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Assessment of the value of grasslands in Olszówka (Mszana Dolna Commune, Southern Poland)

Abstract

The botanical composition of meadows and pastures and their value in use should determine the activities undertaken on grasslands in order to maximise their yields. The aim of the study was to analyse the floristic composition of meadows and pastures in the area of Olszówka village (Southern Poland), their characteristics and determination of the value in use and agricultural suitability. In the meadows and pastures, 50 plots, each with an area of 25 m^2, were marked out and floristic lists were made on them according to the Klapp method. In the analysed area, the presence of five groups of similar plots was determined: I – pasture with *Lolium perenne*, II – meadow with *Dactylis glomerata*, III – meadow/pasture with *Phleum pratense* and *Poa pratensis*, IV – meadow with *Arrhenatherum elatius*, V – weeded meadow/pasture with *Plantago lanceolata*. Usage studies have shown that most of the plots have medium and good forage values. In order to improve the quality of meadows and pastures, undesirable species should be limited and appropriately selected care treatments should be intensified.

Keywords: non-forest area, meadows, pastures, Usage Value of the Meadow UVM

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Introduction

Semi-natural plant communities of meadows and pastures have existed in the Carpathians for a very long time (Flizak, 1936). As a result of grazing, mowing, and organic fertilisation of places where the forest was previously cut down or burned, biocenoses with an extremely high species richness, both plants and animals, have developed (Kaźmierczakowa et al., 1997). The high biodiversity of grassland ensures its stability and resistance to changing habitat and climatic conditions (Jankowska-Huflejt, 2016). Permanent grasslands – meadows and pastures, fulfil several functions in nature, including climatic, hydrological, protective, filtration, phytosanitary, landscape, and aesthetic functions. Moreover, they are a refuge for many rare organisms (Grzegorczyk, 2016). All these functions are related to human compliance with the principles of sustainable

management, which poses a challenge for users and managers of semi-natural agricultural areas (Kozak, 2014).

The quality and highest of crops are negatively influenced by pests, including pathogens and many species of weeds that accompany yield plants. The most common causes of weed infestation are improper use, inadequate soil moisture, or incorrect proportions of nutrients (Taegue et al., 2011). The occurrence of undesirable species can be prevented by properly selected care of meadows and pastures. However, incomplete weed control (i.e. appropriate regulation of weed infestation) is considered a very important protection measure in the cultivation of meadow-pasture plants. It is worth emphasizing the fact that weeds, in appropriate proportions, also play a useful role in meadow phytocoenoses; they may, for example, be a feeding habitat for pollinating insects, which are also important from the point of view of the human economy (Dobrzański, 2009).

Weed infestation may also be influenced by the soil abundance of nutrients, mentioned above, e.g. nitrogen (Barabasz, 1994; Dobrzański, 2009; Barszczewski, Szatyłowicz, 2011; Barabasz-Krasny, 2016). Too high concentrations of nitrogen compounds in the soil may hurt many plants, as well as seriously disturb the biodiversity of non-forest areas and ultimately lead to a reduction in the durability of meadows and pastures. Nitrogen fertilisers change the floristic composition of grasslands, reducing the number of plants from the Fabaceae family (legumes) and at the same time supporting the development of grasses and other nitrophilous plants. The nitrogen dose should depend on the share of legumes in the sward – the larger the share, the lower the nitrogen dose (Jankowska-Huflejt, Zastawny, 2003; Barszczewski, Szatyłowicz, 2011; Raus et al., 2012; Krstic et al., 2016; Radkowska, Radkowski, 2019). Legumes are eagerly eaten by cattle due to their high nutritional value, that is why they are valuable from the point of view of meadow usage. Fertilising with manure increases the organic matter content by providing microorganisms and enzymes. However, too much manure allows the expansion of nitrophilous weeds that do not belong to fodder species, what also adversely affects the utility value of the sward (Wesołowski, 2003).

A rationally applied mowing and grazing system contributes to improving the floristic composition of grasslands (Barabasz, 1994). Grazing allows you to maintain the species richness and typical floristic composition of pastures subjected to this treatment (Karami et al., 2021). During controlled grazing, undesirable weeds, missed by cattle, become more visible and can be easily removed together with the roots (Grynia, 1974). Thanks to this, the cultivated pastures contain fodder species that are resistant to crushing and browsing by grazing animals (Nowiński, 1970). Moreover, grazing cattle or sheep, excreting seeds with their excrement, take part in the processes of seed dispersal and re-colonisation of browsed plants. In this way, they regulate the structure of plant communities, and the spatial distribution and viability of populations of various species (Anderson et al., 2014; Sanou et al., 2023). Annual plant production is

significantly increased by mowing with a scythe, and in economic terms, this procedure may even bring better benefits than seasonal grazing (Karami et al., 2021). However, the complete lack of both mowing and grazing may lead to floristic depletion and gradual degradation of meadow and pasture habitats (Musiał et al., 2015).

Knowledge of the botanical composition of grasslands and their utility value enables the selection of appropriate care methods and techniques to obtain the most beneficial effects in a given area. This makes it easier for the farmer to determine the production potential and correctly select species for sowing mixtures, depending on habitat requirements and rules of use (Łyszczarz, 2014). Taking into account the described importance of the floristic composition of grasslands in the assessment of their botanical values and agricultural suitability, the main aim of this study was to analyse the floristic composition of meadows and pastures in the village of Olszówka (Mszana Dolna Commune), their characteristics and to determine utility value and agricultural suitability. So far, no analyses have been carried out in this respect in Olszówka, even though agriculture plays an important role here. This village is an agricultural settlement typical of the Carpathian area of southern Poland, characterised by small farms functioning in mountain conditions. In the commune this village belongs to the dominant farms have an area of less than 1ha and there are 5435 such farms here, while those above 1 ha there are 3222 (Haponiuk, 2017).

Study area

The area selected for research is the village of Olszówka (49°36'38"N 20°01'56"E), located in the Lesser Poland Voivodeship, on the northern slopes of the Gorce Mountains (425–580 m a.s.l.). Administratively, Olszówka belongs to the Mszana Dolna Commune and the Limanowa County (Fig. 1). J. Kondracki (2002) located Olszówka in the following geographical units: Megaregion: Carpathian Region, Province: Western Carpathians, Subprovince: Outer Western Carpathians, Macroregion: Western Beskids, Mesoregion: Gorce Mountains. The village is inhabited by 9.4% of the inhabitants of the Mszana Dolna commune. Ethnically, Olszówka belongs to the Zagórzan region, which is linguistically close to the Podhale dialect (Kobylińska, 2005; Wielek, 2005).

J. Burtan (1978) located Olszówka on the southern pre-Magurian nappe and the Magura nappe (Jasionów village), in the tectonic window of Mszana Dolna (Outer Flysch Carpathians). The geological structure here is characterised by an alternation of thick sandstone-conglomerate rock complexes resistant to weathering, separated by less resistant shale-sandstone complexes. This area is characterised by low, flat, and gently rounded hills and elevations of the area. The lower parts of the mountain slopes and hills are softened by the slope clay covers that flow down the valley together with rock fragments.

