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Floristic diversity of selected plant communities on extensive and abandoned grasslands in the Nadwieprzański Landscape Park

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Abstract

The paper presents floristic diversity of some plant communities in the Nadwieprzański Landscape Park (middle part of the Wieprz River valley). Phytosociological relevés were made in the years 2005–2007 with Braun-Blanquet method. Species richness was a base to calculate the Shannon-Wiener diversity index.

The Wieprz River valley has the character of a floodplain. In its middle reaches, communities of the *Molinio-Arrhenatheretea* class accounted for nearly 75% of all plant communities in grasslands. Herbaceous communities were represented by associations from the *Filipendulion* alliance. The greatest diversity ($H' = 3.4$) was characteristic for vegetation of the *Valeriano-Filipenduletum* association. It formed small patches in abandoned meadows. Small patches of plants from the *Lythro-Filipenduletum ulmariae* association, having a slightly smaller floristic diversity ($H' = 3.0$) were found on abandoned meadows located in highly silted and poor organic soils. Characteristic species of herbaceous communities (*Filipendula ulmaria*, *Valeriana officinalis* and *Lythrum salicaria*) occurred also in the sward of abandoned thistle meadows. Typical thistle meadows (*Cirsietum rivularis*), with the predominance of *Cirsium rivulare* developed in land depressions, not far from the Wieprz River, in the vicinity of abandoned drainage ditches and along the edges of the valley. However, the total abandonment of these meadows leads to changes in floristic composition of the sward and to succession towards herbaceous communities.

Key words: floristic diversity, grassland communities, Nadwieprzański Landscape Park, valley of the middle Wieprz River,

INTRODUCTION

Grassland communities are especially important components of vegetation and support high biodiversity [KUCHARSKI 1999; WARDA, KOZŁOWSKI 2012]. Being an inherent part of landscape, grass communities provide a backdrop for river valleys [SABINIARZ, KOZŁOWSKI 2009]. In landscape parks, most grass

communities are cut or grazed, and the diversified management system of these grasslands can maintain the floristic diversity of these communities [WARDA, STAMIROWSKA-KRZACZEK 2007]. The existence of protected areas, including Natura 2000 areas, enables the preservation of unique, valuable and almost unchanged landscapes and their floristic diversity. However, recent years have seen a less intensive use or

discontinued use of these grasslands [ZARZYCKI MISZTAŁ 2010]. Coupled with the abandoned management of drainage ditches, this may lead to the disappearance of some communities or to the reduction of their floristic diversity [KOSTUCH 1995].

The Nadwieprzański Landscape Park features Natura 2000 habitats, described as “Dolina Środkowego Wieprza” (“Valley of the Middle Wieprz River”) (Fig.1).



Fig. 1. A map of Natura 2000 areas, the Middle Wieprz River Valley PHL 060005; source: Natura 2000

Currently, the legal status of the area is regulated by the Commission Implementing Decision of 16 November 2012. Protection is extended over various habitats located in the valley of the Wieprz River along the stretch from Kłarów to Ciecanki Krzesimowskie, where most of the area is covered by mown meadows with small patches of alder (*Alnus glutinosa*) carrs [RDOŚ... 2013]. The area is situated in the eastern part of the Lublin Province, on the border of two large physiographic units — the Lublin Upland and the Volyn Polesie within mesoregions of the Dorohucz Depression and Świdnik Plateau [KONDRACKI 1998]. Communities of the *Molinio-Arrhenatheretea* class are most numerous there. They account

for 74.9% of all plant communities in grasslands, in the middle reaches of the Wieprz River valley [STAMIROWSKA-KRZACZEK 2008; WARDA STAMIROWSKA-KRZACZEK 2010]. Although legal protection is extended over communities from the *Arrhenatherion* and *Molinion* alliances within this class, there are also small patches of herbaceous communities comprising many species and deserving attention because of their significant scenic value.

The objective of this study was to examine the vegetation cover and describe the floristic diversity of selected plant communities of extensive and abandoned grasslands in the Nadwieprzański Landscape Park.

MATERIALS AND METHODS

Floristic surveys were conducted in the Nadwieprzański Landscape Park in the years 2005–2007. The investigations encompassed herbaceous and thistle communities in the middle reaches of the Wieprz valley, within the area of Klarów, Milejów, Ciechanki Łańcuchowskie, Sufczyn, Łańcuchów, Wólka Łańcuchowska, Zakrzów and Ciechanki Krzesimowskie. The valley of the Wieprz River has the character of a floodplain. The Wieprz is a natural river, intensively meandering, constantly changing its channel and deeply incised into the valley [BPWiM 1975]. In the past, the valley in the middle reaches of the Wieprz River was characterised by a great share of marshy areas. The lowering of the water level caused by drainage led to rapid changes of the habitat properties and in the natural arrangement of plant communities. Economically valuable mesophytes appeared in all sites with hygrophilous vegetation, [Plan... 1996]. It has recently been found that the system of drainage ditches is clogged due to trees and shrubs growing on the banks, lush vegetation growing on the bottom of the ditches, and large shallow and silted up areas [IMGW 2003].

