007), the harmful and useful invertebrates in wheat culture in Sibiu county (Antonie et al., 2003), the preventing the attack of wireworms (Popov et al., 2001, Csep et al., 2004).

The purpose of this paper was to present data on the species composition and the taxonomic structure of the invertebrate fauna associated with wheat crop.

MATERIAL AND METHOD

The invertebrate fauna was sampling from two wheat fields of 50 ha (A137) and 30 ha (A209) located in Amzacea district, Constanta County (S-E part of Romania). The investigated wheat fields presented from the agronomic point of view some similar characteristics: the quantity of fertilizer, the plugging and the disking and they were exposed to the usual pesticides used in pest control. Precursory culture was the sunflower for A137 and the wheat for A209 wheat plots. The climate is semiarid, the mean temperature is over 10-11°C, annual precipitations averages is 375-450 mm/year. The grounds were represented by cernosium soil.

Depending on the group of organisms under study, three sampling methods have been used. The epigeal fauna was collected in 4 pitfall traps/wheat field, opened for 48 hrs. A trap consisted of a glass container with a volume of 400 ml and a diameter of 80 mm positioned at ground level and in which is introduced a solution of 4 % formaldehyde as fixing solution. Traps were placed in middle of the wheat field at 10 m from each other. The fauna in the soil was prevailed by 4 soil prospecting hole/wheat field (25 x 25 x 30 cm). Additionally, in order to estimate *Anoxia villosa* larvae density, the

soil samplings were extend in four wheat fields in Dobromir-Sipote, Valeni, Lespezi, Platoul Oltina localities. For collecting of the fauna on the plants was used the entomological net (\varnothing 30cm), 100 double application of the net. Extracted fauna was keep up in alcohol 70 %, then sorted and identified up to genus and species level using a stereo microscope. The dominance of the invertebrate fauna is presented according to the classification givens by Stan, 1995: eudominants (>10% of all community specimens), dominants (5.1–10%), subdominants (2.1–5%), recedents (1.1–2%) and subrecedents (<1.1%).

RESULTS AND DISCUSSIONS

A total of 1553 specimens were collected from the two wheat plots located in Amzacea, out of which 843 specimens belonging 37 taxons in A137 plot and 710 specimens belonging 46 taxons in A 209 plot. The species composition, number of specimens, the relative abundance and the domination of the invertebrates associated with wheat agrocenosis, separately on the collecting methods, are presented in the tables 1 and 2. The fauna of invertebrate assemblages collected on plants, the surface of the soil and in the soil was composed a various number of taxons: Colembolla, Annelida-Oligochaeta, Aranee, Thysanoptera, Homoptera, Heteroptera, Hymenoptera, Coleoptera, Diptera and Anthomyidae.

Taking into consideration the prevalent way of the invertebrate fauna, the net method offered the capturing of the largest number of specimens (328-505 specimens) comparatively with the pitfall traps (152-191 specimens) and soil samplings (147-230 specimens). The most abundant species was *Haplothrips triticii* Kurdj with 422 specimens in A137 and 252 specimens in A209 wheat plots. This species gave about 36% and 50% of the total catches in A137 and A209 wheat plots, respectively. By pitfall traps method, the colembolla group was the most numerous (45-115 specimens) followed by *Macrosiphum avenae* F., Formicidae and *Harpalus pubescens* Müll in A137 plot and Aranea in A209 plot. Regarding the specific fauna in the soil, the species with the largest number of collected specimens was *Fridericia bulbosa* Rosa in the both wheat plots (45-71 specimens), followed by *Allolobophora rosea* Sav. and Formicidae in A137 plot and *Anoxia villosa* F., *A. caliginosa* L., Formicidae, Brachycera and *A. rosea* Sav. in A209 plot.

According to prevailing method, eudominant taxons were *H. tritici*, Colembolla, *F. bulbosa* and *A. rosea* in A137 wheat plot, and *H. triticii*, Colembolla, *F. bulbosa*, *A. villosa* and *A. caliginosa* in A209 wheat plot. Following taxons *M. avenae*, Formicidae, *H. pubescens* (in A137 wheat plot) and *A. rosea*, Aranea, *M. avenae*, Formicidae, *O. sabulosum* and Brachycera (in A209 wheat plot) were dominant. Rest of taxons reached a level of the relative abundance under 5%, so that they get subdominant, recedent and subrecedent characters.

On the assembly of the invertebrate fauna recorded in the two wheat fields, it noticed that the ratio between the pest fauna and useful ones (zoophagous and pantophagous together) was 1.87:1. The approximately similar values of fauna were found in A137 plot (1.94:1) as well as in A209 plot (1.80:1).

Anoxia villosa, a particular pest species in semiarid zone as Amzacea district, presented a special interest for us; therefore, the other four neighboring wheat locations were investigated. Data obtained in soil samplings and reported in table 3 show that, *Anoxia villosa* larvae counted 3-16 larvae/mp. The greatest density larvae/mp was founded in Platoul Oltina where the precursory culture was the wheat and the lower density was observed in Lespezi where the sunflower was the precursory culture.

