

## THE INFLUENCE OF HORSE GRAZING ON UTILITY AND NATURAL VALUES OF GRASS PHYTOCENOSES

### Summary

*A decreasing interest in pastures is one of the reasons for their gradual degradation, resulting in impoverishment of species composition and fast development of less valuable (in terms of grazing) species of herbaceous plants and forests. It results in a drop of a grazing value of sward and in a species decline in naturally valuable areas. Extensive grazing, especially of primitive horse breeds, is a chance to restore their natural value, including biodiversity. Field work was conducted on a pasture in Gronówka Stable and a forester in Zaustowo. A multi-aspect natural valorization was carried out on the basis of species structure and a geographical and historical spectrum. Furthermore, habitat conditions of the area were determined, and an assessment of natural and utilization values of sward was performed. In Zaustowo, Polish primitive horses were grazed, whereas in Granówka, horses of the following breeds: the Holsteiner, the Welsh Pony, the Małopolski, the Oldenburg, the Wielkopolski and the Thoroughbred. It was observed that horse grazing influenced pasture sward in a direct way by selective nibbling of plants. A utility value of sward and a natural value of phytocenoses depends on the habitat conditions of grazing quarters and especially on their moisture condition. Floristic composition of the quarters' sward located in more moisturized areas, had moderate natural values and a low utility value.*

**Key words:** pasture, grazing of horses, habitat conditions, natural value of plant communities

## WPŁYW WYPASU KONI NA WARTOŚĆ UŻYTKOWĄ ORAZ PRZYRODNICZĄ FITOCENOZ TRAWIASTYCH

### Streszczenie

*Zmniejszające się zainteresowanie pastwiskami jest jedną z przyczyn stopniowej ich degradacji, czego wyrazem jest ubożenie składu gatunkowego, szybki rozwój mniej cennych paszowo gatunków roślin zielnych oraz zadrzewień. Skutkiem tego jest spadek wartości paszowej runi, a na powierzchniach cennych przyrodniczo ustępowanie gatunków. Szansą przywrócenia ich wartości przyrodniczej, w tym bioróżnorodności, jest prowadzenie ekstensywnego wypasu, szczególnie prymitywnych ras koni. Prace terenowe wykonano na pastwiskach Stajni Granówka i leśniczówki w Zasutowie. Wieloaspektową waloryzację przyrodniczą pastwisk przeprowadzono na podstawie struktury gatunkowej, spektrum geograficzno-historycznego. Ponadto, określono warunki siedliskowe obszaru, a także dokonano oceny walorów przyrodniczych i wartości użytkowej runi. W miejscowości Granówka wypasano konie ras: holsztyński, kuc walijski, małopolski, oldenburski, wielkopolski i pełna krew angielska, a w leśniczówce Zasutowo utrzymywano koniki polskie. Stwierdzono, że pasące się konie wpływają na run pastwiskową w sposób bezpośredni, poprzez selektywne przygryzanie roślin. Wartość użytkowa runi i przyrodnicza fitocenoz wykazuje zależność z warunkami siedliskowymi wypasanych kwater, szczególnie ich uwilgotnieniem. Skład florystyczny runi kwater zlokalizowanych na terenach silnie uwilgotnionych charakteryzował się umiarkowanymi walorami przyrodniczymi, przy jednocześnie niskiej wartości użytkowej.*

**Słowa kluczowe:** pastwisko, wypas koni, warunki siedliskowe, walory przyrodnicze zbiorowisk roślinnych

### 1. Introduction

A decreasing interest in fodder utilization of grasslands and pastures is strongly connected with a drop in the number of farm animals [8]. As a result of improper utilization or its complete cease, grasslands are subject to a gradual degradation. As an effect, a utility value of grassland-pasture sward decreases and its natural values deteriorate. Species composition of communities impoverishes, which leads to a fast development of less valuable reed species and forest cover [7, 9, 20, 23].

