BIODIVERSITY OF OCCURRENCE OF THE EPIGEIC GOUPS IN DEPENDENCE ON TYPE OF FARMING SYSTEM

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Abstract: *The aim of this work was to evaluate the influence of different types of farming on occurrence of principle epigeic group in two evaluated time periods. First experiment was realized at Dolná Malanta experimental station of the Slovak Agricultural University in Nitra, during 1996-1998. Collections of epigeic material was realised during vegetation period from April to October by soil trap. Total area of trial was 1200 m^2 dividing into three treatments as follows: A – no mow treatments, B mow without removing of cut grass, C mow with removing the cut grass. Totally 117 837 individuals of soil organisms were collected from which belong to 28 principle epigeic group. Dominant occurrence of Acarina, Araneida, Coleoptera, Collembola, Heteroptera and Hymenoptera totally 6 epigeic groups was determinate. Occurrence of other groups was on the recendent and subrecendent level. The attributes of specific identity according by Jaccard ranged from 89.29 to 96.29 %. The average attribute of diversity for three treatments on the level 2.01131 reflects stability of this ecosystem. The second trial of conventional farming was carrying out during 2004-2006 at the experimental farm Kolíňany Slovakia. Samples were taken from five treatments: A unfertilized; B 25t ha^{-1} farmyard manure; C 50 t.ha^{-1} bio sludge; D 50 t ha^{-1} farmyard; E 100 t ha^{-1} biosludge. In 2004 the soil trap were paced in canopy of Helianthus annuus, in 2005 at Beta vulgaris field and last year of the trial in the Zea mays field. During three year study totally 44 664 individuals belongs to 22 groups from five treatments were determined. Dominant groups were Acarina, Aphidinea, Araneida, Coleoptera, Collembola* a *Diptera. Occurrence of other groups was on the recendent and subrecendent level. The attributes of specific identity according Jaccard (I_A) ranged from 81.81% to 100.00 %.The average value of the diversity was 1.78307. On the average evaluation of five treatments in terms of the occurrence of zooedaphon showed that application of 50 t ha^{-1} bio sludge supported the most suitable soil condition for zooedaphon development with occurrence of 11 452 individuals.*

Key words**:** *biodiversity, ground beetle, Coleoptera, organic mater, soil organisms, epigeic groups*

INTRODUCTION

Organic matter management has played an important role in creating conditions for specified soil zooedaphon community. Apart from decomposition processes the main role of zooedaphon is stressed in development of soil characteristics and stabilization of soil fertility (LACKO-BARTOŠOVÁ ET. AL. 1995; PORHAJÁŠOVÁ ET AL., 2008b; POSPIŠIL AND RŽONCA, 2008). The ground beetle (*Coleoptera: Carabidae*) communities associated with cropping systems of spring wheat under various tillage regimes were investigated by WEISS ET. AL. (1990). Generally, lower numbers of individuals of a given species were found in cropping systems associated with conventional tillage. However, cropping system may have altered communities to higher degree than the tillage regime.

The abundance and seasonal dynamics of carabid beetles and other ground-dwelling arthropods in conventional and low-input cropping systems were investigated by FAN ET AL., (1993). Carabids and staphylinids were significantly greater in number in the low-input plots.

As a result of their sensitive reaction to anthropogenic changes in habitat quality, carabids are considered of bioindicative value for cultivation impacts. Carabids seem to be negatively affected by deep ploughing and enhanced by reduced tillage systems. No negative effects have been found for mechanical weed control and flaming. Carabid recruitment is enhanced by proper organic fertilization and green manuring. Intensive nitrogen amendment might indirectly affect carabids by altering crop density and microclimate. Field carabid assemblages are not bound to a certain crop type, but shift in dominance according to the crop-specific rhythmicity of cultivation measures and changes in crop phenology and microclimate. Crop rotation effects could also be influenced by field-size dependent recolonization capability of carabids. They are enhanced by crop diversification in terms of monocrop heterogeneity and weediness as well as by intercropping and the presence of field boundaries, although corresponding increases in their pest reduction efficacy have not yet been evidenced (KROMP, 1999, VICIAN et al., 2007; PORHAJÁŠOVÁ ET AL., 2008a).

