

## The possibility of renovation of intensive horse pastures by undersowing method

M. PROŃCZUK, P. STYPIŃSKI

*Department of Agriculture, Warsaw University of Life Science*

**Abstract.** Accurate pasture management is essential to maintain the productivity and value of pasture as well as provide the nutrients and location to breed healthy horses. In some situations however, intensive management results in pasture degradation. The aim of this paper is to show the possibility of the undersowing method for pasture renovation. The field experiment was established in 2016 on a private horse farm located in the central Poland. High stocking rate and very intensive management caused the pasture degradation. Sward renovation was completed using the undersowing method and three different grass mixtures (A: *Lolium perenne*, *Festuca rubra*, *Poa pratensis*; B: *Lolium perenne*; C: *Lolium perenne*, *Lolium multiflorum*, *Festuca arudinacea*, *Festuca rubra*) were sown in four replications using a randomized block system. During the next three vegetative periods (2016, 2017 and 2018), three features were measured: the height of sward, the sodding rate and the share of particular groups of plants (grasses, legumes, herbs and weeds). The undersowing method was successful and showed that the seed mixtures differed individually in their renovation ability during the first vegetative period. In caused of intensive grazing, during next two years, differences between renovation grass mixtures decreased but they remain better evaluate compared to control plots (much better degree of sodding and recommended botanical composition).

Keywords: botanical composition, grass-seed mixtures, horse, pasture renovation, undersowing.

### 1. Introduction

Pasture is a cheap source of nutrients for all herbivorous animals. Horses feed themselves and are forced to move and play, which reduces the symptoms of unwarranted aggression (BERG ET AL., 2015; CHRISTENSES ET AL., 2002) and they are in better physical condition (DAVIDSON and HARRIS, 2007). This stems from the fact, that pastures enables horses to maintain muscle, bone mineral content, and exercise fitness ability during an extended period with no forced exercise – training (PATRICIA ET AL., 2012).

Overly intensive pasture management due to excessive trampling, especially around watercourses, gates or shade trees, reduces the regenerative capacity of the pasture and limits its durability (MAYER and COENEN, 2009). This results in progressive degradation that is reducing the quality and value of the pastures (LONGLAND, 2013). It is nevertheless important to remember about the role and

possibility used the permanent grassland, like a valued forage for a long time. Without correct grazing schedule, based agro-technical practices and only one-sided using, pastures cannot to implement their main role, like a valuable feed base (BARSZCZEWSKI ET AL., 2015).

The aim of this paper is to present the effects of undersowing as a method for pasture renovation. The results are based on the three year trials, where three different seed mixtures were used for renovation in order to determine which one is most suitable for horse pastures in conditions of central-east Poland. In Poland is observed lack of grass mixtures dedicated to horse's pastures renovation.

## 2. Materials and methods

The field experiment was established in the 2016 on a private horse farm, located 80 km east from Warsaw. During the experiment there were 27 horses (16 hot-blooded horses, 9 hucul horses and 2 ponies). Horses were taken to the paddocks every day, during the pasture season (from April to September). The grazing area was about 6,5 hectares. The field experiment took place in two locations which differed in soil moisture; paddock 1 (1.95 ha) was dry (P1), paddock 2 (0.97ha) was wet (P2) due to the high water table. After the first year of the observation (year 2016), the measurements were continued only in the one location – P2, because the stable owner changed the pastures organization. The paddock 1 was excluded from grazing for horses and converted into cut meadow. The results from first year of studies and comparison of these two locations, have been already published (STYPIŃSKI and PROŃCZUK, 2018).