One of the ways to maintain naturally valuable grassland communities, protect their biodiversity and even restore their fodder function consists in their extensive utilization by, among all, farm animals grazing [4, 7, 10-11, 15, 22, 24]. Special importance is attached to primitive and native breeds of, inter alia, horses. They are very resistant to unfavorable environment conditions, healthy and can make use of sward of poor fodder values [6, 10, 12, 16]. Further-

more, their breeding is additionally subsidized by a National Environmental Management Scheme [12].

The aim of the research was to assess possibilities of forming and restoring natural values of grassland communities located in various habitat conditions, through horse breeding.

### 2. Material and methods

Field work was carried out in pastures in a stable in Granówka and a forester in Zaustowo in Wielkopolskie Voivodeship. The main criterion for the selection of research positions included their differentiation in terms of habitats and the size of a grazed flock. Forty-two horses of various breeds (the Wielkopolski, the Oldenburg, the Thoroughbred the Holsteiner, the Małopolski and the Welsh Pony) were being grazed in pastures of Granówka stable. Horses are being grazed for six months in a year, six hours every day, in the following groups of ten animals: foals,

stallions, sport horses, others. Apart from grazing, animals are fed with nutritious fodder and hay without limit two to three times a day. The whole pasture as well as each quarter are fenced with an electric fence and the horses which are kept within the pasture have access to drinking water from a water cart and a well.

On a pasture in a forester in Zaustowo, which is surrounded mainly by a forest and a damp grassland, twenty-one Polish primitive horses were being grazed, including: one stallion, six foals and fourteen mares, five of which are classified to the Environmental Management Scheme. The graze was conducted in a rotation system in six quarters. Grazing areas differed in terms of size: from 0.16 ha to ca. 1.25 ha and their borders were set with an electric fence. Grazing season starts in June and lasts for six months. Animals are free to use a vast area with a constant access to water, where they spent twelve hours every day in the following groups: stallions and mares with foals. For the rest of the year, horses are provided with significant amounts of hay and with a lick, i.e. salt with microelements.

In representative areas of the quarters, phytosociological relevés (20 m<sup>2</sup> each) were taken with the Braun-Blanquet's method [13]. In total, thirty two relevés were taken: nine, three, three and seventeen for each quarter, respectively.

A multi-aspect natural valorization was conducted on the basis of:

- species structure,
- geographical and historical spectrum by classifying the species to groups after Chmiel [1],
- an assessment of natural values by Oświt [18].

Utility value of grassland communities was determined:

- with Novák's method [17],
- on the basis of horses' food preferences by several estimations of a number and share of plants which were eaten or left by grazing animals in a vegetation season.

Habitat conditions of pasture quarters were characterized with a phytoindication method with Ellenberg's indices [5]. Habitat's moisture, soil's reaction and the richness of a soil in nitrogen were determined.

### 3. Results

Pastures where the grazing was conducted, were located in habitats different in terms of moisturization, soil's reac-

tion and the content of nitrogen. Such differentiation of habitat conditions influenced a species structure of the pastures' sward, which resulted in the differentiation of these communities. Pastures of a forester in Zasutowo were located in more moisturized habitats and on soils of lower amount of nitrogen (Table 1).

The differentiation of habitat conditions is connected not only with a species composition of the communities, but also with their natural and utilization values. In the sward of pastures located in less moisturized habitats (Granówka), fewer plant species were found in the sward (Fig. 1).

However, it was not only habitat conditions that influenced a species composition of the quarters' sward. It was also strongly impacted by the breed of grazed horses. There was the grazing horses that had a direct influence on species composition of the sward by selective nibbling of the plants. As a result, the difference between the quarters concerned plant species which were more eagerly eaten by the horses and the level of their nibbling (Table 2). On a pasture in Granówka, animals ate ten species most eagerly, the most popular of which were grasses, especially: *Agrostis gigantea*, *Festuca pratensis*, *Lolium perenne* and *Poa pratensis*. Whereas Polish primitive horses grazed on strongly moisturized pastures in Zaustowo most eagerly ate species of grasses and carexes whose share was the biggest in a quarter. Polish primitive horses nibbled: *Agrostis stolonifera*, *Lolium perenne*, *Poa trivialis*, *P. pratensis* and *Deschampsia caespitosa*. Moreover, *Fabaceae* plants (*Trifolium repens*, *T. pratense*, *Lathyrus palustris*) were very eagerly nibbled on both pastures.

