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Research on epigeic spider communities in agricultural landscape of Malanta (South-West Slovakia) The experimental area with alternative cultivation

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RIASSUNTO

Nel corso del 1991 (da Maggio a Ottobre) sono state studiate, col metodo delle trappole a caduta, le comunità di ragni epigei di tre stazioni nel territorio agricolo di Malanta, vicino Nitra (Slovakia). Le stazioni A e B riguardano campi sperimentali con modalità colturali classica e alternativa. Come controllo è stata utilizzata una stazione ricadente in un pioppeto frangivento. Complessivamente sono stati catturati 2758 ragni appartenenti a 55 specie. La composizione della comunità dei siti A e B è risultata molto simile (HI - 0,993) con la presenza eudominante delle specie agrobionti *Deodothorax agrestis* e *Pardosa agrestis*. L'effetto positivo della modalità colturale alternativa è documentato dal più elevato bilanciamento della comunità della stazione B. La composizione della comunità della stazione di controllo è diversa dalle stazioni A e B (HI - 0,021 e 0,027), con la presenza eudominante delle specie *Syedra gracilis* e *Coelotes longispina*.

Parole chiave: Araneae, Faunistica, Ecologia, Paesaggio agricolo, Colture alternative, Slovakia.

ABSTRACT

In the course of 1991 (may to October) the epigeic spider communities from 3 study sites in the agricultural land of Malanta, near Nitra (Slovakia), were studied by using the pitfall trap method. Study sites A and B represented field experimental territory with a classical and alternative way of culturing. Study sites in a poplar-wind breaker served as a control. Totally 2,758 spiders belonging to 55 species were trapped. The composition of the spider from sites A and B was very similar (HI - 0.993) with the eudominant occurence of the agrobiont species *Oedothorax agrestis* and *Pardosa agrestis*. The positive effect of an alternative way of land culturing can be documented by higher balanced community at study site B. The community composition at study site T in comparison with A and B was different (HI - 0.021 and 0.027), with the eudominantly occurring species *Syedra gracilis* and *Coelotes longispina*.

Key words: Araneae, Faunistics, Ecology, Agricultural landscape, Alternative cultivation, Slovakia

Introduction

Only little interest was paid to the research of the arachnofauna in the Slovakian agricultural landscape. The most significant work was SVATON's (1987), concerning the spiders communities in intensively cultivated fields, meadows and pastures in Turcianska hollow. This topic was partially studied by BARABAS (1986); his main interest was the occurence of individual spiders in animal communities in the cereal fields and the significantly diminishing population of cereal aphids. Some other authors also studied the spider communities in the agricultural landscape (CULIN & YEARGAN, 1983; LUCZAK, 1975, 1979; MILLER, 1974; NOFLATSCHER, 1988; PAVLIK, 1982; THALER *et al.*, 1987; ecc.).

With the aim to know the spider community in the intensively agricultural landscape, the territory of Malanta at South-west of Slovakia was studied. During 1987-1988 the epigeic spider communities on edges of fields and the dispersed verdure (GAJDOS, 1992) was studied. The epigeic spider communities were compared to the experimental fields differently cultivated. The fields belong to the Agricultural University in Nitra.

Methods and Characterization of the Territory

The trapping of the spiders was done in 1991 on 2 experimental fields of the Agricultural University in Nitra and in the poplar alley near to the experimental fields of Malanta. Malanta spreads over Nitrian hill near the town of Nitra, which is a quite warm and dry area. Spiders were caught with formalin pitfall traps from May 20, 1991 to October 30, 1991. The traps were examined and the spider collected at 2-3 week intervals. The spiders found were lined up according to the Platnick system (PLATNICK, 1989).

Study sites

A - the experimental area was a system of experimental fields where wheat, barley, alfalfa, maize and bean were individually cultivated. On each field 2 traps were placed (totally 10 cups with 11 volume, diameter 9,5 cm). Fields were treated with chemicals for protection and artificial fertilizers.