Conclusions

1. A total of 1553 specimens of invertebrates representing 56 taxons were recorded in agrocenosis of two wheat fields in the Amzacea district, Constanta County.

2. *Haplothrips triticii* Kurdj Colembolla, Lumbricidae, Enchitreidae and *Anoxia villosa* were eudominant groups.

3. In dominance order, the taxons were *Macrosiphum avenae* F., Formicidae, *Harpalus pubescens* and Aranea, *Opatrum nebulosum* L., Brachycera.

4. *Anoxia villosa* was recorded a density of 16 larvae /mp in wheat field where the precursory plant was the wheat.

5. The ratio between the pest and the useful fauna assemblage was 1.87:1.

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Table 1

Taxonomic structure, number of specimen, the relative abundance and the domination of the invertebrates associated with wheat culture in Amzacea, Plot A 137, 30 ha, Flamura cv.

Taxons	Food regime	Capture methods								
		Entomological net			Barber traps			Soil samplings		
		n	%	d	n	%	d	n	%	d
Colembolla	P				115	60,21	ED			
Annelida - Oligochaeta										
Lumbricidae										
<i>Lumbricus terrestris</i> L.	D							5	3,40	SD
<i>Allolobophora rosea</i> Sav.	D							25	17,00	ED
<i>A. caliginosa</i> L.	D							5	3,40	SD
Enchitreidae								71	48,32	ED
<i>Fridericia bulbosa</i> Rosa										
Aranee	Z				9	4,72	SD			
Thysanoptera		422	83,56	ED						
Phloëothripidae										
<i>Haplothrips triticii</i> Kurdj.	Fit									
Homoptera										
Aphididae										
<i>Macrosiphum avenae</i> F.	Fit	8	1,58	R	18	9,43	D			
<i>Schizaphis graminum</i> Rosa	Fit	11	2,18	SD						
Heteroptera		2	0,40	SR						
Coreidae										
<i>Syromastes marginatus</i> L.	Fit									
Hymenoptera										
Braconidae	Z	4	0,79	SR						
Formicidae	P				14	7,33	D	10	6,80	D
Apidae	P	2	0,40	SR						
<i>Andrena</i> sp.										
Coleoptera										
Carabidae										
<i>Amara ovata</i> F.	P				3	1,57	R	2	1,36	R
<i>Harpalus pubescens</i> Müll.	Fit				14	7,33	D			
<i>H. distinguendus</i> Duft	P							3	2,04	SD
<i>Zabrus tenebrioides</i> Goeze	Fit							4	2,72	SD
<i>Microlestes plagiatus</i> Duft.	P				4	2,09	SD			
Elateridae										
<i>Agriotes obscurus</i> L.	Fit							1	0,68	SR
<i>A. sputator</i> L.	Fit							5	3,40	SD
<i>A. ustulatus</i> Schall.	Fit							3	2,04	SD
Tenebrionidae	Fit				2	1,05	SR	7	4,76	SD
<i>Opatrum sabulosum</i> L.										
Scarabaeidae	Fit							6	4,08	SD
<i>Anoxia villosa</i> F.										
Chrysomelidae		5	0,99	SR						
<i>Lema melanopa</i> L.	Fit									
<i>Phyllotreta nemorum</i> L.	Fit	12	2,38	SD						
<i>Podagrica malvae</i> Illiger	Fit	3	0,59	SR						
<i>Colaphellus sophiae</i> Scholl-Best	Fit	2	0,40	SR	1	0,52	SR			
Curculionidae		14	2,77	SD						
<i>Tanymecus dilaticollis</i> Gyle	Fit									
Nitidulidae		3	0,59	SR						
<i>Meligethes maurus</i> Strm.	Fit									
Anthicidae					4	2,09	SD			
<i>Anthicus hispidus</i> Rossi	Fit									
Aphodiidae					1	0,52	SR			
<i>Pleurophorus caesus</i> Creutzer	Fit									
Diptera										
Nematocera										
Cecydomyiidae	Fit				3	1,57	R			
Bibionidae		5	0,99	SR						
<i>Bibio hortulanus</i> L.	Fit									
Sciaridae	P	3	0,59	SR						
Brachycera	Z				3	1,57	R			

The invertebrate fauna associated of the wheat agroecosystem in Amzacea area, Constanta county

Syrphidae	Z								
Asilidae	P, Z	2	0,40	SR					
Anthomyiidae	P	7	1,39	R					

n – number of specimens, % – percentage share in community, d – domination: eudominants -ED (>10% of all specimens collected according to capture methods), dominants-D (5.1–10%), subdominants-SD (2.1-5%), recedents-R (1.1–2%) and subrecedents-SR (<1.1%); Food regime: Zoophagous (Z); Pantophagous (P); Phytophagous (Fit).

Table 2

Taxonomic structure, number of specimen, the relativ abundance and the domination of the invertebrates associated with wheat culture in Amzacea, Plot A 209, 30 ha, Flamura cv.