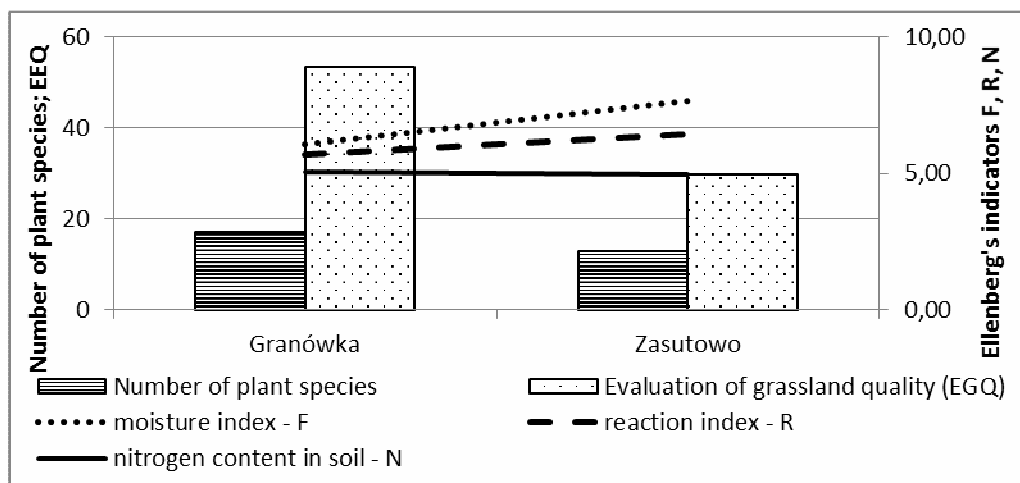
Taking into consideration a bigger number of species present in the sward of Granówka pastures and, simultaneously, greater possibilities of their selection by horses, the list of nibbled species rarely includes more taxons, inter alia grasses (*Dactylis glomerata*, *Holcus lanatus*, *Deschampsia caespitosa* and *Agropyron repens*) and among other species: *Achillea millefolium*, *Conyza canadensis*, *Potentilla anserina*, *P. erecta* oraz *P. reptans* among others. Polish primitive horses in Zaustowo demonstrated less selectiveness towards sward and eagerly nibbled also plants of lower nutritive value, e.g. *Carex acutiformis*, *Carex gracilis* and *Carex riparia* (Table 2).

Table 1. Habitat condition of distinguished plant communities

Tab. 1. Warunki siedliskowe wyróżnionych zbiorowisk roślinnych

| Plant community                       | Moisture<br>F | Reaction of soil<br>R | Nitrogen content in soil<br>N |
|---------------------------------------|---------------|-----------------------|-------------------------------|
| Pasture in Granówka                   |               |                       |                               |
| <i>Lolio-Cynosuretum</i>              | 528           | 586                   | 572                           |
| Com. <i>Deschampsia caespitosa</i>    | 6.89          | 5.53                  | 4.45                          |
| Com. with <i>Holcus lanatus</i>       | 6.22          | 5.66                  | 5.00                          |
| <i>Molinietum coeruleae</i>           | 6.79          | 5.30                  | 2.69                          |
| <i>Caricetum gracilis</i>             | 6.81          | 5.79                  | 5.06                          |
| Mean                                  | 6.07          | 5.71                  | 5.05                          |
| Pasture in Zasutowo                   |               |                       |                               |
| <i>Lolio-Cynosuretum</i>              | 6.13          | 6.51                  | 5.84                          |
| Com. <i>Deschampsia caespitosa</i>    | 6.78          | 5.48                  | 4.13                          |
| Com. with <i>Agrostis stolonifera</i> | 6.43          | 6.18                  | 5.02                          |
| <i>Caricetum acutiformis</i>          | 8.45          | 6.97                  | 5.26                          |
| <i>Caricetum gracilis</i>             | 7.07          | 5.58                  | 4.54                          |
| <i>Caricetum ripariae</i>             | 8.59          | 7.02                  | 4.42                          |
| Mean                                  | 7.64          | 6.43                  | 4.96                          |