B - experimental fields with alternative way of cultivation (fertilization by organic fertilizers and without chemical protection).

T - the poplar alley served as a control, where only 5 traps were placed.

In table 1 the thermopreference of individual species and their belonging to bioindicative groups according BUCHAR (1992) is shown. Bioindicative groups: RI and R - relict species: species living in non polluted or little polluted biotopes and biotopes of cultured forests. E - expansive species: species also able to live in the polluted biotops, ? - not lined up species. For the comparison of individual study sites, the index of similarity HI was used (YAMAMOTO, 1975).

Tab. 1 - The number (N) of specimens and dominance (D) of epigeic spiders cought in pitfall traps in study area of Nitra Agriculture University - Malanta (1991)

X - thermopreference, T - thermophilous, M - mesothermophilous, N - non specific, P - psychrophilous, ? - non classified, B - bioindication.

		site A		site B		site T	
XB	Species, families	N	D(%)	N	D(%)	N	D(%)
	PHOLCIDAE						
TE	*Pholcus opilionoides* (Schrank, 1781)	1	0,09				
	DYSDERIDAE						
TE	*Dysdera erythrina* (Walckenaer, 1802)					2	0,27
TE	*Harpactea rubicunda* (C.L. Koch, 1839)					1	0,13
	THERIDIIDAE						
NR	*Episinus truncatus* Latreille, 1809			1	0,11		
NE	*Robertus arundineti* (O.P. - Cambridge, 1871)	21	1,97	20	2,11	3	0,40
TE	*Steatoda triangulosa* (Walckenaer, 1802)	1	0,09	1	0,11		
NE	*Theridion bimaculatum* (Linnaeus, 1767)	2	0,19	2	0,21		
	LINYPHIIDAE						
NE	*Araeoncus humilis* (Blackvall, 1841)			1	0,11		
NR	*Bathyphantes gracilis* (Blackwall, 1841)	1	0,09				
PRI	*Bolyphantes luteolus* (Blackwall, 1833)			1	0,11		
NE	*Centromerus sylvaticus* (Blackwall, 1841)					4	0,54
NE	*Diplocephalus cristatus* (Blackwall, 1833)					1	0,13
NE	*Diplostyla concolor* (Wider, 1834)			3	0,32	13	1,74
NE	*Erigone atra* Blackwall, 1833	1	0,09	2	0,21		
NE	*Erigone dentipalpis* (Wider, 1834)	4	0,38	5	0,53		
	Lepthyphantes sp.						
NR	*Lepthyphantes tenuis* (Blackwall, 1852)	20	1,87	11	1,16	52	6,98
	Linyphiidae not det.	5	0,47				
NE	*Meioneta rurestris* (C.L. Koch, 1836)	28	2,62	47	4,97	10	1,34
NE	*Micrargus subaequalis* (Westring, 1851)			3	0,32	2	0,27
TRI	*Mioxena blanda* (Simon, 1884)	4	0,38	8	0,85		

Tab. 1 Contd.