Taxons	Food regime	Capture methods								
		Entomological net			Barber traps			Soil samplings		
		n	%	d	n	%	d	n	%	d
Colembolla	P				45	29.61	ED			
<u>Myriapoda</u>										
<i>Blaniulus guttulatus</i> (F.)	Fit				6	3.95	SD			
<i>Lithobius</i> sp.	P							3	1.30	R
<i>Geophilus</i> sp.	P							2	0.87	SR
Annelida - Oligochaeta										
Lumbricidae										
<i>Lumbricus terrestris</i> L.	P							8	3.48	
<i>Allolobophora rosea</i> Sav.	P							12	5.22	D
<i>A. caliginosa</i> L.	P							33	14.35	ED
Enchitreidae										
<i>Fridericia bulbosa</i> Rosa								45	19.57	ED
Gasteropoda					6	3.95	SD			
<i>Hellicela obvia</i> Clessin										
Thysanoptera	Fit	252	78.05	ED						
Phloëothripidae										
<i>Haplothrips triticii</i> Kurdj.										
Aranea	Z				11	7.24	D			
Homoptera										
Aphididae										
<i>Macrosiphum avenae</i> F.	Fit	11	3.36	SD	8	5.26	D			
<i>Schizaphis graminum</i> Rosa	Fit	8	2.45	SD	4	2.63	SD			
Heteroptera										
Cydnidae										
<i>Tritomegas bicolor</i> F.	P				5	3.29	SD			
Hymenoptera										
Formicidae	P,Z	5	1.52	R	9	5.93	D	14	6.09	D
Coleoptera										
Carabidae										
<i>Amara ovata</i> F.	P							4	1.74	R
<i>Harpalus pubescens</i> Müll.	Fit				6	3.95	SD	7	3.04	SD
<i>H. distinguendus</i> Duft	P				2	1.32	R	7	3.04	SD
<i>Zabrus tenebrioides</i> Goeze	Fit							9	3.92	SD
Elateridae										
<i>Agriotes obscurus</i> L	Fit							4	1.74	R
<i>A. gurgistanus</i> Fald.	Fit							3	1.30	R
<i>Drasterius bimaculatus</i> Rossi	Fit	2	0.61	SR						
<i>Melanotus fuscipes</i> Gyllenhal	Fit							4	1.74	R
Coccinellidae										
<i>Coccinella 7punctata</i> L.	Z	4	1.22	R						
Tenebrionidae										
<i>Blaps mortisaga</i> L.	P	4	1.22	R						
<i>Opatrum sabulosum</i> L.	Fit				8	5.26	D	3	1.30	R
Scarabaeidae	Fit									
<i>Anoxia villosa</i> F.								39	16.96	ED
<i>Oxythirea funesta</i> Poda	P	2	0.61	SR						
<i>Pentodon idiota</i> Hbst.	Fit				5	3.25	SD			
Chrysomelidae										
<i>Lema melanopa</i> L.	Fit	3	0.91	SR	6	3.95	SD			
<i>Phyllotreta nemorum</i> L.	Fit	9	2.75	SD						

<i>Ph. atra</i> F.	Fit	3	0.91	SR						
<i>Podagrica malvae</i> Illiger.	Fit	3	0.91	SR				1	0.43	SR
Cerambycidae										
<i>Dorcadion murray</i> Küst	P				3	1.97	R			
Curculionidae										
<i>Tanymecus dilaticollis</i> Gyle	Fit	2	0.61	SR	5	3.25	SD			
<i>Bothynoderes punctiventris</i> Germ	Fit				3	1.97	R			
Nitidulidae										
<i>Meligethes maurus</i> Strm.	Fit	3	0.91	SR						
Anthicidae										
<i>Anthicus hispidus</i> Rossi	Fit				4	2.63	SD			
Aphodiidae										
<i>Pleurophorus caesus</i> Creutzer	Fit				2	1.32	R			
Meloidae										
<i>Meloe violaceus</i> Marsham	P	5	1.52	R						
Staphylinidae	Z				2	1.32	R	1	0.43	SR
Diptera										
Nematocera										
Cecydomyidae	Fit				5	3.25	SD			
Bibionidae										
<i>Bibio hortulanus</i> L.	Fit	6	1.83	R				4	1.74	R
Sciaridae	P	2	0.61	SR	4	2.63	SD	6	2.61	SD
Brachycera	P, Z				3	1.97	R	13	5.65	D
Lepidoptera Noctuidae	Fit							8	3.48	SD

n – number of specimens, % – percentage share in community, d – domination: eudominants -ED (>10% of all specimens collected according to capture methods), dominants-D (5.1–10%), subdominants-SD (2.1-5%), recedents-R (1.1–2%) and subrecedents-SR (<1.1%); Food regime: Zoophagous (Z); Pantophagous (P); Phytophagous (Fit).

Table 3

Density of *Anoxia villosa* larvae/mp in wheat field in Constanta County

Sampling sites	Precursory culture	Area (ha)	No. of larvae /mp
Dobromir-Sipote	maize	60	6
Valeni	wheat	26	8
Lespezi	sunflower	44	3
Platoul Oltina	wheat	30	16