Fig. 1. Location of Olszówka against the background of the Mszana Dolna commune (Southern Poland) (Cartographic background: https://msus.kylos.pl/kapla.php – changed)

According to the classification of E. Romer (1949), the climate of the Gorce Mountains and their surroundings is classified as a mountain climate, while Gumiński (1998) placed this area in the 21st district, called the Carpathian one. According to recent research, the increase in average air temperatures has resulted in raising the limits of climatic levels. In the Gorce Mountains, these changes resulted in the disappearance of the cold climate zone (Miczyński, 2015). It is therefore believed that in this area we currently have two climatic levels: moderately warm (up to an altitude of about 950 m a.s.l.) and moderately cold (from 950 to 1,300 m a.s.l.). The Olszówka area

is located in the mountain climate, a moderately warm climate zone. The average annual air temperature in Olszówka is 6.5°C. The warmest month of the year is July – with the average temperature 16.5°C, and the coldest is January – with the average temperature 4.1°C. The average annual rainfall here is 1,209 mm. The arrangement of ridges and depressions significantly influences the directions and speeds of winds. Foehn winds (Halny) often arise here, sometimes reaching hurricane strength, causing damage to tree stands. Average wind speeds range from approximately 2 m/s in the valleys to 3–5 m/s on the ridges. The vegetation season here ranges from 200 to 210 days (Miczyński, 2006).

The relief of the terrain and the geological structure mean that shallow groundwater reservoirs in weathered covers are low in resources and often seasonal (Soja, 2006). In the Olszówka area, there are hydrogen sulphide springs that enter groundwater through cracks (Burtan, 1978). This area belongs to the catchment area of the Baltic Sea and the Vistula River basin. The largest watercourse in Olszówka is the stream of the same name, which is a right tributary of the Raba River, 5.32 km long. It is formed at an altitude of approximately 718 m, after combining several springs originating on the slopes of Szumiąca (841 m a.s.l.), Krzyżowa (779 m a.s.l.), and Groń (746 m a.s.l.).

Methods

The research was carried out in the 2021 growing season. 50 plots were designated in meadows and pastures, each with an area of 25 m^2 (5 m × 5 m squares), and floristic censuses were carried out on them according to the Klapp (1962) methodology. The location of the studied plots in the field is illustrated in Fig. (2). The share of individual species in the plot was estimated with an accuracy of 1% (+ means species with a cover of less than one percent) and ranked according to the following categories: grasses, legumes, and others. Estimating the percentage of species cover began by determining the share of dominant species in the plot, and then those with a smaller share. Plants that were not identified in the field were collected and marked in laboratory conditions using atlases (e.g. Nawara, 2015; Rothmaler, 2017).

The lists of plants and their percentage cover were entered into the TURBOWEG database, where they were subjected to numerical classification in order to determine the similarities of the plots. The classification was carried out based on the percentage scale in the plots. Similarities between plots were calculated according to the van der Maarel similarity coefficient (Westhoff, van der Maarel, 1973) from the following formula:

$$r(x,y) = \frac{\Sigma xy}{\Sigma x_2 + \Sigma y_2 - \Sigma xy}$$

where r means similarity, x, y – vectors of quantitative values of plots.

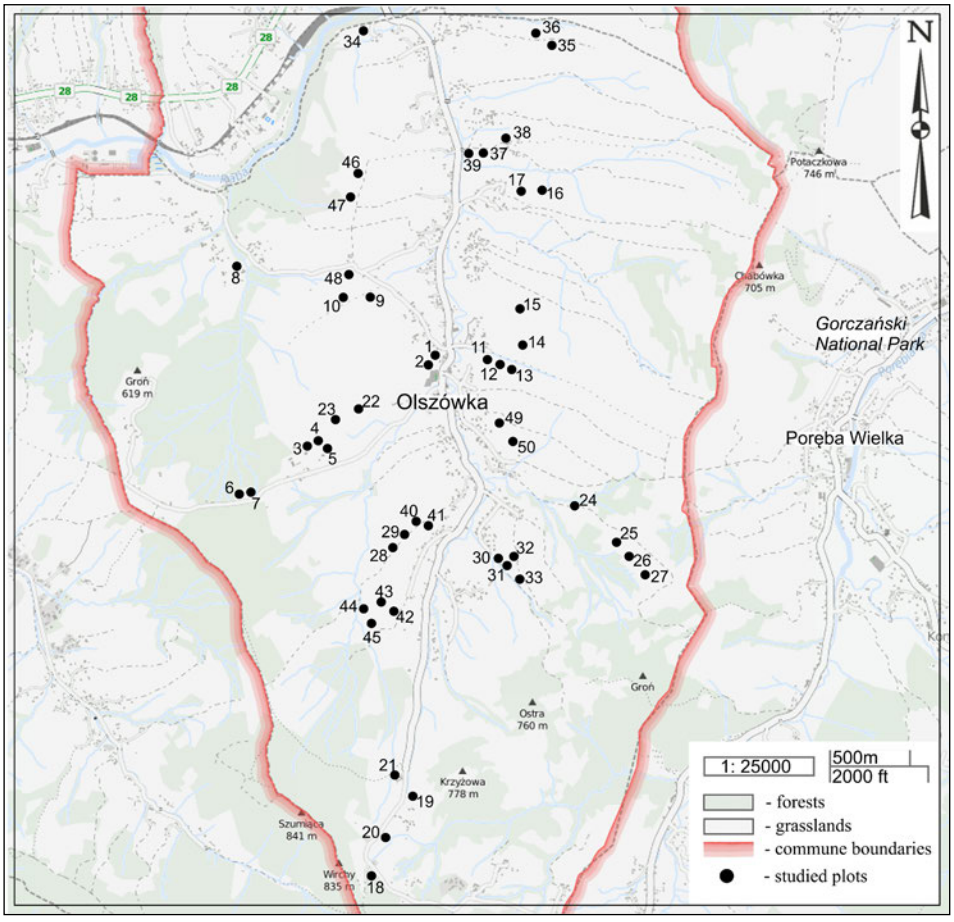

Fig. 2. Distribution of studied plots (1–50) in Olszówka village (Cartographic background: https://www.google.com/maps)

Ward's Method – Minimum Variance Clustering was used to group the plots (Dzwonko, 2007). The numerical classification was performed using the MULWA-5 program (Wildi, Orlóci, 1996). Based on the dendrogram, groups of similar plots were selected and included in the tables. These tables were used in the analysis and detailed assessment of the botanical composition.

Based on groups of similar plots, which were conventionally named depending on the species giving the appearance of the patches, an assessment of the Usage Value of the Meadow (WUŁ – UVM) was made. Each species from a given group was assigned a Use Value Index (LWU – UVI) according to Filipek (1973). This is a wide 14-point scale ranging from +10 to –3, in which the highest values are assigned only to a few grasses and clovers. However, lower marks are given to species with decreasing nutritional value, and even the lowest ones are given to species containing substances

poisonous to animals, without losing these properties in the drying process. Then, UVM was calculated as the sum of the products of the percentage shares of each species in the sward and its Use Value Index (UVI) divided by 100 (Łyszczarz, 2014). The UVM values obtained for the groups are tabulated. The nomenclature of vascular plants was used according to the *Vascular Plants of Poland. An annotated checklist* (Mirek et al., 2020).

Results

In the similarity dendrogram (Fig. 3), 5 groups of plots were distinguished. They were marked with numbers from I to V and named: I – pasture with *Lolium perenne*, II – meadow with *Dactylis glomerata*, III – meadow with *Phleum pratense* and *Poa pratensis*, IV – meadow with *Arrhenatherum elatius*, V – weedy meadow/pasture with *Plantago lanceolata* (Tab. 1–5 – Appendix 1). The floristic characteristics of the distinguished groups of plots are presented below.