Source: own work / Źródło: opracowanie własne



Source: own work / Źródło: opracowanie własne

Fig. 1. Number of plant species, evaluation of the grassland quality and habitat conditions of pastures

Rys. 1. Liczba gatunków oraz wartość użytkowa runi a warunki siedliskowe pastwisk

Table 2. The level of nibbling of selected plant species on horse pastures

Tab. 2. Stopień przygryzania wybranych gatunków roślin na pastwiskach dla koni

| Plant species                 | Pasture in Granówka | Pasture in Zasutowo |
|-------------------------------|---------------------|---------------------|
| Grasses                       |                     |                     |
| <i>Agrostis gigantea</i>      | 85                  | -                   |
| <i>Agrostis stolonifera</i>   | -                   | 90                  |
| <i>Poa pratensis</i>          | 80                  | 80                  |
| <i>Festuca pratensis</i>      | 80                  | -                   |
| <i>Lolium perenne</i>         | 75                  | -                   |
| <i>Poa trivialis</i>          | -                   | 80                  |
| <i>Deschampsia caespitosa</i> | -                   | 80                  |
| <i>Holcus lanatus</i>         | -                   | 75                  |
| <i>Festuca rubra</i>          | -                   | 70                  |
| Other plant species           |                     |                     |
| <i>Trifolium repens</i>       | 90                  | 85                  |
| <i>Trifolium pratense</i>     | 85                  | 90                  |
| <i>Lathyrus palustris</i>     | 85                  | 85                  |
| <i>Trifolium hybridum</i>     | 85                  | -                   |
| <i>Plantago lanceolata</i>    | 75                  | -                   |
| <i>Lotus corniculatus</i>     | -                   | 80                  |
| <i>Lotus uliginosus</i>       | -                   | 80                  |
| <i>Bellis perennis</i>        | -                   | 80                  |

Source: own work / Źródło: opracowanie własne

Regardless of age, sex or breed, grazed horses avoided plant species which are considered distasteful as harmful. Among species which were avoided most often on both pastures, there were toxic ones (*Caltha palustris*, *Ranunculus acris*, *Equisetum arvense*), burning ones (*Urtica dioica*) and the ones that contain a lot of aromatic oils (e.g. *Mentha arvensis*). However, also other species were not nibbled in Granówka e.g. *Ranunculus repens*, *E. palustre* i *Hieracium pilosella*, and also lignifying ones: *Carex gracilis*, *C. nigra*, *C. panicea*, *Juncus articulatus*, *J. conglomeratus*, *Juncus effusus*, *Rumex acetosa* (Table 2). Polish primitive horses in Zasutowo avoided the following species: *Ranunculus flammula*, *Caltha palustris*, *Iris pseudacorus*, *Equisetum arvense*, *Geum rivale*, *Sium latifolium*, *Thalictrum flavum*, *Mentha arvensis* and *Urtica dioica*. Other species present in the sward were less often searched for, they were included in the animals' diet, though (Table 3).