XB	Species, families	site A N	site A D(%)	site B N	site B D(%)	site T N	site T D(%)
NR	*Neriene clathrata* (Sundevall, 1829)					5	0,67
ME	*Oedothorax apicatus* (Blackwall, 1850)	430	40,30	333	35,20	1	0,13
M?	*Ostearius melanopygius* (O.P. - Cambridge, 1879)	7	0,66	5	0,53	2	0,27
MRI	*Porrhomma lativela* Tretzel, 1956	21	1,97	15	1,59	2	0,27
PRI	*Silometopus reussi* (Thorell, 1871)			1	0,11		
TRI	*Syedra gracilis* (Menge, 1869)			1	0,11	219	29,40
?RI	*Thyreosthenius biovatus* (O.P. - Cambridge, 1875)					1	0,13
	Wackenaeria sp.	6	0,56				
NR	*Walckenaeria capito* (Westring, 1861)	10	0,94	21	2,22	1	0,13
??	*Walckenaeria vigilax* (Blackwall, 1853)	7	0,66	4	0,42	1	0,13
	TETRAGNATHIDAE						
NE	*Pachygnatha degeeri* Sundevall, 1829	41	3,84	51	5,39	2	0,27
NR	*Tetragnatha pinicola* L. Koch, 1870			1	0,11		
	ARANEIDAE						
NE	*Mangora acalypha* (Walckenaer, 1802)	1	0,09				
	LYCOSIDAE						
NE	*Alopecosa pulverulenta* (Clerck, 1757)			1	0,11	23	3,09
NR	*Aulonia albimana* (Walckenaer, 1805)	2	0,19	2	0,21	50	6,71
NE	*Pardosa agrestis* (Westring, 1861)	392	36,74	343	36,26	1	0,13
?R	*Pardosa agricola* (Thorell, 1856)	2	0,19	1	0,11		
NR	*Pardosa lugubris* (Walckenaer, 1802)	1	0,09			3	0,40
RI	*Pardosa monticola* (Clerck, 1757)	1	0,09				
NE	*Pardosa pullata* (Clerck, 1757)	14	1,31	11	1,16	39	5,23
ME	*Trochosa ruricola* (De Geer, 1778)	4	0,38	16	1,69	10	1,34
NE	*Trochosa terricola* Thorell, 1856	1	0,09			2	0,27
	AGELENIDAE						
TR	*Tegenaria agrestis* (Walckenaer, 1802)	1	0,09	4	0,42	1	0,13
	HAHNIIDAE						
TRI	*Hahnia nava* (Blackwall, 1841)					3	0,41
	DICTYNIDAE						
TRI	*Argenna subnigra* (O.P. - Cambridge, 1861)			1	0,11		
	AMAUROBIIDAE						
??	*Coelotes longispina* Kulczynski, 1897	4	0,38	5	0,53	195	26,17
	LIOCRANIDAE						
NR	*Phrurolithus festivus* (C.L. Koch, 1835)					4	0,54
	CLUBIONIDAE						
ME	*Clubiona lutescens* Westring, 1851			1	0,11		
	GNAPHOSIDAE						
NE	*Drassyllus pusillus* (C.L. Koch, 1833)	6	0,56	7	0,74	5	0,67
	Ghaphosa sp.					1	0,13
??	*Haplodrassus minor* (O.P. - Cambridge, 1879)	1	0,09				
NR	*Micaria pulicaria* (Sundevall, 1831)			1	0,11		
TRI	*Trachyzelotes pedestris* (C.L. Koch, 1837)	1	0,09	1	0,11	27	3,62
NR	*Zelotes latreillei* (Simon, 1878)					1	0,31
	Zelotes sp.					2	0,27
	ZORIDAE						
NR	*Zora spinimana* (Sundevall, 1833)	1	0,09			2	0,27
	THOMISIDAE						
NR	*Ozyptila praticola* (C.L. Koch, 1837)	4	0,38			8	1,07

Tab. 1 Contd.

XB	Species, families	site A N	site A D(%)	site B N	site B D(%)	site T N	site T D(%)
	THOMISIDAE						
MRI	*Ozyptila simplex* (O.P. CAmbridge, 1862)	3	0,28	6	0,63	43	5,77
	Ozyptila sp.					2	0,27
	Xysticus sp.	12	1,13	5	0,53		
ME	*Xysticus kochi* Thorell, 1872	5	0,47	4	0,42		
	SALTICIDAE						
NR	*Euophrys frontalis* (Walckenaer, 1802)	1	0,09				
	TOTAL	1067		946		745	

Results and discussion

On three study sites (st.) using the methods of pitfall traps, 2,758 spiders belonging to 55 species and 16 families were trapped during 1991. Most numerous at all study sites were the families *Linyphidae* D from 42,13% to 51,27% (st. A). The course of season activity dominance of the families is shown in Fig. 1-3. The representatives of the families on study sites A and B during the studied period has a similar character (HI - 0.993), but differs from site T (HI - 0.021 and 0.027), where the family *Amaurobiidae* was very numerous. On the basis of BUCHAR's (1992) species classification, the majority of species belongs to expansive ones E (47,3%). The representation of termoprefering groups is a follows: thermophilous - 10 species, mesothermophilous - 9 species, nonspecific - 30 species, psychrophilous - 1 species, non classified - 5 species. The very low portion of psychrophilous species and considerable number of thermophilous and mesothermophilous species reveals the studied territory's warm microclimate.