The percentage of grass, legumes, and other species in the plot groups was graphically presented (Fig. 4). In each group, other plant species are the most numerous, the number of which exceeds 50% of all identified ones. Grasses and legumes occur in a similar number, ranging from 13 to 21%.

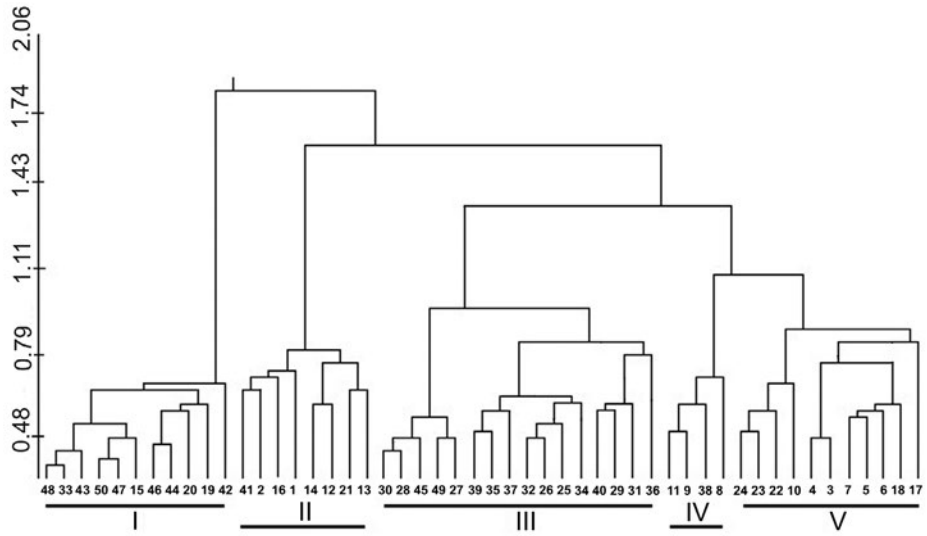

Fig. 3. Classification of the studied plots based on the percentage of species cover: I – pasture with *Lolium perenne*, II – meadow with *Dactylis glomerata*, III – meadow/pasture with *Phleum pratense* and *Poa pratensis*, IV – meadow with *Arrhenatherum elatius*, V – weedy meadow/pasture with *Plantago lanceolata*

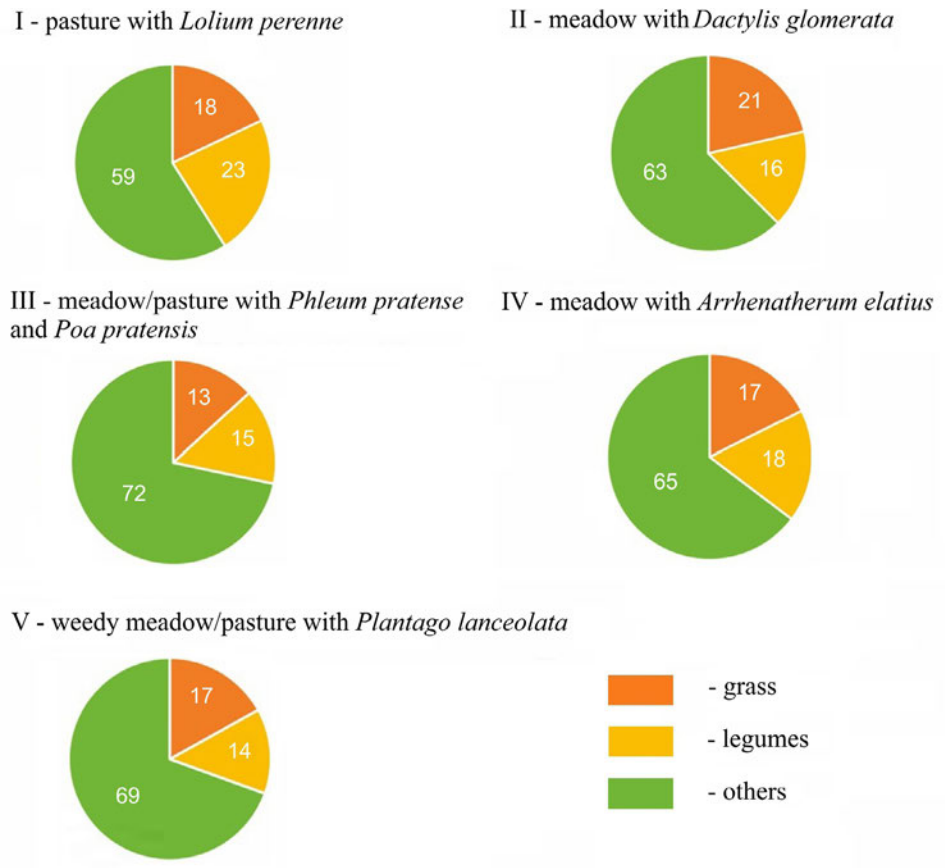

Fig. 4. Percentage [%] of grasses, legumes and others plants in groups I–V

Characteristics of distinguished groups of similar plots

Group I – pasture with *Lolium perenne* (Tab. 1 – Appendix 1)

There were 11 plots included in the group. *Lolium perenne* has the maximum number of occurrences among grasses, reaching a share of 10 to 25% in the plots. *Trisetum flavescens* has a slightly smaller number of occurrences – 10 – with an area share ranging from 10 to 37%. Other species, such as *Alopecurus pratensis* or *Dactylis glomerata*, have a much smaller number of occurrences – two, with a cover of 3 to 15%. The most common legumes are *Trifolium pratense* and *T. repens*, with the number of 11 occurrences and the share in plots ranging from 4 to 40%, with *T. pratense* having a larger area share in each plot than *T. repens*. *Vicia cracca* and *V. sepium* occur less frequently and with much lower coverage – from + to 4% coverage for 6–7 occurrences. Among other species, the most occurrences are recorded for *Ranunculus acris* – 10, with a coverage of up to 5%. *Plantago lanceolata*, *Ranunculus repens*, *Sonchus arvensis* occur here slightly

less frequently, but with greater coverage – from + to 15% coverage for 9 occurrences. *Achillea millefolium* is also quite a common species, with seven occurrences and coverage from + to 4%. *Plantago major* appears in two plots – a weed of heavily trampled areas, with a cover of up to 8%.

Group II – meadow with *Dactylis glomerata* (Tab. 2 – Appendix 1)
There are eight plots in this group. Among the grasses, *Dactylis glomerata* has the largest share in the plots – from 10 to 30%. *Elymus repens* occurs less frequently and with lower coverage – from 5 to 10% in four plots, *Trisetum flavescens* – from 10 to 20% coverage, and *Phleum pratense* – from 5 to 8% in three plots. The most common legumes are *Vicia sepium* – six occurrences, *V. villosa*, and *V. cracca* – four occurrences, with an area share of up to 3%. *Medicago sativa* occurs in two plots, with a share ranging from 2 to 18%. Among the remaining plants from group II, the most noteworthy is *Urtica dioica*, with the largest area share – from 5 to 30%, recorded in five plots. Other species with a significantly smaller share are *Aegopodium podararia* – up to 5%, *Galium mollugo* – up to 4%, *Heracleum sphondylium* – up to 10% and *Ranunculus acris* – up to 4% coverage per four occurrences.

