

**Influence of red deer (*Cervus elaphus* L.) grazing on yield reduction and changes in the chemical composition of grassland forage: experiences from an organic farm at Stari Breg in the Kočevje Region**

Vpliv paše jelenjadi (*Cervus elaphus* L.) na zmanjšanje pridelka in spremembe hranilne vrednosti krme trajnega travinja: izkušnje iz ekološke kmetije v Starem Bregu na Kočevskem

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**Abstract:** In 2013 and 2014 the effect of red deer grazing (*Cervus elaphus*) on yield decrease and its changes in forage quality was investigated on the permanent grassland of an organic cattle farm at Stari Breg in the Kočevje region. We performed the standard method of yield loss determination (iron cages) in the period from June to October in three cuts. In the first year of research we determined a 56% yield loss (4.0 t/ha of dry matter), and in the second year a 75% yield loss (5.0 t/ha of dry matter). In 2014 the content of crude proteins in the forage was always larger in an unprotected (control) treatment than in a protected treatment, and we annotate this to permanent vegetative sward regrowth due to severe and uncontrolled red deer grazing. On the contrary, the content of crude fiber was higher in the forage that was enclosed in cages (treatment protected). Due to large yield loss at all cuts we also observed a significantly smaller yield of crude proteins, metabolized energy, and NEL in the control treatment. We established that in the studied location that red deer were an important biotic factor that limited productivity on the permanent grassland. This is why it is necessary to find solutions in the future that enable the co-existence of humans (farmers) and wildlife.

**Keywords:** permanent grassland, yield reduction, cutting, feeding value, red deer, Kočevje region

**Izveček:** V letih 2013 in 2014 smo na trajnem travinju ekološke govedorejske kmetije v Starem Bregu na Kočevskem preučevali vpliv paše jelenjadi (*Cervus elaphus*) na zmanjšanje pridelka in njegove hranilne vrednosti. S standardno metodo določanja zmanjšanja pridelka zaradi paše (železne kletke) smo v obdobju od junija do oktobra izvedli tri košnje in v prvem letu raziskave ugotovili za 56 % manjši pridelek suhe snovi (4 t suhe snovi/ha), v drugem letu pa celo za 75 % manjši pridelek (5 t suhe snovi/ha). Vsebnost surovih beljakovin je bila v letu 2014 na nezavarovani površini vedno

večja kot na zavarovani površini trajnega travinja, kar pripisujemo stalnemu pomla-jevanju travne ruše kot posledico obtrgavanja jelenjadi. Nasprotno je bila vsebnost surove vlaknine v povprečju večja v zelinju na zavarovanih mestih. Zaradi velikega zmanjšanja pridelka smo pri vseh treh košnjah na nezavarovanih parcelah ugotovili manjši pridelek surovih beljakovin ( $P < 0,05$ ), presnovljive energije ( $P < 0,05$ ) in NEL ( $P < 0,05$ ). Ugotavljamo, da je jelenjad na preučevani lokaciji pomemben biotični dejavnik omejevanja produktivnosti trajnega travinja, zato bo potrebno v prihodnjih letih poiskati rešitve, ki bodo omogočile sobivanje človeka (kmeta) in divjih živali.

**Ključne besede:** trajno travinje, zmanjšanje pridelka, košnja, hranilna vrednost, jelenjad, Kočevska

## Introduction

Wild ungulates are in Slovenia, which is the third most forest abundant (more than 60% of forest cover) European country, an important biotic factor which decreases the productivity of cultivated plants. In Slovenia, economically speaking, the most harmful species of game by far is the wild boar (*Sus scrofa*), which causes damage especially by rooting the grass sward, eating plants, and destroying the maize and other cereal fields. Also, red deer (*Cervus elaphus*), whose noxiousness is defined through grazing on grassland – as the grass feed represents around 50% of their nutrition (Trdan and Vidrih 2008, Bleier et al. 2012, Verbič et al. 2013, Laznik and Trdan 2014). Already Adamič (1990) and afterwards Jerina (2006) and later also Adamič and Jerina (2010) report about red deer grazing activity on forest edges, pastures, and meadows through the entire year due to a lack of feed in the forest and its clearings, and in such a way cause direct yield reduction from grassland (Milner et al. 2006, Myserud 2006, Lande et al. 2014). This issue is not encompassed by researchers in such experiments. We were the first group of agricultural experts in the area of southern and central Europe who already drew attention to the aforementioned situation at the beginning of the millennium (Trdan et al. 2000). Both wildlife species cause large difficulties to cattle and small ruminant producers in the Kočevje region, because they need to buy additional forage due to the yield loss of voluminous feed. Also, grassland restoration and prevention measures are expensive, due to the large density of the previously mentioned species because no type of prevention works efficiently. For damage on grassland caused by wild boar, which

is reported to competent authorities, farmers can expect corresponding compensation due to the yield loss. Meanwhile farmers find it harder to receive compensation for the reduction of grass yield due to red deer grazing. In this research we wanted to use a standard and also internationally recognised methods of evaluating yield loss of voluminous feed, and to study the differences in the chemical composition of herbage from a protected plot and plots heavily grazed by red deer. The paper consists of experimental results from years 2013 and 2014, gained on permanent grassland in Stari Breg in the Kočevje region, and where red deer represent an important biotic factor of yield reduction in voluminous feed.