Study sites A and B (Table 1, Fig. 1 and 2)

The typical agrobiont species *Oedothorax apicatus* and *Pardosa agrestis* were represented at the locality A and B. On both sites they represented the highest portion of a eudominant occurring families *Linyphiidae* and *Lycosidae*. In dominance above 2% only 5 species were represented, it gives evidence about the great evenness in the relative distribution of the species. The results are in agreement with those from the field biotopes in Slovakia (SVATON 1987, BARABAS, 1986 and GAJDOS, 1992). According to THALER *et al.* (1987) the spider fauna at the

agricultural sites in central Europe is represented by 20 - 50 species. Spider diversity is the lowest at the crop fields, which is proved by the presence of two stenotypic dominant *Oedothorax apicatus* and *Pardosa agrestis*.

Representation of species with dominance D > 2%

species	st. A	st. B
Oedothorax agrestis	40.30 %	35.20 %
Pardosa agrestis	36.74 %	36.26 %
Pachygnatha degeeri	3.84 %	5.39 %
Meioneta rurestris	2.64 %	4.97 %
Robertus arundineti	- - %	2.11 %
Total	83.50 %	83.93 %
activity of abundance (ex. per 1 day and 10 m efective edge of pitfall trap)	21.94 %	19.46 %

index of dominance c (Simpson 1949)	0.301	0.263
index of diversity H1n (Shannon-Weaver)	1.75	1.95
index of evenness e (H/1n N)	0.49	0.54

Spider abundance at the study site A was a bit higher, than that at B which is in connection with the higher amount of biomass produced on A. Comparing the study sites we found similarities in species composition and representation (number of species at study sites A 35 and site B 37). On study sites B the positive influence of alternative cultivation on spider communities is evident, and is documented by a higher balance of community (lower value of c and higher values H and e).

The evaluation of the influence of alternative cultivation on the composition of animal communities requires larger areas for comparison, which would be cultured in this way. Some very rare species were found on study sites A and B eg *Bathyphantes gracilis*, *Mioxena blanda*, *Ostearius melanopygius*, *Syedra gracilis*, *Argenna subnigra* and *Haplodrassus minor*. Intensively cultured areas are preferred mainly by the expansive species (E), which prevailed at both sites (A - 91.85%, B - 93.13%).

Sudy site T (Table 1, Fig. 3)

On study site T 36 species were found. The character of the stand caused the higher species diversity and higher abundance as than in the fields. The expansive species were represented as only 16.37%. The line venture is very important for a high species diversity preservation in the agricultured area. The composition of the community at study site T is different from that at field sites A and B. The eudominant species are *Syedra gracilis* and *Coelotes longispina.* The eudominant presence of *Coelotes longispina* in ecoton fields and line venture was published by GAJDOS (1992).

Representation of species with dominance D > 2% (st. T)

Syedra gracilis	29.40 %	*Ozyptila simplex*	5.77 %
Coelotes longispina	26.17 %	*Pardosa pullata*	5.23 %
Aulonia albimana	6.71 %	*Trachyzelotes pedestris*	3.62 %
		Alopecosa pulverulenta	3.09 %

Total	79.99 %
activity of abundance (ex./1day/10 m)	30.64
index of dominance c (Simpson 1949)	0.174
index of diversity H1n (Shannon-Weaver)	2.28
index of evenness e (H/1n N)	0.64

From rare and interesting category the following species could be found: *Ostearius melanopygius, Syedra gracilis, Thyreosthenius biovatus* and *Ozyptila simplex.*