Group III – meadow/pasture with *Phleum pratense* and *Poa pratensis*
(Tab. 3 – Appendix 1)
The group includes 16 plots. Among the grasses, one species occurs in all the studied plots – *Poa pratensis* and its share ranges from 4 to 30%. A large share was also recorded for *Dactylis glomerata* – from 5 to 35% coverage; however, it occurs slightly less frequently here, in 12 plots. *Phleum pratense* has a smaller area share – from 3 to 20% out of 14 occurrences. Among legumes, only *Trifolium pratense* occurs in all plots with a cover of 1 to 25%. Other common legumes in this group, but with a smaller share, are *Lotus corniculatus*, occurring in 12 plots, and *Vicia sepium*, occurring in 11 plots. The share of *Trifolium repens* is noteworthy, ranging from 4 to 25% in nine occurrences. Other species include: *Achillea millefolium*, identified in 15 plots with a cover of up to 10%, *Plantago lanceolata*, occurring in 14 plots with a cover of up to 15%, and *Ranunculus acris* with a smaller cover – up to 5%, occurring in 13 plots.

Group IV – meadow with *Arrhenatherum elatius* (Tab. 4 – Appendix 1)
The group includes four plots. On all four plots, *Trisetum flavescens* with a share of 15 to 30%, and *Arrhenatherum elatius* with a share of 15 to 25% were identified. However, only half of the plots are *Alopecurus pratensis* and *Lolium multiflorum*, with a much smaller cover – from 2 to 10%. Of the legumes, the *Trifolium pratense* has the largest share here – from 4 to 20%, with three occurrences. *Vicia sepium* is equally common, but with a smaller cover – up to 2%. Other legumes, such as *Lathyrus pratensis* and *Vicia*

cracca were noticed on two plots, with a maximum share of 5%. Other species of plant: *Plantago lanceolata*, *Ranunculus acris*, *Achillea millefolium*, *Rumex acetosa*, *Sonchus arvensis*, *Taraxacum officicinale*, *Urtica dioica* perform in three plots with a maximum share of up to 7% (*Plantago lanceolata*).

Group V – weedy meadow/pasture with *Plantago lanceolata* (Tab. 5 – Appendix 1) There are 11 plots in the last group. Among the grasses, the most common here is *Phleum pratense* – seven occurrences, with a share of 5 to 20%. *Poa pratensis* was identified on six plots, with a share of 5 to 15%, and on five plots *Trisetum flavescens*, with a cover of 5 to 20%. The remaining four grass species occur less often – up to four plots, with a maximum cover of 15% (*Holcus lanatus*). From legumes, *Trifolium pratense* occurs on each studied plot, with a share of 2 to 30%. *Lotus corniculatus* and *Vicia sepium* grow slightly less often; on nine plots, the first species reaches a cover of 4 to 15%, and the second to a maximum of 5%. The most common weed is *Plantago lanceolata*, which has been identified on each studied plot, reaching here from 4 to 20%. Only one of the studied plots did not record *Ranunculus acris*; this species reaches a maximum cover of 10% in this group of plots.

Results of assessing the usage values of meadows

Studies of the botanical composition of the plots in terms of use showed that most of them had average and good UVM values (Fig. 5; Tab. 6 – Appendix 1).

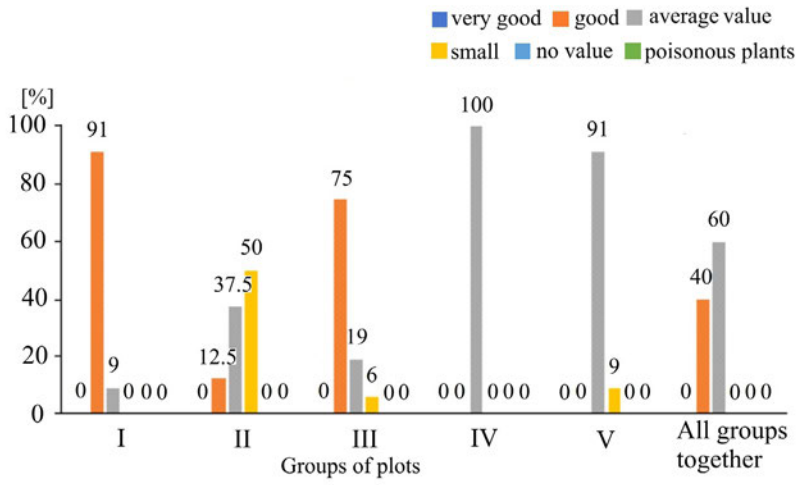

Fig. 5. Comparison of the percentage share of six Usage Value of the Meadow (UVM) categories (Filipek, 1973) between groups of plots distinguished on the study area: I – pasture with *Lolium perenne*, II – meadow with *Dactylis glomerata*, III – meadow/pasture with *Phleum pratense* and *Poa pratensis*, IV – meadow with *Arrhenatherum elatius*, V – weedy meadow/pasture with *Plantago lanceolata*

Plots from group I (pasture with *Lolium perenne*) have the highest average UVM value – 7.8. However, the lowest average UVM value is characteristic of group II (meadow with *Dactylis glomerata*) – 4.44, in which as many as four plots with small utility values were found. In group III (meadow/pasture with *Phleum pratense* and *Poa pratensis*), the usage values of the plots are quite diverse. Most of them have good usage value, four plots have – an average value and one plot has a small value, which gives an average good value of – 7.22. Group IV (meadow with *Arrhenatherum elatius*) has an average UVM of 5.95 (Tab. 6 – Appendix 1). In group V (weedy meadow/pasture with *Plantago lanceolata*), only one plot has a small usage value, while the rest are classified at an average level. In total, 60% of the plots have an average usage value, and approximately 40% have a good value of the analysed indicator (Fig. 5).

Discussion

A weed is any "alien" plant whose presence in a plantation of currently cultivated plants brings unsustainable harm and is undesirable from the point of view of humans. During the growing season, crops are accompanied by many species of weeds that negatively affect the quality and plant yield (Dobrzański, 2009). In the latest bibliography, there are more and more reports on the potentially positive ecological effects of the presence of weeds, including toxic ones, in grasslands. For example, Zhang et al. (2020) indicate that the presence of weeds with toxic properties may be a self-defense mechanism of degenerated pastures and promote their resistance. These weeds can be an element of soil and water protection, improve the circulation of nutrients, and also play an important role in protecting grasslands against excessive damage by farm animals (Taegue et al., 2011).

Among the poisonous species commonly found in meadows are representatives of the Ranunculaceae Juss family. In 50 analysed plots in Olszówka, *Ranunculus acris* occurred as many as 40 times (Tab. 1–5 – Appendix), in each separate group, which makes it the most numerous weed among all those identified in the study area. Meadow buttercup, like all buttercups, contains ranunculin – a glycoside that causes skin and mucous membrane irritation, and poisoning. Poisonings most often occur in spring, when there are no flowers yet and animals do not avoid the plant by eating its leaves. When dried, buttercups pose no threat to animals (Nawara, 2012). An equally serious threat, especially to cattle, is *Ranunculus repens*, which occurs in wet meadows and pastures. It appeared less frequently in the plots studied in Olszówka – 21 times. Another toxic species is *Stellaria graminea*, which was found in all five groups, in a total of 11 plots; however, the area share of this species was relatively small and ranged from + to 8% of the cover.

