The Importance of Biobelts from the Point of View of the Biodiversity of Epigeic Groups

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Abstract
The importance of biobelts lies mainly in the natural greening of the ecosystem. The loss of biodiversity is currently one of the biggest problems and the final challenge we face. The agricultural landscape is becoming increasingly less suitable habitat for many species of plants and animals. The answer to the decreasing biodiversity in the agricultural landscape is various measures that support biodiversity. The aim of the work was to evaluate the abundance, structure and dominance of the occurrence of epigeic groups present in biobelts in the southwestern part of Slovakia. Biobelts perform many primarily positive functions within agroecosystems. The ground trap method was used to determine the presence of epigeic groups. 19 taxonomic groups were obtained, with a dominant representation of Coleoptera, Collembola, Acarina, Formicoidae, Opilionida Araneida. From the point of view of biodiversity, minorly represented groups such as Heteroptera, Diplopoda, Chilopoda, Dermaptera, Lumbricidae, etc. are also important. The calculated diversity index reached a value of 2.243 in the 1st year and 1.778 in the 2nd year. The faunal similarity of the variants reached a value of 94.44%. Despite the fact that these are ecological areas intended for target groups of animals, in the case of all types of biobelts, these are areas from which the entire biosystem benefits.

Keywords: biodiversity, biobelts, epigeic groups, fauna, flora

1. Introduction

The issue of agricultural landscape protection has recently come to the forefront of interest among both professionals and the general public. The reduction of biodiversity, landscape diversity and subsequent climate change are the main topics of creating and protecting a sustainable agricultural landscape [1].
Biobelts, i.e. multifunctional field edges, aim to increase biodiversity, support bee colonies and other pollinators, and create conditions for bird nesting and the protection of small animals in and around fields [2].

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Biobelts are a new element in agricultural policy. This is a topic that has been discussed for years, which also requires knowledge of current legislation when putting it into practice. Certain rules apply when establishing biobelts. The width of the created biobelt must be at least 12 meters, although up to 22 meters is recommended. The biobelt is made up of a clover-grass, grass-herb mixture, or it can also be made up of mixtures for pollinators and herbal mixtures. explains the agricultural sector. The deadline by which the belt must be created in the field within the current season is April 30. Biobelts can be mowed a maximum of twice a year, with the first mowing taking place no earlier than June 23 and the second mowing no earlier than two months after the first. The biobelt area is therefore maintained as fallow with vegetation, mainly by preventing

the spread of invasive woody plants, removing invasive plant species and tenacious weeds [3].
The importance of biobelts lies mainly in the natural greening of the ecosystem, from which all components of biodiversity benefit. Biobelts are not only a refuge for wild animals, but can also be a rich source of trophic relationships, from the harvest of the main crops to the winter period. Many authors are of the opinion that biobelts as agro-environmental and climate measures increase the species diversity of vegetation in the agricultural landscape, the vegetation of biobelts improves the food supply and supports the spatial and temporal availability of food sources for animals and, last but not least, creates space for their shelter [4].
The positive aspects of biobelts include supporting biodiversity in the landscape, supporting bees and other pollinators, creating conditions for nesting of ornithofauna, reproduction, shelter and protection of small animals in the fields and their surroundings, reducing damage to cultivated crops by being food for wild animals, landscape-forming significance, the function of a biocorridor, reducing the risk of water and wind erosion, limiting the transport and washout of agrochemicals, retaining water in the landscape. We also encounter negative aspects associated with obtaining financial resources for their implementation, excluding the use of agrochemicals, the species composition of plants that form the biobelt. Biobelts are established for a period of 5 years, the vegetation cannot be treated with herbicides, there is a risk of the spread of invasive species and the spread of some competitive weed species. It is not possible to use insecticides, which allows larvae and various types of insects to survive, which can threaten the surrounding growth of the cultivated crop. At the same time, they serve as food for many species of field birds [1].
Farmers are also satisfied with the higher biodiversity in the fields, but they point out that weeds spread more easily in the strips, and the enormously multiplied population of the field vole, which in many cases decimates farmers' crops on surrounding land, is also a problem. It follows from the above that agriculture represents a conflict of two directions. On the one hand, there is the protection of the present flora and fauna, and on the other hand, there is protection from harmful organisms that commonly occur in agriculture. Of course, weeds are also part of it as accompanying organisms [5, 6]. The key role in the protection and stabilization of ecosystems is primarily the protection of biodiversity [7, 8].
The aim of the presented work is to identify and evaluate the biodiversity of epigeic groups in biobelts in agroecosystems in the southwestern part of the Slovak Republic.