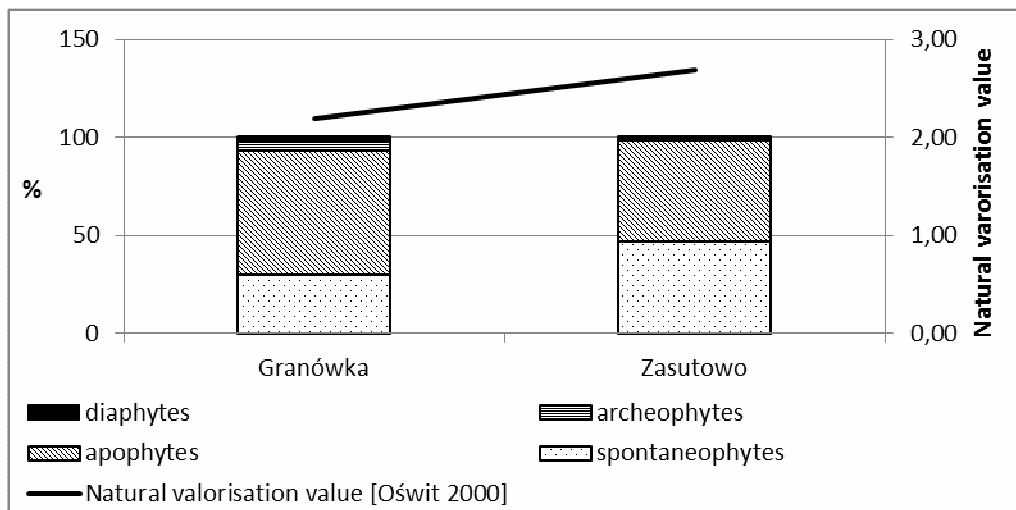
Regardless of the species composition, horses did not eat plants which were contaminated with excrements. Together with the species avoided due to their distastefulness, these species formed groups of uneaten plants. Also a utilization values of sward in the assessed quarters were very diversified. Sward of the pastures located in more moisturized habitats and therefore, with a greater share of species of a lower nutritious value, was less valuable in terms of utilization, e.g. less useful in terms of nutrition (Fig. 2).

Table 3. Species preferred on the investigated horse pastures

Tab. 3. Preferowane gatunki roślin na badanych pastwiskach dla koni

| Pasture in Granówka  | Pasture in Zasutowo  |
|--|--|
| Eagerly nibbled species  |  |
| <i>Agrostis gigantea</i> , <i>Poa pratensis</i> , <i>Festuca pratensis</i> , <i>Lolium perenne</i> , <i>Trifolium repens</i> , <i>T. pratense</i> , <i>T. hybridum</i> , <i>Lathyrus palustris</i> , <i>Lotus corniculatus</i> , <i>Plantago lanceolata</i>  | <i>Agrostis stolonifera</i> , <i>Lolium perenne</i> , <i>Poa trivialis</i> , <i>P. pratensis</i> , <i>Deschampsia caespitosa</i> , <i>Holcus lanatus</i> , <i>Festuca rubra</i> , <i>Trifolium repens</i> , <i>T. pratense</i> , <i>Lathyrus palustris</i> , <i>Lotus corniculatus</i> , <i>L. uliginosus</i> , <i>Bellis perennis</i> |
| Rare nibbled species   |  |
| <i>Dactylis glomerata</i> , <i>Holcus lanatus</i> , <i>Agropyron repens</i> , <i>Deschampsia caespitosa</i> , <i>Achillea millefolium</i> , <i>Conyza canadensis</i> , <i>Potentilla anserina</i> , <i>P. erecta</i> , <i>P. reptans</i>   | <i>Carex acutiformis</i> , <i>C. gracilis</i> , <i>C. riparia</i>  |
| Avoided species  |  |
| <i>Caltha palustris</i> , <i>Ranunculus acris</i> , <i>R. repens</i> , <i>Equisetum arvense</i> , <i>E. palustre</i> , <i>Hieracium pilosella</i> , <i>Carex gracilis</i> , <i>C. nigra</i> , <i>C. panicea</i> , <i>Juncus articulatus</i> , <i>J. conglomeratus</i> , <i>J. effusus</i> , <i>Rumex acetosa</i> , <i>Mentha arvensis</i> , <i>Urtica dioica</i> | <i>Caltha palustris</i> , <i>Ranunculus acris</i> , <i>R. flammula</i> , <i>Iris pseudacorus</i> , <i>Equisetum arvense</i> , <i>Geum rivale</i> , <i>Sium latifolium</i> , <i>Thalictrum flavum</i> , <i>Mentha arvensis</i> , <i>Urtica dioica</i>   |