In the study area, phytosociological relevés were made along designated transects within homogeneous vegetation patches of an area from 10 to 70 m². Species composition of the sward was assessed using the Braun-Blanquet method. Degrees of constancy were determined for species whose occurrence was recorded in at least 10 relevés, while the range of cover-abundance points was determined for other species. The nomenclature of species was adopted according to MIREK *et al.* [2002], while the taxonomy and nomenclature of communities according to MATUSZKIEWICZ [2007].

The Shannon-Wiener diversity index H' was used to assess the species diversity of plant communities [KREBS 1997]. The values of the obtained H' index were used to describe the diversity of particular communities according to a five-point scale elaborated by JURKO [1986].

RESULTS AND DISCUSSION

All studied grasslands described in this paper belonged to the *Molinietalia caeruleae* order. Wet meadows of this order are the secondary biocoenoses whose species composition and dynamics depend on the kind and intensity of use. The cessation or intensification of use and changes in the hydrological regime result in unfavourable changes in the sward of these communities manifested in the formation of unstable transitional forms and, in consequence, their disappearance. Due to their high environmental value and high risk of extinction in Europe, wet meadows have been entered into the Polish list of protected habitats and included in the Natura 2000 network of protected areas [PAWLACZYK, JARMACZEK 2000].

Based on phytosociological relevés, three plant communities were distinguished within wet meadows belonging to the *Molinietalia caeruleae* order. The phytosociological classification of the communities distinguished is as follows:

Class: *Molinio-Arrhenatheretea* R. Tx. 1937

Order: *Molinietalia caeruleae* W. Koch 1926

Alliance: *Filipendulion ulmariae* Segal 1966

Association *Valeriano-Filipenduletum* Siss. In Westh. *et al.* 1946

Association *Lythro-Filipenduletum ulmariae* Hadac *et al.* 1997

Alliance: *Calthion palustris* R. Tx. 1936 em. Oberd. 1957

Association *Cirsietum rivularis* Nowiński 1927.

The floristic surveys of herbaceous communities (*Valeriano-Filipenduletum* and *Lythro-Filipenduletum*) revealed the occurrence of 82 vascular plant species, among which the most numerous were dicotyledons classified as herbs and weeds (Fig. 2).

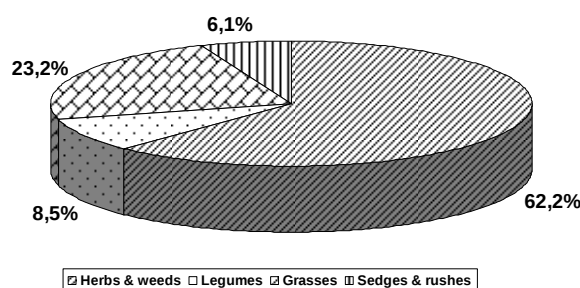


Fig. 2. Percentage share of vascular plant groups in the sward of herbaceous communities in the middle part of Wieprz River valley; source: own study

Typical herbaceous communities covered areas of different size in the middle reaches of the Wieprz River valley. They were represented by communities from the *Filipendulion* alliance (Tab. 1). These communities were characterised by high species richness and values of the floristic diversity index. The greatest diversity ($H' = 3.4$) was shown by vegetation of the *Valeriano-Filipenduletum* association (Tab. 2) that formed small patches in abandoned meadows (due to the lack of use and fertilisation) in the vicinity of Zakrzów, Sufczyn and Wólka Łańcuchowska. Sixty four plant species were found to occur in the sward of this community (17–38 species per relevé) representing mainly the *Molinio-Arrhenatheretea* class, with a clear predominance of *Filipendula ulmaria* and *Valeriana officinalis*.

The lack or considerable restriction of the use of valuable grass communities of the *Arrhenatheretalia* order causes a systematic increase of the share of dicotyledons, particularly *Lythrum salicaria*, in the sward. The share of this species in the sward depends on the degree of turf sparseness and degradation of organic topsoil, which leads to succession from valuable mown meadows to herbaceous communities.