The aim of this work was to evaluate the influence of different types of farming on occurrence of principle epigeic group in two evaluated time periods.

MATERIAL AND METHODS

First experiment was realized at Dolná Malanta experimental station of the Slovak Agricultural University in Nitra, during 1996-1998. The experimental site belongs to warm and moderate arid climatic region in the south-western Slovakia. The long term average precipitation is 561mm, for the growing season 327 mm; altitude of 173 m. Average air temperature is 9.7^{o}C. The main soil type is Orthic Luvisol with medium supply of available P, high content of available K and good content of available Mg and pH 6.4 in an average. Collections of epigeic material was realised during vegetation period from April to October by soil trap with four replication were fulfil with 4 % solution of formaldehyde. Total area of trial was 1200 m^2 dividing into three treatments as follows: A – no mow treatments, B mow without removing of cut grass, C mow with removing the cut grass.

The second trial of conventional farming was carrying out during 2004-2006 at the experimental farm Kolíňany Slovakia. The experimental site belongs to warm and moderate arid climatic region with the LTA precipitation of 631 mm and 9.7 and 160-180 altitude. Soil type was Haplic Luvisol, clearly affected by anthropogenic activity. Humus layer was sand loamy with the middle content of humus 2.15%, pH in KCL was strong acid or acid (of pH 4.59- 5.39). Samples were taken from five treatments: A unfertilized; B 25t ha^{-1} farmyard manure; C 50 t.ha^{-1} bio sludge; D 50 t ha^{-1} farmyard; E 100 t ha^{-1} biosludge. In 2004 the soil trap were paced in canopy of sunflower (*Helianthus annus)*, in 2005 at sugar beet (*Beta vulgaris*) field and last year of the trial in the maize (*Zea mays*) field (2006) from April to October. Soil traps (2% solutions of formaldehyde) were control and renew in month interval.

RESULTS AND DISCUSSIONS

During three years of collection at Malanta site totally 117 837 individuals of soil organisms were collected from which belong to 28 principle epigeic group from which 23 belong to invertebrates and only three belong to vertebrates. On the results from table 1 we noted dominant occurrence of *Acarina, Araneida, Coleoptera, Collembola, Heteroptera* and *Hymenoptera.* Totally 6 epigeic groups was determinated. Occurrence of other groups as *Dermaptera, Chilopoda, Isopoda, Lumbricidae, Opilionida* was on the recendent and subrecendent level but their presence have supported stability of agroecosystem .The most frequent occurrence are *Collembola, Coleoptera* and *Acarina* groups.

According MAJZLAN (2002) and PETŘVALSKY ET AL. (2005) presence of these groups is very important for stability and biodiversity of ecosystems and reflects the trophic chain.

Their absence is as indicator of negative impact to the specific ecosystem.

On the result shown in table 1 the best condition was created at the treatments C with remove management of cut grass.

Table 1

Abundancce of epigeic groups, during the years 1996-1998, on the locality Nitra–Dolná Malanta

Epigeic group with occurrence above > 5% / treatment	A treatments		B treatments		C treatments	
	ind.	%	ind.	%	ind.	%
Acarina	5 514	18.12	8 962	20.91	8 863	19.88
Araneida	2 152	7.07	3 452	8.05	3 598	8.07
Coleoptera	6 827	22.44	8 958	20.91	9 319	20.91
Collembola	8 339	27.41	10 611	24.76	11 080	24.85
Heteroptera	928	3.05	2 454	5.72	2 970	6.66
Hymenoptera	1 777	5.84	2 683	6.26	2 766	6.20
Other epigeic groups < 5%	4 887	16.07	5 722	13.39	5 975	13.43
Total	30 424	100.00	42 842	100.00	44 571	100.00

The important part of evaluation is qualitative evaluation. The attributes of specific identity according by Jaccard ranged from 89.29 to 96.29 % The A-B similarity was 96.29%, A-C 89.29% and B-C 92.59% are the evidence of higher similarity. According Shannon-Weaver (d) index the average attribute of diversity for three treatments on the level 2.01131 reflects stability of this ecosystem (A 2.07491; B 1.84768; C 2.1113).