Three grass mixtures were sown in 2016 in four replications on the both pastures P1 and P2 by undersowing method. Before undersowing, plots were rotary cultivated, to reduce the competitiveness of old sward. The plot border were labelled by hoe. A seeding rate of 30 g m<sup>2</sup> was used. Seeds were sown by hand. Twelve small plots of area 1 m<sup>2</sup> were used for observation of persistence of mixtures and changes in botanical composition. The grass mixtures differed in species composition and variety. Mixture A was prepared using three grass species (*Lolium perenne*, *Festuca rubra* and *Poa pratensis*), Mixture B consisted only of two varieties of *Lolium perenne* and mixture C was *Lolium perenne*, *Festuca rubra*, *Festuca arundinacea* and *Lolium multiflorum* (Table 1).

During the vegetative period in 2016, 2017 and 2018 three basic parameters were measured: sward height (three measurements on each plots by stick method), percentage of sodding degree and share of particular groups of plants (grasses, legumes, herbs and weeds) by the Weber method. The measurements

are performed three time during the vegetative period every year, at the end of April (beginning of grazing season), at the beginning in June (full grazing season) and in the middle of September (end of grazing season).

Table 1. Grass mixture species composition

	Grass mixtures – species and varieties		
	A	B	C
Species composition	40% <i>Lolium perenne</i> • 20% Taya • 10% Bokser • 10% Grilla 40% <i>Festuca rubra</i> • 20% Groboa • 10% Livista • 6% Chrame • 4% Olivia 20% <i>Poa pratensis</i> • 10% Conni • 10% Miracle	100% <i>Lolium perenne</i> • 50% Romance • 50% Barminton	60% <i>Lolium perenne</i> • 30% Libero • 30% Grassland Nui 20% <i>Festuca rubra</i> • 20% Gondolin 10% <i>Festuca arundinacea</i> • 5% Greenfront • 5% Triana 10% <i>Lolium multiflorum</i> • 10% Estanzuela 284

The main role of the pastures in this stable were to enables horses to unforced move, play and interaction between them to maintain animals in good welfare. Because of an insufficient amount of pastures in this stable, the horses were feed concentrated feeding stuffs (oats and beet pulp) twice a day in the barn and coarse fodder (hay) three times a day (two times in the barn and one times on the runway).

### 3. Results and discussion

The differences in sward height where observed between mixtures during the first year of measures (2016). The results depended on various soil moisture and grazing intensity. Control plots (without renovation) characterized greater average sward height during three year of observations than those after renovation. It was the effect of greater share of leavings and lower palatability of the control sward than renovations plots, with higher percentage share of grasses favored by horses.

The test plots characterized by much higher records in sodding degree on renovated part of pasture, for about 21.5% then control plots without renovation (Table 2, Figure 1). The higher records in sodding rate on renovated part of pasture were the result of undersowing. During this renovation method, the gaps

in sward are fulfilled by grass seeds. The grasses are characterized by moderate soil requirement, durability, high ability to tillering and regrowing, resistance to negative weather conditions and good use of fertilizers (WASILEWSKI, 2007).

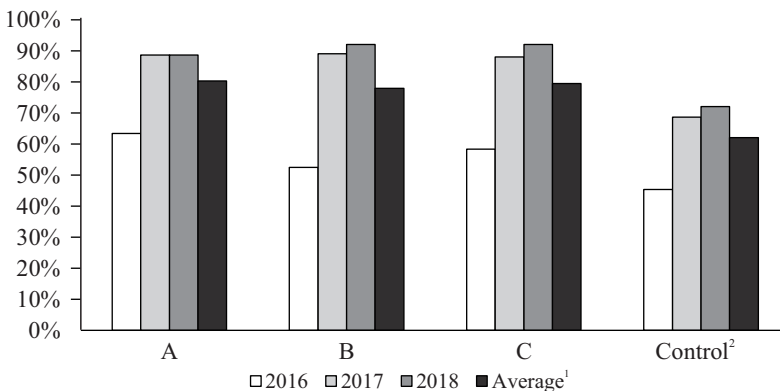
The multi-species mixture A and C dominated by *Lolium perenne* and *Festuca rubra* varieties were more suitable for pasture renovation than pure *Lolium perenne* mixture B. Aesthetic value of pasture when only *Lolium perenne* varieties were used was pretty good but unfortunately the sod density was lower in comparison to the other mixture. The lower records in sodding degree and height of sward on plots with mixture B were the effect of only one grass species in the mixture used for renovation. Furthermore *Lolium perenne* is the species sensitive to negative conditions during winter period (freezing) (KULIK ET AL., 2004).