Table 1. Phytosociological characteristic of *Valeriano-Filipenduletum*, *Lythro-Filipenduletum* and *Cirsietum rivularis* association

Characteristic species for syntaxons	<i>Valeriano-Filipenduletum</i>	<i>Lythro-Filipenduletum</i>	<i>Cirsietum rivularis</i>
	range of cover – abundance points	range of cover – abundance points	Constancy S 1–20
ChAss.: Valeriano-Filipenduletum			
<i>Filipendula ulmaria</i>	2 – 4	2 – 4	III
<i>Valeriana officinalis</i>	1 – 3	+	III
DAss.: Lythro-Filipenduletum			
<i>Lythrum salicaria</i>	+ – 1	2 – 4	III
ChAll.: Filipendulion ulmariae			
<i>Veronica longifolia</i>	1	+ – 2	–
<i>Lysimachia vulgaris</i>	1	+ – 1	I
<i>Equisetum palustre</i>	+	+	IV
ChAss.: Cirsietum rivularis			
<i>Cirsium rivulare</i>	+ – 2	–	V
ChAll.: Calthion palustris			
<i>Geum rivale</i>	–	–	IV
<i>Polygonum bistorta</i>	+ – 1	1	III
<i>Lathyrus palustris</i>	+ – 1	–	II
<i>Myosotis palustris</i>	–	–	II
<i>Caltha palustris</i>	–	–	I
ChO.: Molinietales			
<i>Deschampsia caespitosa</i>	+ – 2	+	IV
<i>Lychnis flos-cuculi</i>	+ – 1	+	IV
<i>Sanguisorba officinalis</i>	+ – 1	–	III
<i>Galium boreale</i>	1	–	–
<i>Dianthus superbus</i>	1	1	–
<i>Glechoma hederacea</i>	–	–	II
ChO.: Trifolio fragiferae-Agrostietalia stoloniferae			
<i>Agrostis stolonifera</i>	1	1	–
<i>Potentilla anserina</i>	–	–	III
<i>Ranunculus repens</i>	+	–	II
<i>Lysimachia nummularia</i>	–	–	I
<i>Festuca arundinacea</i>	–	–	I
ChO.: Arrhenatheretalia			
<i>Geranium pratense</i>	–	–	II
<i>Leucanthemum vulgare</i>	–	–	I
<i>Trifolium repens</i>	–	–	I
<i>Galium mollugo</i>	–	–	I
<i>Dactylis glomerata</i>	–	–	I
ChCl.: Molinio-Arrhenatheretea			
<i>Holcus lanatus</i>	+ – 1	–	IV
<i>Festuca rubra</i>	+ – 2	2	III
<i>Alopecurus pratensis</i>	+	1 – 2	III
<i>Poa pratensis</i>	+ – 2	–	III
<i>Rumex acetosa</i>	+ – 2	+ – 2	III
<i>Festuca pratensis</i>	2	–	–
<i>Plantago lanceolata</i>	–	–	II
<i>Poa trivialis</i>	–	–	II
<i>Ranunculus acris</i>	–	–	II
Number of associated species	8	11	12
Number of sporadic species	33	20	43

Source: own study.

Table 2. Floristic diversity indices of surveyed herbaceous communities

Association	Number of species		Cover – abundance by characteristic species	Shannon-Wiener index of floristic diversity H'
	total	mean in relevé		
<i>Valeriano-Filipenduletum</i>	64	25.4	5 750	3.4
<i>Lythro-Filipenduletum ulmariae</i>	45	18.0	6 500	2.6
<i>Cirsietum rivularis</i>	93	19.1	5 250	2.8

Source: own study.

Small patches of vegetation of the *Lythro-Filipenduletum ulmariae* association of a slightly smaller floristic diversity ($H' = 3.0$) were found on the neglected meadows located in highly silted and poor organic soils in Sufczyn, Wólka Łańcuchowska and Ciechanki Łańcuchowskie. Species characteristic of this syntaxon – *Lythrum salicaria* and *Filipendula ulmaria* dominated in the sward and were a beautiful addition to landscape diversity in their blooming period. Due to a tendency of increasing non-productive functions of grasslands, it is very important to assess their aesthetic and environmental value to ensure suitable care of them.

Floristic richness of studied grassland phytocenoses was higher than similar communities described by BABCZYŃSKA-SENDEK [2009] and SUDER [2007]. Among the assessed communities, *Cirsietum rivularis* was predominant. Thistle meadows (*Cirsietum rivularis*), with the predominance of *Cirsium rivulare* (Tab. 1), developed in depressions of the terrain not far from the Wieprz River channel, in the vicinity of neglected drainage ditches and along the edges of the valley. The association of *Cirsietum rivularis* is widespread in river valleys of the Lublin region [DRESLER 2010; MOSEK, MIAZGA 2006; TRĄBA 1999]. Typically, the sward of this community was mown although the use of some isolated, small-sized patches was discontinued. Patches of the *Cirsietum rivularis* association (93 species; 14–27 species per relevé) occurred within the *Allopecuretum pratensis* and *Caricetum gracilis* association as well as communities with *Holcus lanatus* and *Deschampsia caespitosa*. The number of species of the *Magnocaricion* alliance (*Carex gracilis*, *Phalaris arundinacea*, *Galium palustre*) increases in wetter sites, which was also confirmed by the sedge and herb character of the *Cirsietum rivularis* in the Wieprz River valley. This syntaxon offers wonderful aesthetic and scenic values, particularly during the blooming of plume thistle (*Cirsium rivulare*) and other perennial dicotyledons belonging to this community [TRĄBA 1999]. Substantial share of grass species in the typical patches of the plume thistle communities results from habitat changes like drying up of the meadows, which was confirmed by KRYSZAK [2001] in the studies of meadow and pasture communities in the Wielkopolska region. Floristic and habi-