## Materials and methods

We conducted research in years 2013 and 2014 on the permanent grassland of the Zemljič organic cattle farm in the area of village Stari Breg (45°41'7.12" N, 14°55'16.33" E) in the Kočevje region. We chosen this farm due to the fact that they face substantial yield reduction of voluminous feed on permanent grassland due to red deer grazing. The level of forage production on meadows where we conducted the experiment is extensive to moderately intensive. They performed a late first cut, and afterwards the cattle graze till the end of the growing season. Meadows are only fertilized with stable manure and slurry, and animal excreta from grazing animals must be added as well. According to the typology of habitats in Slovenia (Jogan et al. 2004), meadows and pastures of the studied area belong to a habitat of manured mesotrophic and eutrophic slightly moist grasslands

on relatively dry soils and inclined positions with prevailing tall oat-grass (Physis code 38.221), and which have less biomass and which is cut up to two times per year.

### *Experimental design*

We started the experiment in 2013 on 10<sup>th</sup> of May, and on 9<sup>th</sup> of May 2014 when we first placed cages on selected plots (they were surrounded by forest, and red deer are present throughout the whole calendar year) in Stari Breg. The outer sizes of the cages were 1 x 1 x 0.5 m, and so even one time larger than we used in previous research (Trdan et al. 2003, Trdan and Vidrih 2008). In 2013 we placed five cages on each of three locations, and in 2014 we conducted the experiment only on one location with five cages. We placed cages in an area that was from 100 to 200 m away from the forest edge, and the distance between cages varied from 15 to 20 m. In order so the red deer could not move the cages, we anchored them with a 15 cm long peg into the soil on both short sides of the cage.

In both years the position of the previously mentioned 15 cages was not changed from their placement until we took a sample of herbage mass (Tab. 1), as such plots (area of 1m<sup>2</sup>) represented a protected surface (treatment “protected” or “PROT”) with optimal yield. Only in 2013 we placed an additional three cages approximately two to three weeks before each of three sampling dates (cuts) in all three locations (treatment “regeneration” or “REG”) to protect grass sward which was already grazed (defoliated) by red deer.

When sampling the herbage we determined the grass sward capability of regeneration (renewal) or yield loss which appears in the sward that is previously (in early spring time) grazed by red deer – but two to three weeks before the appointed cutting time protected against grazing. The most direct yield loss or yield reduction (treatment “control” or “CONT”) due to the aforementioned wild ungulates on grassland we measured on sampling dates when we were on each of the three locations (2013). Also, at one location (2014) we placed three cages and in places that were most heavily grazed.

### *Weather conditions in the research area*

To follow the growth and development pattern of grass sward, and also the time and type of utilization we need to know the weather conditions of the studied area. Both growing seasons were something special, according to long-term rainfall and air temperature averages. In Slovenia due to the warm and moist weather in winter of 2013 there was no real growth interruption of grasses, legumes, and herbs. Favourable weather conditions even accelerated early spring growth when grasses developed and transferred from the previous vegetative developmental phase to the generative phase and developed leaves on stems and inflorescence. May 2013 and June and July 2014 were relatively hot, and with significant rainfall (Fig. 1) which made difficulties for hay conservation and even silage making. If, however, farmers managed to conserve the latter forage from the grassland, we cannot confirm this for the most

Table 1: Time line of activities on grassland experiment in Stari Breg in 2013 and 2014

Tabela 1: Časovni potek opravil pri poskusu v Starem Bregu v letu 2013 in 2014

Year	Placement date of cages	Date of shifting the cage (regeneration)	Date of cut
2013	10.5	27.5	18.6
	4.7	31.7	27.8
	27.8	-	14.10
	9.5	-	6.6
2014	6.7	-	13.8
	13.8	-	3.10