An undesirable species, occurring, like the previous ones, in wet and humid meadows, is the marsh horsetail *Equisetum palustre*. Its herb contains numerous alkaloids (including palustrine, palustridine, equisetin). This plant is also poisonous when dried because it causes diarrhoea, emaciation and reduces the milk yield of domestic cattle (Dąbkowska, 2013). In Olszówka, it was identified in one plot, in group III (Tab. 3 – Appendix 1); therefore, it did not have much significance for the overall usage value of the analysed plots. Broadleaf plantain and common dandelion may also appear on wet soils. However, these species never cover all field surfaces, because they are typical ruderal plants, characteristic of field margins and uncultivated places (Dobrzański, 2009). *Plantago major* appeared only twice in the study area in group I with *Lolium perenne*. *Taraxacum officinale* occurred in each group, on 14 tested plots, with a maximum cover of 8% (group II).

One of the species that reduces the value of feed and causes poisoning and deterioration of milk quality is the cypress spurge, *Euphorbia cyparissias*. This species is characteristic of dry communities, both sandy and rich in calcium carbonate. The milk juice contains toxic compounds that retain their properties in both fresh and dried biomass. The milk of poisoned animals changes colour and is also poisonous to humans (Siminska et al., 2009). Cypress spurge occurred in two studied plots, belonging to groups II and V.

Species that deteriorate the quality of animal products also include plants rich in compounds that give feed a specific taste and smell, such as the already mentioned buttercups, mint, and common yarrow (Dąbkowska, 2013). Species of the *Mentha* genus occurred in five studied plots, while *Achillea millefolium* occurred in as many as 29 plots. In group III, yarrow did not occur in only one of the studied plots. However, its Use Value Index (UVI) is 5 (Łyszczarz, 2014), which means that in appropriate quantities it is beneficial for animals – it improves digestion and has a positive effect on the quality of milk. Therefore, it is worth taking action to balance the share of these plants on the analysed plots.

In the sward of grasslands, there are species of limited usefulness, also among grasses and legumes. *Lotus corniculatus* – a valuable legume fodder and melliferous plant is bitter when fresh due to the content of cyanogenic glycosides (Dąbkowska, 2013). It was noticed in exactly half of the examined plots, and its share in the plots ranged from 2 to 18%. For the same reason, *Lathyrus pratensis*, which occurred in 12 surveyed plots, is reluctantly consumed by farm animals.

The deterioration of hay quality also applies to plants that become woody quickly and heavily, even before mowing, when mowing is delayed, or when grazing is neglected. Their seeds are then spread or eaten and end up in manure, retaining their viability. These are, for example, *Rumex acetosa* and *R. obtusifolius* (Nowiński, 1970; Dąbkowska, 2013). The first of them occurred in 12 plots, and the second one only once, which had no significant impact on the overall usage value of the analysed plots.

Animals also avoid plants that sting or have sharp thorns and leaves. *Urtica dioica* occurred in 14 plots, including five in group II. In one of the plots, its share reached up to 30%. In one plot in group IV, stemless carline thistle *Carlina acaulis* with sharp thorns, characteristic of mountain meadows and pastures, and partially protected, was also identified. One of the most dangerous meadow weeds, classified as grasses, is *Deschampsia caespitosa* (Grynia, 1974). Its leaves with sharp, silica-rich edges discourage animals from eating them. As a result, it forms dense clumps, displacing more valuable species. It appeared four times in the study area, with a share ranging from 10 to 30%.

A good indicator of improper moisture is *Equisetum arvense*, which is unattractive to animals due to its rough, sterile shoots, saturated with silica. In a short time, it can dominate large areas of grassland (Wróbel, Różański, 2023). In 50 studied plots, it occurred seven times, mainly in plots belonging to group III. Similarly, species of the genus *Juncus* are avoided by animals due to the hardness of the stems. The high durability of their seeds and the strong growth of rhizomes make it difficult for other plants to compete with these species (Nowiński, 1970). Three species of this genus occurred individually in the study area: *Juncus articulatus*, *J. conglomeratus*, and *J. effusus*. The last of them achieved 40% coverage in plot no. 36 from group III, which is why the plot has the lowest usage value among all the examined ones – 2.51 (Tab. 6 – Appendix 1).

In the study area, the most favourable composition of the meadow sward is noticed in plots from group I (Fig. 9–10; Tab. 1 – Appendix 1), whose mean UVM is at a good level (Tab. 6 – Appendix 1). This is due to the large share of grass species in these areas, such as *Lolium perenne*, *Phleum pratense*, and *Trisetum flavescens*, which are characterised by high usage value. *L. perenne* is very good for pastures because it can use nitrogen contained in animal excrement very well and is also highly tasty (Nowiński, 1970). However, group II with *Dactylis glomerata* has the weakest mean UVM (Fig. 9–10; Tab. 2 – Appendix 1). There were no plots of good usage quality and as many as half of the plots had a small usage value of the meadow. The orchard grass that dominates here has a high usage value, but in most plots, it is the only valuable species. *Trisetum flavescens*, *Phleum pratense*, and *Poa pratensis*, as well as legumes, which help maintain the usage value at an average level (Tab. 6 – Appendix 1), occur here sporadically and with a small share in the areas.

Research carried out in the Olszówka area confirms that meadow areas have so far been used in a rather sustainable manner, typical of foothill regions, but many plots should be subjected to appropriately selected care treatments. Such activities include maintaining the compactness of the turf and cleaning work in the sward, such as removing mole mounds, animal excrements, undesirable weeds, and rational mowing and grazing of animals. Properly fertilised soil also contributes to increased yields – with nitrogen, phosphorus, and potassium in the case of grasses, and magnesium fertilisation in the case of legumes. Proper care distribution over time is also important here.

Cleaning works should take place in autumn, and in early spring fertilisation and work on proper drainage, if necessary, should be carried out (Kocan, Jacniacki, 1980; Falkowski, 1983).

For proper management, the care of meadows and pastures is as important as rational use. It turns out that direct control of weeds with chemical agents has a worse impact on meadows and pastures than slow, but thoughtful and rational prevention of their spread (Falkowski, 1983). The farmer's goal should therefore be to minimise the negative effects caused by the constant presence of weeds. All agrotechnical and chemical activities in grassland areas should be carried out sustainably to minimise the negative impact of anthropogenic pressure on the environment (Dobrzański, 2009).

Conclusions

Communities of meadows and pastures were created as a result of human activity consisting of grazing, mowing, and organic fertilisation of places where the forest had previously been cut down or burned. The location of the studied areas near Olszówka indicates this type of origin. Although most of the examined patches have average and good usage values, many plots should be subjected to appropriately selected care treatments. Rational use is particularly important – mowing, grazing, and moderate fertilisation, along with appropriate timing of care. To improve the quality of meadows and pastures, it is recommended to reduce the occurrence of undesirable species, especially those that are missed by grazing animals. Weed control would therefore be advisable in grazed areas.

Conflict of interest

The authors declare no conflict of interest related to this article.