2. Materials and methods

The epigeic material was collected using the ground trap method (glass jars with a volume of 1 l, which are exposed at ground level and filled with 4% formaldehyde, protected from above by a roof), which were exposed during the growing season of 2022, in the southwestern part of Slovakia, within two variants. 1st variant - 2 repetitions (biostrips in the 1st year) and 2nd variant - 2 repetitions (biostrips in the 2nd year). The collected biological material was collected at monthly intervals, the ground traps were subsequently renewed and determined and statistically evaluated under the conditions of the Institute of Plant and Environmental Sciences. The material was determined [9, 10, 11] and statistically evaluated.
The presence and biodiversity of epigeic groups was evaluated based on abundance, dominance, species identity according to Jaccard (I_J), degree of diversity according to Shannon-Weaver (d) [12].
The prediction of the richness of edaphic animal groups and homeostasis of agroecosystems were also evaluated.
The monitored epigeic groups indicate topical and trophic environmental conditions by their presence and at the same time serve as part of complex mechanisms, as they respond to any changes and inputs in the soil system, including pollutant transport, soil management system and present vegetation.

3. Results and discussion

During the research period, 6,493 specimens (ex) of epigeic animal groups (Table 1) belonging to 19 taxonomic groups were collected in the southwestern part of Slovakia using the ground trap method. Almost all of them are part of the

taxonomic unit Arthropoda, except Lumbricidae and Muridae. The Larvae group represents the developmental stages of the epigeic groups present, which are not further taxonomically classified. The obtained results correspond to the methodology used and the topical and trophic requirements in relation to the soil and climatic conditions at the monitored site.

Table 1. Cumulative abundance and dominance of epigeic groups, south-western part of the Slovak Republic, variants – biobelt in the 1st and 2nd year, year 2022

Epigeic groups	Biobelt	Biobelt	∑	Biobelt	Biobelt	∑	∑
	1th repetition-1th year	2nd repetition-2nd year	S_1	1th repetition-2nd year	2nd repetition-2nd year	S_2	$S=S_1+S_2$
Acarina	175	164	339	269	205	474	813
Araneida	80	25	105	89	135	224	329
Auchenorrhyncha	1	3	4				4
Coleoptera	305	499	804	499	697	1 196	2 000
Collembola	158	294	452	315	216	531	983
Dermaptera	8	23	31		15	15	46
Diplopoda	18	16	34	18	35	53	87
Diptera	55	65	120	10	18	28	148
Formicoidae	201	198	399	155	149	304	703
Heteroptera	18	18	36	20	33	53	89
Hymenoptera	15	16	31	36	56	92	123
Chilopoda	5	2	7	19	23	42	49
Isopoda	23	15	38	42	43	85	123
Larvae	85	93	178	65	79	144	322
Lumbricidae	10	6	16	5		5	21
Muridae				2	3	5	5
Opilionida	98	56	154	103	99	202	356
Orthoptera	71	73	144	88	52	140	284
Siphonaptera				3	5	8	8
∑	1 326	1 566	2 892	1 738	1 863	3 601	6 493