During three year study 44 664 individuals belongs to 22 groups from five treatments were determined. From which 21 belongs to invertebrates and only one group belongs to vertebrates. On the results shown in table 2 we can conclude that the Dominant groups (similarly as in first experiment) were *Acarina*, *Aphidinea*, *Araneida*, *Coleoptera*, *Collembola* and *Diptera.* Occurrence of other groups of soil edaphon was on the recendent and subrecendet level. On the average evaluation of five treatments in terms of the occurrence of zooedaphon showed that application of 50 t ha^{-1} bio sludge supported the most suitable soil condition for zooedaphon development with occurrence of 11 452 individuals. This treatment was situated in the middle of the experiment and perhaps this migratory pathway is important from point of you of higher occurrence.

Table 2

Abundance of epigeic groups, during the years 2004-2006, on the locality Kolíňany

Epigeic group with occurrence above > 5%/treatment	A treatment		B treatment		C treatment		D treatment		E treatment	
	ind.	%	ind.	%	ind.	%	ind.	%	ind	%
Acarina	316	3.51	932	8.96	1508	13.17	492	7.32	256	3.61
Aphidinea	465	5.16	352	3.38	796	6.97	104	1.55	168	2.37
Araneida	871	9.67	1556	14.96	1016	8.87	968	14.41	1196	16.88
Coleoptera	4788	53.15	5208	50.08	5260	45.93	3096	46.07	3116	43.97
Collembola	728	8.09	664	6.38	504	4.41	616	9.17	484	6.83
Diptera	496	5.51	388	3.73	624	5.45	320	4.76	424	5.98
Other epigeic groups < *5%*	1344	14.91	1300	12.51	1744	15.20	1124	16.72	1440	20.36
Total	9008	100.0	10400	100.0	11452	100.0	6720	100.00	7084	100.00

This result is with concordance with KIELHORN ET AL. (1999) that organic manure create better condition for soil zooedaphon, but this support of organic manure is only indirect (PETŘVALSKÝ ET AL., 2007). The maximal occurrence of individuals was received in the most favourable year 2004 in canopy of sunflower.

The results of attributes of species identity are shown in table 3. The attributes of specific identity according Jaccard (I_A) ranged from 81.81% to 100.00 %. The maximal 100% similarity was noted between treatments B-E (B 25t ha^{-1} farmyard manure, E 100 t ha^{-1}

biosludge).The values of the diversity reflect relatively stable conditions on the level as follows: A treatment – 1.74605; B treatment – 1.71713; C treatment – 1.89002; D treatment – 1.84272; 5 treatment – 1.71944. The average value of the diversity was 1.78307.

Table 3

Species identity according Jaccard index (I_J) on the locality Kolíňany, in the years 2004-2006

A – B : 95.00 %	B – D : 85.71 %
A – C : 95.23 %	B – E : 100.00 %
A – D : 81.81 %	C – D : 86.36 %
A – E : 95.00 %	C – E : 90.47 %
B – C : 90.47 %	D – E : 85.71 %

CONCLUSIONS

On the base of two experimental field trials of green fallow and conventional management with different input of organic mater we can conclude that green fallows create the better environment for zooedaphon Totally 117 837 individuals of soil organisms were collected from which belong to 28 principle epigeic group. Dominant occurrence of *Acarina, Araneida, Coleoptera, Collembola, Heteroptera* and *Hymenoptera* totally 6 epigeic groups was determinated. The suitable condition and ecosystem stability of this specific environment indicate also the attributes of specific identity according Jaccard in range from 89.29% to 96.29%. The average attribute of diversity for three treatments on the level 2.01131 also reflects stability of this ecosystem.

In the frame of conventional farming practices during three year period, totally 44 664 individuals belongs to 22 groups from five treatments were determined. Dominant groups, similarly as in first experiment, were *Acarina, Aphidinea, Araneida, Coleoptera, Collembola* and *Diptera*. The attributes of specific identity according Jaccard (I_A) ranged from 81.81% to 100.00 %.The average value of the diversity was 1.78307. On the average evaluation of five treatments in terms of the occurrence of zooedaphon showed that application of 50 t ha^{-1} bio sludge created the most suitable soil condition for zooedaphon development with occurrence of 11 452 individuals.

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