Table 2. Average measures factors – the height of sward (cm) and the sodding degree (%)

Mixture	Average measures factor <sup>1</sup>	
	The height of sward (cm)	The sodding degree (%)
A	5.14	80
B	4.39	78
C	5.30	79
Mixtures average	4.95	79
Control <sup>2</sup>	5.90	62

<sup>1</sup>Average for 36 measurements from the vegetation period 2016, 2017 and 2018

<sup>2</sup>Old sward without undersowing



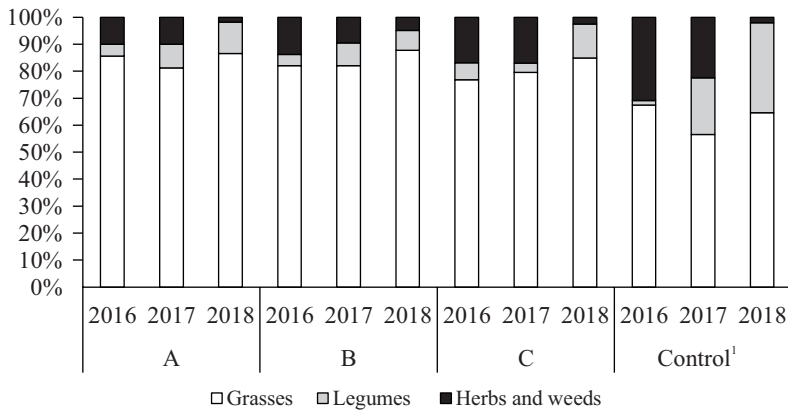
<sup>1</sup>Average for 36 measurements from the vegetation period 2016, 2017 and 2018

<sup>2</sup>Old sward without undersowing

Figure 1. The change of sodding degree during the next three years observation and average value (%)

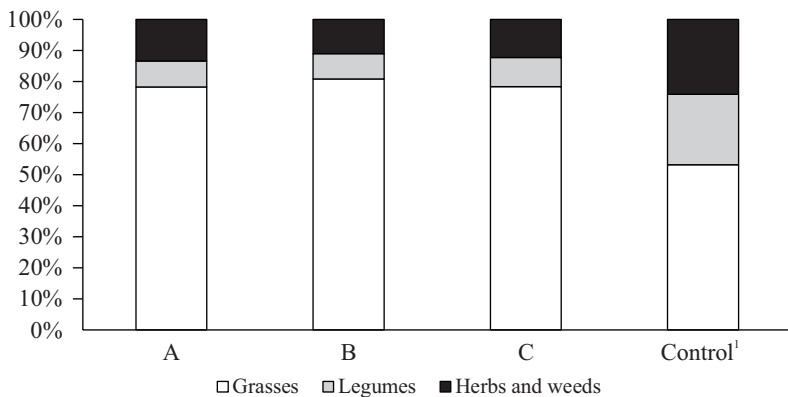
The renovated pasture showed a higher percentage share of grasses in comparison to the control (Figure 2 and 3). Additionally the use of the rotary cultivators reduced the competitiveness of the old sward. It resulted the higher proportion of *Taraxacum officinale* and *Trifolium repens* in the botanical compositions of pasture.