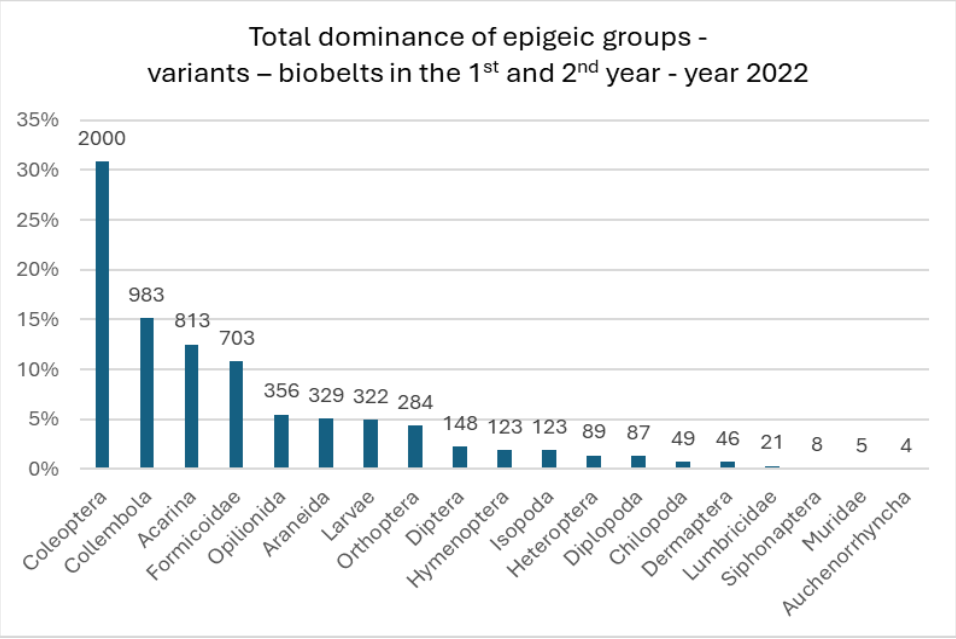

Figure 1. Total dominance of epigeic groups – biobelts in the 1st and 2nd year - year 2022

These semi-natural habitats are suitable environments for supporting biodiversity, are characterized by high plant diversity, and provide refuges for overwintering epigeic fauna [6]. According to [13], biobelts contribute to increasing biodiversity and related ecosystem services. After summarizing and evaluating the obtained results, which are presented in Table 1, indicating dominance (Graph 1), it can be stated that the significantly eudominant representation was confirmed by the occurrence of Coleoptera (S1 = 804 ex; s2 = 1,196 ex; s = 2,000 ex; D = 30.81%). Lower eudominance was shown by Collembola (S1 = 452 ex; s2 = 531 ex; s = 983 ex; D = 15.14%), Acarina (S1 = 339 ex; s2 = 474 ex; s = 813 ex; D = 12.52%), Formicoidea (S1 = 399 ex; s2 = 304 ex; s = 703 ex; D = 12.52%). = 10.83%). The dominant representation was confirmed by Opilionida (S1 = 154 ex; s2 = 202 ex; s = 356 ex; D = 5.49%) and Araneida (S1 = 105 ex; s2 = 224 ex; s = 329 ex; D = 5.07%). Larvae (S1 = 178 ex; s2 = 144 ex; s = 322 ex; D = 4.38%) and Orthoptera (S1 = 144 ex; s2 = 140 ex; s = 284 ex; D = 4.38%) were subdominant. The subdominant occurrence was also confirmed by non-epigeic Diptera (S1 = 120 ex; s2 = 28 ex; s = 148 ex; D = 2.28%). Isopoda (S1 = 38 ex; s2 = 85 ex; s = 123 ex; D = 1.89%), Hymenoptera (S1 = 34 ex; s2 = 92 ex; s = 123 ex; D = 1.89%), Heteroptera (S1 = 36 ex; s2 = 53 ex; s = 89 ex; D = 1.37%), Diplopoda (S1 = 34 ex; s2 = 53 ex; s = 87 ex; D = 1.34%) occurred in a recident manner. The occurrence of Auchenorrhyncha, Dermaptera, Chilopoda, Lumbricidae, Muridae, Siphonaptera was below 1%, thus showing a subrecident representation.