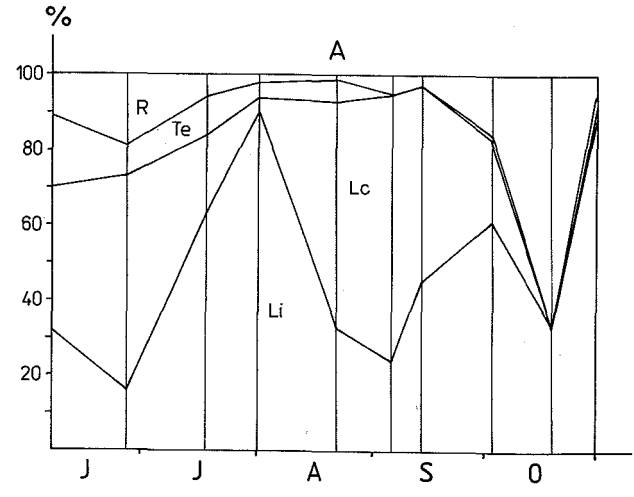

Fig. 1 - Season activity of spider families on the site A in Malanta near Nitra (1991)
axis x: percentage of dominance, axis y: months, Li - Linyphiidae,
Lc - Lycosidae, Te - Tetragnathidae, R - another families

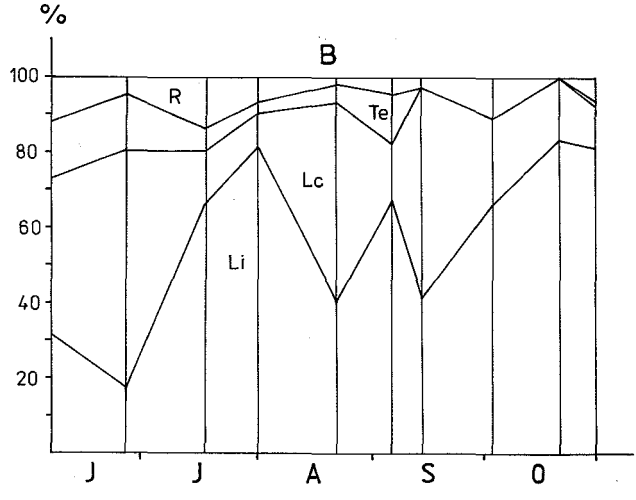

Fig. 2 - Season activity of spider families on the site B in Malanta near Nitra (1991)
axis x: percentage of dominance, axis y: months, Li - Linyphiidae,
Lc - Lycosidae, Te - Tetragnathidae, R - another families

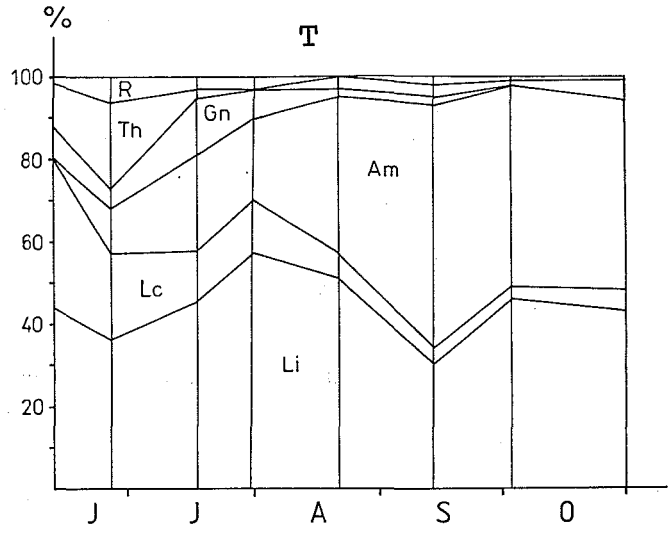

Fig. 3 - Season activity of spider families on the site T in Malanta near Nitra (1991)
axis x: percentage of dominance, axis y: months, Am - Amaurobiidae, Gn - Gnaphosidae, Li - Linyphiidae, Lc - Lycosidae, Te - Tetragnathidae, R - another families

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