The *Taraxacum officinale* belong to the group of herbs gladly to eat by horses (STYPIŃSKI, 2010). DĄBROWSKA (2013) included this plant to the valuable group of herbs, but when the share is below 5% in the botanical composition of pasture sward. If the percentage of *Taraxacum officinale* is higher (this situation



<sup>1</sup>Old sward without undersowing

Figure 2. The share of particular groups of plants (grasses, legumes, herbs and weeds) during the next three years of observation (%)



<sup>1</sup>Old sward without undersowing

Figure 3. Average percentage of particular groups of plants (grasses, legumes, herbs and weeds) over three years of observation (%)

take place in this observations), the plant lose their value. This plant is very competitive to the grass and legumes and fills the gaps in sward. His increasing share influence the lower value of pasture sward. It can happen that, despite the significant biomass production, their feeding value is low.

The *Trifolium repens* is valuable plant. Clovers are beneficial to the soil structure. In the pasture contributed to increase the content of protein and reduce the crude fibre content. However, clovers are sensitive to drought (ŁYSZCZARZ and DEMBEK, 2015).

The test plots, during all three year observations characterized a good percentage of particular groups of plants, which can be recommended for horses pastures. CHRZANOWSKI (2014) informed that the share of particular groups of plants right for pastures designed for horses amounts to: 70–80% grasses, 10–15% legumes and 10–15% herbs and weeds.

Grasses decide about amount of obtained yield from pastures. Therefore, grasses should be the main component of mixtures recommended for pastures for horses.

#### 4. Conclusions

- Undersowing proved to be an effective method of renovation for horse pastures and contributed to the improvement of botanical composition of the pasture sward.
- Renovated pastures generally showed better parameters (sodding degree and botanical composition) compared to the control plots without renovation.
- Multi-species mixtures were characterized by a greater height of pasture sward and sodding rate in comparison to a single species.

#### References

- BARSZCZEWSKI J., WASILEWSKI Z., MENDRA M., 2015. Racjonalne użytkowanie pastwisk niżowych. Wydawnictwo Instytutu Technologiczno-Przyrodniczego, Falenty.
- BERG M., BROWN W.Y., LEE C., HINCH G.N., 2015. Browse – related behaviors of pastured horses in Australia: A survey. *Veterinary Behavior*, 10, 48-53.
- CHRISTENSEN J.W., LADEWIG J., SONDERGAARD E., MALMKVIST J., 2002. Effects of individual versus group stabling on social behavior in domestic stallions. *Animal Behaviour Science*, 75, 233-248.
- CHRZANOWSKI S., 2014. Żywienie koni. Wydawnictwo Wieś Jutra, Warszawa.

- DĄBROWSKA T., 2013. Charakterystyka wybranych gatunków ziół i chwastów użytków zielonych. Trwałe użytki zielone w gospodarstwie ekologicznym. Uniwersytet Warmińsko-Mazurski, Olsztyn, pp. 85-114.
- DAVIDSON N., HARRIS P., 2007. Nutrition and welfare. The Welfare of Horses. Kluwer Academic Publisher, Dordrecht, pp. 45-76.
- GRAHAM-THIERS P.M., BROWEN L.K., 2013. Improved ability to maintain fitness in horses during large pasture turnout. *Journal of Equine Veterinary Science*, 33, 581-585.
- KULIK M., BARYŁA R., LIPIŃSKI H., 2004. Zimotrwałość *Lolium perenne* w runi pastwiskowej i łąkowej na glebie torfowo-murszowej. *Acta Scientiarum Polonorum, Agricultura* 3(2), 215-220.
- LONGLAND A., 2013. Pastures and pasture management. *Equine Applied and Clinical Nutrition*, Philadelphia, pp. 332-350.
- ŁYSZCZARZ R., DEMBEK R., 2015. Ocena przydatności mieszanek trawiasto-motylkowych do renowacji niskoplennych pastwisk położonych na glebach lekkich. *Infrastruktura i Ekologia Terenów Wiejskich*, 2, 305-318.
- MEYER H., COENEN M., 2009. Żywienie koni. PWRiL, Warszawa.
- STYPIŃSKI P., 2010. Znaczenie pastwisk w żywieniu i chowie koni, Cz.1. *Hodowca i Jeździec*, 1(24), 88-90.
- STYPIŃSKI P., PROŃCZUK M., 2018. The possibility of renovation of pastures for horses using an undersowing method. Poster. 27<sup>th</sup> General Meeting of the European Grassland Federation "Sustainable Milk and Meat Production from Grasslands", Cork, Ireland, 17-21.06.2018.
- UNDERSANDER D., 2013. Grass varieties for horses. *Journal of Equine Veterinary Science*, 33, 315-320.
- WASILEWSKI Z., 2007. Gatunki traw stosowane na intensywne pastwiska – wartość gospodarcza i paszowa. *Poradnik Gospodarczy*, 1, 18-19.