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Appendix 1

Tab. 1. Group I – pasture with *Lolium perenne*; the most common species and those with the highest percentage coverage are highlighted in grey

Successive No	1	2	3	4	5	6	7	8	9	10	11	Number of occurrences
Number of plots in the field	48	33	43	50	47	15	46	44	20	19	42	
Number of groups in the dendrogram	1	1	1	1	1	1	1	1	1	1	1	
Number of species in the plot	14	14	13	13	15	16	15	14	18	11	11	
Grasses												
Lolium perenne	25	20	20	15	10	15	10	10	25	10	15	11
Trisetum flavescens	10	15	15	15	37	15	10	15	20	15	.	10
Phleum pratense	5	10	12	.	3	7	3	.	.	.	10	7
Dactylis glomerata	.	3	8	.	.	.	.	.	.	.	.	2
Alopecurus pratensis	.	.	.	5	.	.	.	.	15	.	.	2
Legumes												
Trifolium pratense	30	15	18	25	18	20	15	20	10	40	20	11
Trifolium repens	15	10	15	20	15	10	15	20	4	10	20	11
Vicia cracca	.	.	+	.	2	+	2	2	1	4	.	7
Vicia sepium	+	+	+	+	2	.	2	.	.	.	.	6
Lathyrus pratensis	.	.	.	.	.	4	.	.	5	.	.	2
Vicia tenuifolia	.	.	.	.	.	+	.	.	+	.	.	2
Vicia villosa	.	.	.	.	.	+	.	+	.	.	.	2
Lotus corniculatus	.	.	.	.	.	.	4	8	.	.	.	2
Other plants												
Ranunculus acris	4	3	+	3	2	3	.	2	+	2	5	10
Plantago lanceolata	5	10	2	3	2	6	12	15	8	.	.	9
Ranunculus repens	3	3	2	+	+	2	+	2	.	.	5	9
Sonchus arvensis	2	2	3	3	3	4	2	+	.	.	2	9
Achillea millefolium	+	4	.	2	+	.	1	2	+	.	.	7
Rumex acetosa	.	1	4	5	3	4	.	.	.	.	.	5
Stellaria graminea	+	.	.	.	+	.	+	.	.	.	.	3
Heracleum sphondylium	.	.	.	.	.	3	.	2	.	6	.	3
Hypericum perforatum	.	.	.	.	.	.	1	2	1	.	.	3
Plantago major	+	.	.	.	.	.	.	.	.	.	8	2
Symphytum officinale	+	.	.	.	.	.	.	.	.	.	2	2
Potentilla anserina	.	.	.	3	.	.	.	.	.	.	3	2
Rumex crispus	.	.	.	.	.	.	.	.	.	.	.	2
Taraxacum officinale)	.	.	.	.	.	6	.	.	3	.	.	2

Sporadic species – **Grasses:** *Poa pratensis* 33:2, *Arrenatherum elatius* 26:22. **Legumes:** *Trifolium arvense* 42:10. **Other plants:** *Galium molugo* 20:2, *Pimpinella saxifraga* 19:5, *Myosotis arvensis* 19:1, *Veronica montana* 20:1, *Campanula patula* 20:1, *Bellis perennis* 20: 2, *Carum carvi* 19:4, *Pastinaca sativa* 47:1, *Sinapis arvensis* 20: 1, *Alchemilla* sp. 3:19.

Tab. 2. Group II – meadow with *Dactylis glomerata*; the most common species and those with the highest percentage coverage are highlighted in grey

Successive No	1	2	3	4	5	6	7	8	Number of occurrences
Number of plots in the field	41	2	16	1	14	12	21	13	
Number of groups in the dendrogram	2	2	2	2	2	2	2	2	
Number of species in the plot	11	19	15	18	15	16	14	15	
Grasses									
Dactylis glomerata	20	18	20	10	15	30	15	30	8
Elymus repens	5	6	10	5	.	.	.	.	4
Phleum pratense	.	7	5	.	8	.	.	.	3
Trisetum flavescens	.	.	.	.	10	20	.	10	3
Lolium multiflorum	5	.	.	.	.	.	.	15	2
Deschampsia caespitosa	.	.	30	.	.	.	20	.	2
Legumes									
Vicia sepium	2	2	.	+	2	2	.	2	6
Vicia cracca	2	.	2	.	2	3	.	.	4
Vicia villosa	+	.	+	+	.	.	.	+	4
Medicago sativa	.	18	.	4	.	.	.	.	2
Lotus corniculatus	.	.	.	.	.	3	2	.	2
Trifolium pratense	.	.	.	.	.	.	10	12	2
Vicia tenuifolia	.	.	.	.	.	+	.	.	1
Other plants									
Urtica dioica	15	12	.	.	30	5	.	5	5
Aegopodium podagraria	+	2	.	.	5	+	.	.	4
Heracleum sphondylium	10	2	.	5	.	.	5	.	4
Galium mollugo	.	.	4	.	4	4	3	.	4
Ranunculus acris	.	.	+	.	.	+	4	2	4
Taraxacum officinale	.	.	.	2	.	4	4	8	4
Ranunculus repens	+	2	.	8	.	.	.	.	3
Cirsium arvense	.	3	2	10	.	.	.	.	3
Symphytum officinale	.	+	.	9	.	.	.	5	3
Sonchus arvensis	.	.	2	5	.	.	.	2	3
Rosa canina	.	.	6	.	4	3	.	.	3
Potentilla reptans	.	12	3	.	.	.	.	.	2
Geranium sylvaticum	.	3	.	2	.	.	.	.	2
Artemisia vulgaris	.	3	.	2	.	.	.	.	2
Mentha longifolia	.	+	.	8	.	.	.	.	2
Potentilla anserina	.	2	.	.	.	2	.	.	2
Hypericum perforatum	.	.	4	.	2	.	.	.	2
Convolvulus arvensis	.	.	.	.	.	+	.	+	2
Plantago lanceolata	.	.	.	.	.	.	8	4	2

Sporadic species – **Grasses:** *Alopecurus pratensis* 14:8, *Agrostis stolnifera* 12:10, *Lolium perenne* 12:5, *Phleum phleoides* 12:18, *Poa pratensis* 1:5. **Legumes:** *Lathyrus pratensis* 13:3, *Medicago lupulina* 21:1, *Vicia tenuifolia* 12:1. **Other plants:** *Achillea millefolium* 8:16, *Alchemilla* sp. 21:2, *Lysimachia vulgaris* 14:1, *Rumex acetosa* 14:4, *Rumex crispus* 16:3, *Armoracia rusticana* 41:40, *Carex hirta* 14:5, *Myosotis palustris* 1:1, *Petasites albus* 1:3, *Pimpinella saxifraga* 21:6, *Stellaria graminea* 13:1.

Tab. 3. Group III – meadow/pasture with *Phleum pratense* and *Poa pratensis*; the most common species and those with the highest percentage coverage are highlighted in grey

