

Collembola diversity in agricultural environments (Lajta Project, Western Hungary)

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Springtails (Collembola) are the most abundant arthropods in terrestrial ecosystems, colonising all soil habitats that provide enough humidity and food, such as organic matter or microorganisms. They are regarded as key indicators of soil fertility and health. Several papers have reported that agricultural intensification tends to reduce collembolan diversity (e.g. Giller et al. 1997, Sousa et al. 2006). The main goal of our research was to investigate Collembola community species composition, abundance and diversity in different agricultural habitats (summer rape, maize, winter wheat, shelterbelt, escarp) of LAJTA Project.

Samplings were carried out during the eleven-year period from 2002-2012. In each habitat, soil cores of 100 cm³ were collected. Collembola were extracted from the soil cores using a Berlese-Tullgren apparatus. The characteristics of Collembola community structures were analyzed by using different diversity indices (Shannon-Wiener index, Simpson's diversity index, Fisher α , Pielou's equitability index). Collembola community structure comparison between the different habitats was estimated using single linkage cluster analysis based on the Bray-Curtis similarity index.

A total of 9259 specimens belonging to 62 species were collected. Hypogastruridae was the most abundant springtail group (2603 individuals – 28,11%) followed by Tullbergiidae (2332 individuals – 25,19%) and Isotomidae (2042 individuals – 22,05%). The most important Collembola community structural properties of the sampled habitats are presented in *Table 1*.

Table 1. Ecological structural properties of Collembola communities of the sampled agricultural habitats (SB – shelterbelt, SR – summer rape, MA – maize, WW – winter wheat, ES – escarp)

	Species richness (S)	Number of individuals (N)	Simpson's diversity (D)	Shannon diversity (H')	Fisher α	Equitability (J)
SB	46	3849	0,899	2,728	7,344	0,713
SR	22	2055	0,678	1,565	3,441	0,506
MA	14	212	0,740	1,805	3,367	0,684
WW	25	387	0,853	2,451	5,971	0,762
ES	37	2756	0,736	2,044	6,041	0,566

Species richness, abundance and values of the different diversity measures were the highest in shelterbelts, which shows the great importance of tree line ecotones in agricultural environments. Escarps, ditches are further ecotones that play a significant role in Collembola diversity and abundance that is reflected in the relative high values of ecological structural properties. Collembola species richness in intensively managed habitats (maize, summer rape and winter wheat) was lower compared with the ecotones.

The result of the agglomerative cluster analysis based on Bray-Curtis similarity coefficient is shown in *Fig. 1*. The dendrogram well emphasises the difference between the two main habitat types: intensively managed fields and line ecotones.

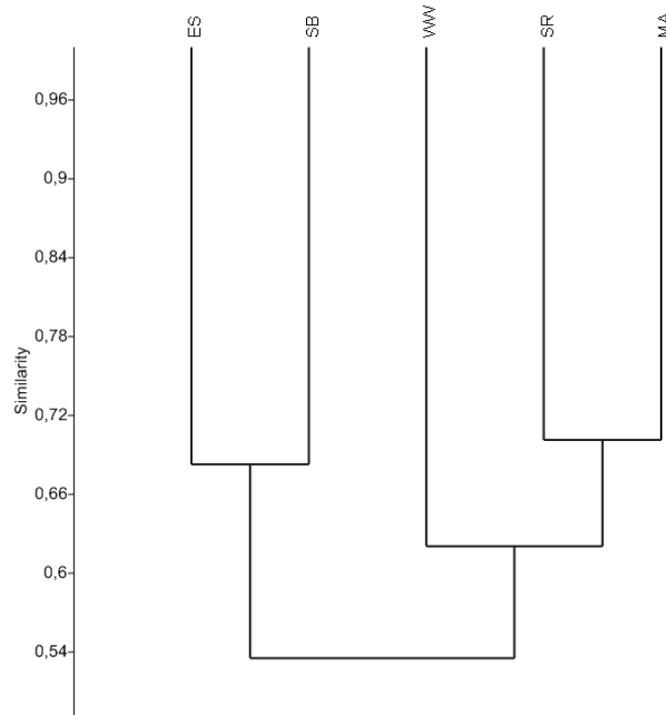


Figure 1. Dendrogram based on cluster analysis using the Bray-Curtis similarity coefficient on the Collembola communities of the sampled habitats

The final results suggested that the types of land use affected the species richness and abundance, and human activity had a significant impact on the soil Collembola communities.

Giller K.E., Beare M.H., Lavelle P., Izac A.-M.N. & Swift M.J. (1997): Agricultural intensification, soil biodiversity and agroecosystem function. *Applied Soil Ecology* 6: 3–16

Sousa J. P., Bolger T., da Gama M.M., Lukkari T., Ponge J-F., Simon C., Traser G., Vanbergen A.J., Brennan A., Dubs F., Ivits E., Keating A., S. Stofer, A. Watt (2006): Changes in Collembola richness and diversity along a gradient of land-use intensity: a pan European study. *Pedobiologia* 50: 147–156.