tat-related correlation between this syntaxon and high sedge communities was described by BARYŁA [1970]. However, the total lack of using thistle meadows leads to the domination of the sward by *Filipendula ulmaria*, *Valeriana officinalis* and *Lythrum salicaria*, to formation of herbaceous communities and, next, to the propagation of shrubs in these grasslands [BARYŁA, URBAN 2002; GAWLIK *et al.* 2001; TRĄBA, WOŁAŃSKI 2011]. It can be assumed that some unused fragments of thistle meadows were replaced by herbaceous communities. Similar observation was described by TRĄBA *et al.* [2004].

Varying humidity and trophic levels of valley meadow habitats are conducive to the occurrence of species rich and diverse grassland communities. The use of traditional forms of grassland management in areas protected by law makes it possible to preserve the semi-natural vegetation occurring there. According to SABINIARZ and KOZŁOWSKI [2009], diverse and rich in species grassland communities affect landscape variety and its attractiveness for tourists.

CONCLUSIONS

1. Studied grassland communities in the Nadwieprzański Landscape Park were classified as *Valeriano-Filipenduletum*, *Lythro-Filipenduletum ulmariae* and *Cirsietum rivularis* associations.

2. They are very interesting for their species richness. The highest number of species (93) was characteristic for *Cirsietum rivularis* association but *Valeriano-Filipenduletum* association manifested a higher index of floristic diversity ($H' = 3.4$).

3. Contribution of many dicotyledon plants in these communities offers wonderful aesthetic and scenic values in the landscape.

4. However, lack of or less intensive use of grasslands in the vicinity of neglected drainage ditches leads to the disappearance of some communities or to reduction of their floristic diversity. It can be assumed that small patches of herbaceous communities present in the middle part of Wieprz River valley are the result of succession within *Cirsietum rivularis* communities.

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Zróżnicowanie florystyczne wybranych zbiorowisk roślinnych ekstensywnych użytków zielonych w Nadwieprzańskim Parku Krajobrazowym

STRESZCZENIE

Słowa kluczowe: Dolina Środkowego Wieprza, Nadwieprzański Park Krajobrazowy, różnorodność florystyczna, zbiorowiska roślinne użytków zielonych

Celem pracy była ocena różnorodności florystycznej zbiorowisk roślinnych w Nadwieprzańskim Parku Krajobrazowym. Zdjęcia fitosocjologiczne wykonano w latach 2005–2007 metodą Brauna-Blanqueta. Posłużyły one do określenia fitosocjologicznej przynależności zbiorowisk użytków zielonych. Liczebność gatunków stanowiła podstawę do obliczenia wskaźników różnorodności Shannona-Wienera.

Dolina Wieprza ma charakter doliny zalewowej. Zbiorowiska należące do klasy *Molinio-Arrhenatheretea* stanowiły prawie 75% wszystkich zbiorowisk występujących na użytkach zielonych w środkowej części doliny Wieprza. Zbiorowiska ziołoroślowe reprezentowały zespoły ze związków *Filipendulion*. Największe zróżnicowanie florystyczne ($H' = 3,4$) stwierdzono w runi zespołu *Valeriano-Filipenduletum*, występującego w małych płatach na zaniedbanych łąkach. Nieco mniejszą różnorodnością ($H' = 3$) charakteryzowała się roślinność zespołu *Lythro-Filipenduletum*, która zasiedlała niewielkie powierzchnie łąk na słabych glebach organicznych. Gatunki charakterystyczne zbiorowisk ziołoroślowych (*Filipendula ulmaria*, *Valeriana officinalis* i *Lythro salicaria*) pojawiały się w runi nieużytkowanych łąk ostrożeńiowych. Trzecim wyróżnionym zespołem były łąki ostrożeńiowe (*Cirsietum rivularis*), z dominacją *Cirsium rivulare*, które wykształciły się w obniżeniach terenowych, w niewielkiej odległości od koryta rzeki Wieprz, w pobliżu zaniedbanych rowów melioracyjnych oraz na obrzeżach doliny. Jednakże, brak użytkowania tych łąk prowadzi często do zmian w składzie florystycznym runi i sukcesji w kierunku zbiorowisk ziołoroślowych.