Successive No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Number of plots in the field	30	28	45	49	27	39	35	37	32	26	25	34	40	29	31	36	
Number of groups in the dendrogram	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Number of species in the plot	15	18	15	17	17	15	18	19	16	16	15	17	18	16	19	16	Number of occurrences
Grasses																	
Poa pratensis	5	20	4	18	20	15	30	10	5	20	15	8	20	10	28	8	16
Phleum pratense	3	4	5	.	.	12	10	15	15	10	10	20	4	5	4	10	14
Dactylis glomerata	10	20	5	6	10	.	5	.	8	10	.	6	25	25	35	.	12
Trisetum flavescens	9	5	8	10	10	.	.	.	10	.	15	.	5	15	3	.	10
Lolium perenne	.	.	.	15	5	25	10	10	10	5	.	4	.	8	.	.	9
Alopecurus pratensis	.	.	.	.	.	.	5	3	5	20	25	5	10	.	.	.	7
Poa trivialis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8	6	2
Legumes																	
Trifolium pratense	25	15	20	15	15	15	5	10	8	5	6	4	4	7	3	1	16
Lotus corniculatus	4	5	18	.	3	.	2	6	10	12	4	2	.	.	4	4	12
Vicia sepium	.	.	.	2	+	+	.	+	2	+	+	+	+	.	1	+	11
Trifolium repens	25	15	18	17	10	15	4	.	6	.	4	.	.	.	.	.	9
Vicia villosa	+	+	+	+	+	.	.	.	.	.	2	.	+	3	+	.	9
Vicia cracca	.	5	.	5	1	+	.	+	2	.	.	+	3	2	.	.	9
Lathyrus pratensis	.	.	.	.	.	.	.	4	.	4	.	.	.	3	.	.	3
Vicia tenuifolia	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Other plants																	
Achillea millefolium	+	1	3	.	5	5	2	3	4	2	3	2	10	3	+	1	15
Plantago lanceolata	5	5	4	3	15	4	6	4	12	4	3	3	2	.	+	.	14
Ranunculus acris	2	+	4	.	2	2	4	3	2	2	5	.	3	3	1	.	13
Sonchus arvensis	6	.	+	4	.	.	5	.	.	.	.	+	4	.	.	.	6
Equisetum arvense	.	+	.	.	.	3	.	3	+	+	.	.	+	.	.	.	6
Potentilla anserina	.	.	.	+	.	.	2	.	.	.	+	2	.	.	.	2	5
Hypericum perforatum	.	+	.	.	+	1	.	.	.	.	.	.	.	.	4	.	4
Ranunculus repens	.	.	2	.	.	+	.	.	2	.	.	.	2	.	.	.	4
Aegopodium podagraria	.	.	.	1	.	.	.	.	.	.	.	4	.	4	+	.	4
Cerastium arvense	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	+	4
Stellaria graminea	.	.	.	+	.	.	.	.	.	.	.	.	2	4	+	.	4
Urtica dioica	.	.	.	.	.	2	+	5	.	.	.	2	.	.	.	.	4
Lysimachia vulgaris	.	.	.	.	.	.	.	2	.	3	6	.	.	.	.	10	4
Galium mollugo	.	2	.	.	.	.	.	.	.	.	.	.	.	2	2	.	3
Leontodon hispidus	.	.	.	.	1	.	.	.	.	.	.	.	.	4	2	.	3
Potentilla erecta	.	.	.	.	.	.	.	2	.	.	.	.	.	.	+	5	3
Pimpinella saxifraga	2	.	.	.	6	.	.	.	.	.	.	.	.	.	.	.	2
Rosa canina	+	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	2
Euphrasia rostkoviana	.	1	.	.	.	.	.	.	.	.	.	.	.	2	.	.	2

Potentilla reptans	.	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Mentha longifolia	.	.	2	.	.	.	.	2	.	.	.	.	.	.	.	.	.	2
Cirsium arvense	.	.	.	.	+	.	.	.	.	.	1	.	.	.	.	.	.	2
Taraxacum officinale	.	.	.	2	.	.	5	.	.	.	.	.	.	.	.	.	.	2
Rumex acetosa	.	.	.	.	.	.	2	2	.	.	.	.	.	.	.	.	.	2
Filipendula ulmaria	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	5	.	2

Sporadic species – **Legumes:** *Vicia tenuifolia* 28:1. **Other plants:** *Myosotis arvensis* 26:1, *Veronica montana* 31:1, *Campanula patula* 36:1, *Bellis perennis* 35:1, *Rumex crispus* 26:1, *Equisetum palustre* 36:2, *Geranium palustre* 34:5, *Juncus conglomeratus* 37:15, *J. effusus* 36:40, *Ranunculus flammula* 36:2, *Veronica arvensis* 40:1, *Heracleum sphondylium*. 45:5, *Glechoma hederacea* 30:1.

Tab. 4. Group IV – meadow with *Arrhenatherum elatius*; the most common species and those with the highest percentage coverage are highlighted in grey

Successive No	1	2	3	4	Number of occurrences
Number of plots in the field	11	9	38	8	
Number of groups in the dendrogram	4	4	4	4	
Number of species in the plot	18	14	14	17	
Grasses					
Trisetum flavescens	15	15	30	20	4
Arrhenatherum elatius	15	15	25	15	4
Alopecurus pratensis	5	5	.	.	2
Lolium multiflorum	2	10	.	.	2
Legumes					
Trifolium pratense	15	20	4	.	3
Vicia sepium	2	2	+	.	3
Lathyrus pratensis	4	5	.	.	2
Vicia cracca	2	.	.	2	2
Other plants					
Plantago lanceolata	4	4	7	.	3
Ranunculus acris	.	3	2	2	3
Achillea millefolium	+	.	3	4	3
Rumex acetosa	.	6	3	6	3
Sonchus arvensis	2	2	3	.	3
Taraxacum officinale	3	5	.	5	3
Urtica dioica	2	.	4	+	3
Ranunculus repens	.	3	.	2	2

Sporadic species – **Grasses:** *Phleum pratense* 38:10, *Deschampsia caespitosa* 11:15. **Legumes:** *Astralagus glycyphyllos* 8:4, *Vicia villosa* 38:1. **Other plants:** *Stellaria graminea* 8:2, *Heracleum sphondylium* 8:3, *Aegopodium podagraria* 8:3, *Lysimachia vulgaris* 38:5, *Pimpinella saxifraga* 8:10, *Glechoma hederacea* 8:2, *Lythrum salicaria* 11:1, *Veronica chamaedrys* 8:3, *Galium mollugo* 38:2, *Potentilla anserina* 8:3, *Cirsium arvense* 11:2, *Hypericum perforatum* 11:5, *Stachys palustris* 11:3.

Tab. 5. Group V – weedy meadow/pasture with *Plantago lanceolata*; the most common species and those with the highest percentage coverage are highlighted in grey

Successive No	1	2	3	4	5	6	7	8	9	10	11	Number of occurrences
Number of plots in the field	24	23	22	10	4	3	7	5	6	18	17	
Number of groups in the dendrogram	5	5	5	5	5	5	5	5	5	5	5	
Number of species in the plot	15	19	17	16	14	14	16	11	15	17	20	
Grasses												
Phleum pratense	10	20	10	.	8	15	10	.	5	.	.	7
Poa pratensis	.	.	.	.	10	8	5	5	8	15	.	6
Trisetum flavescens	20	20	10	10	.	.	.	.	.	5	.	5
Alopecurus pratensis	.	.	.	10	.	.	10	.	5	.	10	4
Arrhenatherum elatius	.	.	.	.	6	10	.	6	.	.	.	3
Holcus lanatus	15	.	5	7	.	.	.	.	.	.	.	3
Legumes												
Trifolium pratense	10	10	20	8	14	2	15	30	15	15	5	11
Lotus corniculatus	8	10	4	15	8	15	6	5	.	5	.	9
Vicia sepium	.	1	+	2	3	2	5	2	2	.	1	9
Trifolium repens	10	4	.	.	.	.	10	10	10	10	3	7
Vicia villosa	.	+	.	2	2	3	.	+	.	.	1	6
Lathyrus pratensis	.	.	.	10	6	10	.	.	4	.	.	4
Vicia cracca	.	1	.	.	.	.	.	.	.	.	1	2
Vicia tenuifolia	.	+	.	.	.	.	+	.	.	.	.	2
Other plants												
Plantago lanceolata	8	5	10	15	20	20	10	15	20	8	4	11
Ranunculus acris	4	4	4	4	10	6	6	10	.	+	2	10
Galium mollugo	2	.	2	.	2	.	.	.	.	2	3	5
Alchemilla sp.	.	.	2	4	.	.	.	.	4	8	5	5
Sonchus arvensis	+	.	.	.	.	2	.	.	3	.	2	4
Achillea millefolium	4	.	.	.	.	.	.	.	.	2	3	3
Cirsium palustre	.	.	.	.	+	+	.	3	.	.	.	3
Leontodon hispidus	1	.	.	.	.	.	.	.	.	2	1	3
Myosotis arvensis	.	.	.	.	+	.	5	.	+	.	.	3
Ranunculus repens	.	.	2	.	.	.	5	.	+	.	.	3
Taraxacum officinale	.	.	4	.	.	.	5	.	.	3	.	3
Cerastium holosteoides	.	10	+	.	.	.	.	.	.	.	.	2
Cirsium arvense	.	.	.	2	.	.	+	.	.	.	.	2
Euphorbia esula	.	.	.	.	10	.	+	.	.	.	.	2
Hypericum perforatum	.	2	.	.	.	4	.	.	.	.	.	2
Potentilla anserina	.	.	2	2	.	.	.	.	.	.	.	2
Stellaria graminea	.	.	.	.	.	.	.	.	8	.	+	2
Symphytum officinale	.	3	8	.	.	.	.	.	.	.	.	2
Urtica dioica	.	1	.	.	.	.	2	.	.	.	.	2
Veronica montana	2	.	.	.	.	.	.	.	1	.	.	2