Source: own work / Źródło: opracowanie własne



Source: own work / Źródło: opracowanie własne

Fig. 2. Natural values vs. a geographical and historical structure of the pasture sward  
Rys. 2. Walory przyrodnicze pastwisk a spectrum geograficzno-historyczne runi pastwisk

At the same time, plant communities in these quarters have higher (i.e. mediocre) natural values (Fig. 2). So, natural values and a utility value of the swards in phytocenoses of the assessed quarters are negatively dependent. Pastures in Zaustowo have low productivity but significantly high natural values.

Lower natural value of the pasture sward in Granówka is also determined by the presence of foreign species. Quarters located in moisturized habitats are dominated by native species – mainly spontaneophytes (Fig. 2).

#### 4. Discussion

Proper utilization of pastures allows not only for the consideration of animals' nutritious needs, but also for the maintenance of floristic diversity of phytocenoses. It is extensive grazing that is considered as a chance for the protection of endangered habitats [11].

According to the results, differences in a species composition of the sward are mainly a result of various habitat conditions of the quarters. At the same time, the share of species in the sward is modified by changes in the selectiveness of plants nibbled by horse breeds. Horses grazed in quarters in Granówka, where the selection of species was greater, most eagerly chose those of higher nutritious value. They usually looked for the following grasses: *Agrostis gigantea*, *Poa pratensis*, *Festuca pratensis*, *Lolium perenne* as well as *Fabaceae* and *Plantago lanceolata*. Similar preferences of farm horses were observed by Rogalski [21-22] and Rogalski & Kryszak [23]. Polish primitive horses grazed on more moisturized quarters in Zaustowo have a smaller selection of sward species and need to nibble species of lower nutritious value, i.e. *Deschampsia caespitosa*, or *Carex gracilis*, *C. acutiformis*, *C. riparia*. Despite lower requirements in terms of nutritious value of the species, Polish primitive horses eagerly search for *Lolium perenne* and species from *Agrostis*, *Poa* and *Festuca*. The possibility to adjust food preferences by horses to the accessibility of given species was noted by Chodkiewicz and Stypiński [2, 3]. Polish primitive horses grazed on highly moisturized quarters in Biebrza National Park, nibbled *Carex* more eagerly than grasses. During the research it was noted that regardless of the breed, all horses avoid plants which are poi-

sonous, pungent and containing aromatic oils. Species composition of the sward, which was a result of, inter alia, selectiveness in plant nibbling, was also influenced by additional feeding and shortening the time horses spent in quarters. Horses which were grazed shorter and additionally fed with hay (Granówka), nibbled the species more selectively. They ate the most valuable species quite fast, whereas Polish primitive horses nibbled plants slower.

According to these results, horse grazing, and even their breeds, may influence a floristic composition of pastures' sward and, as a consequence, their utilization (nutritious) and natural values. According to Miłek [14], Pławska-Olejniczka and Żywiczka [19] by grazing Polish primitive horses, even after four years it is possible to increase the sward's utility value, however, at a simultaneous drop in the natural values of the communities.

#### 5. Conclusions

1. Grazing horses have a direct influence on the pasture's sward by selective nibbling of plants and an indirect influence – by leaving excrements and treading the sward.
2. Flora transformations depend on a horse breed and on a grazing system, i.e.:
  - polish primitive horses, which in summer ate green feed by even nibbling, have a favorable impact on the maintenance of botanical structure of the sward and its natural values and are therefore very helpful in the maintenance of protected areas,
  - farm breed horses, which are grazed shorter in quarters and additionally fed with hay, choose species more selectively, which influences the decrease of sward's natural values.
3. Dependencies between pastures' flora and grazing horses ought to be taken into consideration at the renewal of pastures and when choosing a technique and organization of grazing.

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