The obtained results confirm the claims of many authors that the presence of epigeic groups occurring in biobelts is related to their high adaptation to environmental conditions and also to their trophic preference. The presence of groups is evident from environmental factors such as climatic conditions, present vegetation and intensity of intraspecific and interspecific relationships. From the point of view of the assessment of ecological factors, the present taxa represent groups typical of field ecosystems that occur in accordance with their reproductive cycle, subsequently their occurrence is influenced by local soil or moisture conditions of the environment and the trophic chain [7]. Many authors are of the opinion that the level of biodiversity in ecosystems is significantly dependent on vegetation cover, crop rotation, management intensity and adjacent agricultural land. This is confirmed by our results and findings. An almost identical representation of epigeic groups was found by [14]. However expressed the opinion that the problem of biobelts is the presence of tenacious weeds and invasive plant species that grow very quickly and are expansive. Due to above-average precipitation and temperature conditions and the lack of use of plant protection products, these unwanted plants multiply very quickly in biobelts [15].

The obtained results can also be evaluated from a qualitative point of view. Indicators are used, e.g. faunal similarity calculated according to Jaccard (I_J), which reached a value of 94.44%, and the diversity index adjusted according to Shannon-Weaver (d), which reached a high value of 2.243 in the 1st year and 1.778 in the 2nd year. The presence of monitored epigeic groups in the monitored types of management is influenced by many factors, but in connection with the evaluation of the obtained results, it is also necessary to know the autecology of individual populations occurring in the monitored habitats [16].

Intensive farming systems provide only limited opportunities for the existence of common plant and animal species. Ploughing boundaries and the intensification of agriculture have had a negative impact on the structure of the landscape, in which wild animal species do not have enough opportunities to provide food, nesting, and they lack natural cover in the landscape. The decline in species diversity is problematic precisely from the point of view of the functioning of natural ecosystems. This applies primarily to pollinators. A healthy ecosystem performs a number of other functions beneficial to agriculture, including biological protection [17].

The title "biobelt" contributes to increasing the biodiversity and ecological stability of the landscape. The occurrence and structure of populations indicate the state of the habitat, at the same time contributing to its biodiversity and ecological balance, and thus affecting the ecosozological value of ecosystems and the functions taking place in them. It plays a fundamental role in relation to humans and their sustainable development. The presence of individual epigeon groups in ecosystems, through

their quantitative, but especially qualitative representation, directly reflects and characterizes the basic topical and trophic relationships in a given environment [18].
Research on biobelts in Slovakia has shown their irreplaceable importance for pollinators. These parts of the territory host approximately a third of Slovakia's bumblebee species.
Biobelts play a key role in protecting biodiversity and also attract predators of pests such as mealybugs.
From April to September, scientists monitored 15 biobelts in western Slovakia, and in May and June, the number of insects in flowering biobelts was up to 40 times higher than in the surrounding fields. Biobelts are home to many endangered species, but they also help farmers reduce the need for pesticides and support sustainable farming [19].

4. Conclusions

Biosphere reserves are intended to bring life back to the landscape and also fulfill functions that other elements cannot fulfill. They are important for the protection of pollinators, endangered species and small game. Their creation contributes to carbon sequestration, climate protection, and, when placed along contour lines, to water retention. From the perspective of nature conservation, biosphere reserves create suitable conditions for endangered species. Biosphere reserves will support the occurrence of pollinators. Thanks to a higher number of pollinators, agricultural areas adjacent to biosphere reserves will have higher yields for some crops. The aim is to introduce biosphere reserves into the landscape as much as possible, as their importance is multifunctional: trophic, topical, agro-environmental.
Biobelts are intended to bring life back to the landscape and fulfill functions that other elements cannot. They are important for the protection of pollinators, endangered species, and small game.

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