Sporadic species – **Grasses:** *Lolium perenne* 22:15, *Deschampsia caespitosa* 10:10, *Agrostis stolnifera* 17:30, *Phleum phleoides* 10:10. **Other plants:** *Rumex acetosa* 24:1, *Heracleum sphondylium* 18:8, *Pimpinella saxifraga* 18:2, *Potentilla reptans* 22:1, *Campanula patula* 18:1, *Euphrasia rostkoviana* 18:15, *Stachys palustris* 23:2, *Agrimonia eupatoria* 17:10, *Euphorbia cyparissias* 17:5, *Athyrium filix-femina* 24:1, *Carlina acaulis* 17:1, *Centaurea jacea* 17:1, *Cerastium arvense* 23:2, *Clinopodium vulgare* 17:15, *Crepis capillaris* (23:3, *Juncus articulatus* 10:3, *Leucanthemum vulgare* 17:1, *Mentha arvensis* 6:5, *Prunella vulgaris* 18:1, *Ribes rubrum* 3:2, *Rumex obtusifolius* 23:2.

Tab. 6. Usage Value of the Meadow (UVM) calculated for groups of plots distinguished in the village of Olszówka, using the Use Value Index (UVI) according to Filipek (1973)

Name of group	Plot No	Categories of meadow usage value					
		very good 10–9	good 8–7	average value 6–4	small 3–1	no value 0	poisonous plants
Group I – pasture with *Lolium perenne*	48	-	8.36	-	-	-	-
	33	-	7.96	-	-	-	-
	43	-	8.6	-	-	-	-
	50	-	8.09	-	-	-	-
	47	-	7.9	-	-	-	-
	15	-	7.39	-	-	-	-
	46	-	7.96	-	-	-	-
	44	-	7.77	-	-	-	-
	20	-	7.69	-	-	-	-
	19	-	7.5	-	-	-	-
	42	-	-	6.64	-	-	-
Average UVM for group I; n = 11		good – 7.8; SD ±0.52					
Group II – meadow with *Dactylis glomerata*	41	-	-	-	3.2	-	-
	2	-	-	4.91	-	-	-
	16	-	-	-	3.83	-	-
	1	-	-	-	3.21	-	-
	14	-	-	4.14	-	-	-
	12	-	-	5.45	-	-	-
	21	-	-	-	3.79	-	-
	13	-	-	6.97	-	-	-
Average UVM for group II; n = 8		average value – 4.44; SD ±1.29					
Group III – meadow/ pasture with *Phleum pratense* and *Poa pratensis*	30	-	7.75	-	-	-	-
	28	-	8.26	-	-	-	-
	45	-	7.69	-	-	-	-
	49	-	8.24	-	-	-	-
	27	-	7.94	-	-	-	-
	39	-	8.52	-	-	-	-
	35	-	7.68	-	-	-	-
	37	-	-	5.92	-	-	-
	32	-	8.31	-	-	-	-
	26	-	8.44	-	-	-	-
	25	-	7.58	-	-	-	-
	34	-	-	4.95	-	-	-
	40	-	7.15	-	-	-	-
	29	-	-	6.94	-	-	-
	31	-	7.62	-	-	-	-
	36	-	-	-	2.51	-	-

Average UVM for group III; n = 16	good – 7.22; SD ±1.57						
Group IV – meadow with *Arrhenatherum elatius*	11	-	-	5.71	-	-	-
	9	-	-	6.92	-	-	-
	38	-	-	6.47	-	-	-
	8	-	-	4.35	-	-	-
Average UVM for group IV; n = 4	average value – 5.86; SD ±1.12						
Group V – weedy meadow/pasture with *Plantago lanceolata*	24	-	-	6.54	-	-	-
	23	-	-	6.17	-	-	-
	22	-	-	6.61	-	-	-
	10	-	-	6.07	-	-	-
	4	-	-	5.96	-	-	-
	3	-	-	6.63	-	-	-
	7	-	-	6.52	-	-	-
	5	-	-	6.13	-	-	-
	6	-	-	5.58	-	-	-
	18	-	-	5.64	-	-	-
	17	-	-	-	3.56	-	-
Average UVM for group V; n = 11	average value – 5.95; SD ±0.87						

Ocena wartości użytków zielonych w miejscowości Olszówka (Gmina Mszana Dolna, Południowa Polska)

Streszczenie

Niewłaściwe użytkowanie, nieodpowiednia wilgotność gleb, bądź nieprawidłowe proporcje składników pokarmowych, są przyczynami nadmiernego zachwaszczenia, co negatywnie wpływa na przydatność rolniczą użytków zielonych. Celem opracowania była analiza składu florystycznego łąk i pastwisk w miejscowości Olszówka (woj. małopolskie, Południowa Polska) oraz ustalenie ich wartości użytkowej. Wybranym do badań obszarem była wieś położona na północnych stokach Gorców. Badania przeprowadzono w sezonie wegetacyjnym 2021. Na łąkach i pastwiskach wykonano 50 spisów florystycznych wg metodyki Klappa. Ustalono podobieństwa składu gatunkowego na powierzchniach i wyodrębniono 5 grup poletek podobnych z następującymi gatunkami dominującymi: I – pastwisko z *Lolium perenne*, II – łąka z *Dactylis glomerata*, III – łąka/pastwisko z *Phleum pratense* i *Poa pratensis*, IV – łąka z *Arrhenatherum elatius*, V – zachwaszczona łąka/pastwisko z *Plantago lanceolata*. Istotnym parametrem, który określa jakość użytków zielonych jest wskaźnik Wartości Użytkowej Łąki (WUŁ). Obliczono go dla każdej z wyodrębnionych grup poletek. Badania wykazały, że analizowane grupy mają średnie (grupa z II z *Dactylis glomerata*, grupa IV z *Arrhenatherum elatius*, grupa V z *Plantago lanceolata*) i dobre (grupa I z *Lolium perenne*, grupa III z *Phleum pratense* i *Poa pratensis*) wartości użytkowe, co oznacza, że na badanym terenie gospodarka łąkowa jest prowadzona w sposób zrównoważony, a obszary te są nadal użyteczne pod względem rolniczym.

Słowa kluczowe: użytki zielone, łąki, pastwiska, Wartość Użytkowa Łąki WUŁ

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