## Możliwość renowacji intensywnie użytkowanych pastwisk dla koni metodą podsiewu

M. PROŃCZUK, P. STYPIŃSKI

*Katedra Agronomii, Wydział Rolnictwa i Biologii,  
Szkoła Główna Gospodarstwa Wiejskiego w Warszawie*

### Streszczenie

Prawidłowe zarządzanie pastwiskiem jest niezbędne do utrzymania jego wysokiej produktywności. Zachowanie wartościowego pastwiska, umożliwia dostarczenie zwierzętom potrzebnych im składników odżywczych. Zdarza się jednak, że w wyniku prowadzenia zbyt intensywnego użytkowania pastwisk, doprowadza się do ich postępującej degradacji.

Celem pracy jest pokazanie możliwości wykorzystania metody podsiewu do renowacji zdegradowanych pastwisk dla koni. Eksperyment polowy został założony w 2016 roku, w prywatnej

stadninie koni, zlokalizowanej w centralnej Polsce. Wysoka obsada zwierząt oraz bardzo intensywne użytkowanie pastwisk przyczyniły się do postępującej ich degradacji.

Renowacja została przeprowadzona przy wykorzystaniu metody podsiewu. Do doświadczenia wybrano trzy mieszanki traw o odmiennym składzie (A: *Lolium perenne*, *Festuca rubra*, *Poa pratensis*; B: *Lolium perenne*; C: *Lolium perenne*, *Lolium multiflorum*, *Festuca arundinacea*, *Festuca rubra*). Każdą z wybranych mieszanek wysiano w czterech powtórzeniach, stosując losowy system bloków. W trakcie kolejnych trzech sezonów wegetacyjnych (2016, 2017 i 2018) przeprowadzono pomiary następujących trzech parametrów: wysokość runi (cm), stopień zadarnienia (%) oraz procentowy udział poszczególnych grup roślin (traw, bobowatych oraz ziół i chwastów).

Metoda podsiewu okazała się być skuteczną metodą do przeprowadzenia renowacji pastwiska. Mieszanki wykazały indywidualne różnice pod względem obserwowanych cech w trakcie pierwszego sezonu wegetacyjnego. W następnych dwóch sezonach wegetacyjnych, w wyniku prowadzenia zbyt intensywnego wypasu, różnice pomiędzy mieszankami wykorzystanymi do renowacji zmniejszyły się. Pomimo to poletka, na których przeprowadzono renowację, nadal charakteryzowały się lepszymi wynikami obserwowanych parametrów w porównaniu z resztą pastwiska, na której nie przeprowadzono podsiewu (dużo lepsze zadarnienie oraz korzystny skład botaniczny).

Adres do korespondencji – Address for correspondence:

Mgr inż. Martyna Prończuk

Katedra Agronomii, Wydział Rolnictwa i Biologii

Szkoła Główna Gospodarstwa Wiejskiego w Warszawie

ul. Nowoursynowska 159

02-776 Warszawa

e-mail: [martyna\\_pronczuk@sggw.pl](mailto:martyna_pronczuk@sggw.pl)