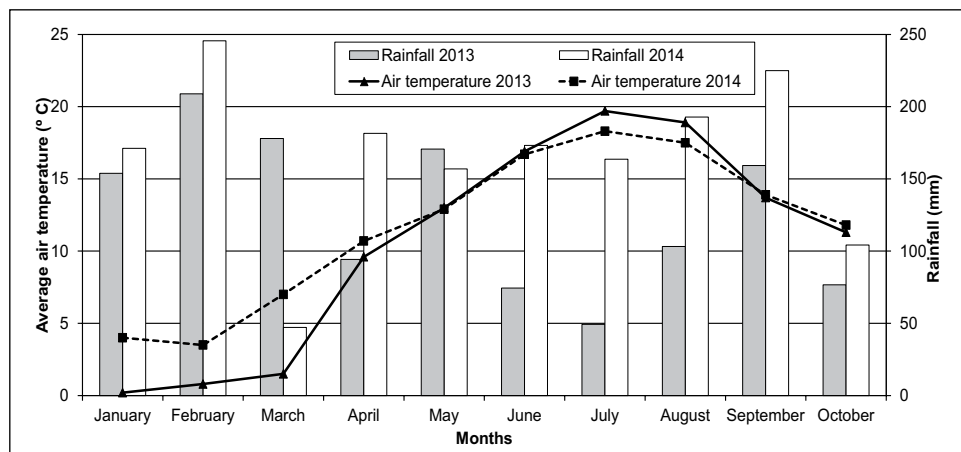


Figure 1: Average monthly air temperature and rainfall at Kočevje in years 2013 and 2014

Slika 1: Povprečna temperatura zraka in količina padavin po mesecih v Kočevju v letih 2013 in 2014

expanded form of conserved feed in Slovenia as the hay or fodder of the first cut on meadows was only utilized in the first 10 days of June, and this did not predict good quality of hay (Verbič and Žnidaršič 2013).

#### Herbage sample analysis

Herbage samples were hot air dried in a dryer at 45 °C to a constant weight at the Biotechnical Faculty, Agronomy Department in Ljubljana. After drying the samples we determined the air dry matter of the yield for each of the plots in the experiment. In 2014 we milled all samples for the further chemical analysis through a 1 mm sieve (mill Brabender, no. 880804, Brabender, Duisburg, Germany). In the laboratory at the Institute for Hygiene and Pathology of Animal Nutrition of the Veterinary Faculty, a Weende analysis was conducted to determine the content of dry matter, moisture, crude protein, crude fiber, crude fat, and ash. The values of metabolic energy (ME) and net energy for lactation (NEL) were calculated according to the Universität Hohenheim (1997). We selected measured parameters to help us calculate the yield of crude protein and net energy for lactation. Measured and calculated values of the chemical composition in the herbage ranged in selected classes of quality (excellent, good,

undesirable) according to Verbič and co-workers (2011). Herbage samples from 18 experimental plots in Stari Breg from 2014 were included in the chemical analysis, nine from treatment PROT and nine from treatment CONT.

We evaluated the results of the experiments with the statistical software Statgraphics Centurion XVI (Statgraphics 2009). Using an analysis of variance (ANOVA) and the Newman-Keuls multiple test ( $P < 0.05$ ), we assessed the differences between treatments (PROT – protected, REG – regeneration, CONT – control).

The results are graphically presented as an average yield of herbage dry matter ( $\pm$  SE), converted into t/ha in two (three – when considering the results of regeneration) treatments in Stari Breg at a particular cut. On the basis of such presented results we calculated the average reduction of grass yield due to red deer grazing in the Kočevje region and described it in percentages in figures.

## Results

With the data analysis collected at the first cut, on 18 June 2013 we confirmed in two locations and in treatment PROT the expected and significantly highest yield (4.8–7 t/ha) of dry matter. The yield loss on treatment CONT (unprotected plots)

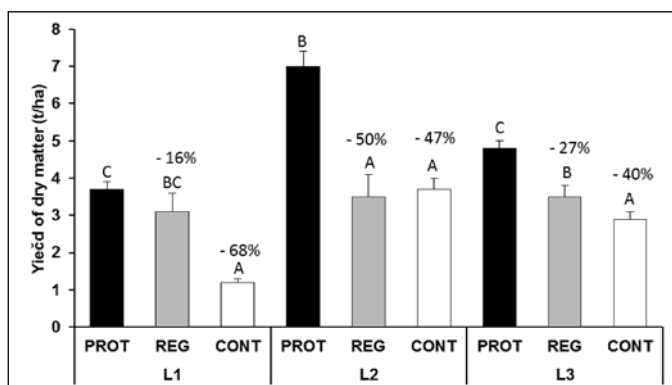


Figure 2: The yield of dry matter (t/ha) at the 1<sup>st</sup> cut in three locations (L1, L2, L3) and in three treatments (PROT - protected, REG - regeneration, CONT - control) in Stari Breg in 2013. The number above the columns indicates yield loss (%) due to deer grazing. The different letters denote values which represent statistically significant differences (Newman-Keuls test) at the 0.05 significance level

Slika 2: Pridelek sušine (t/ha) ob 1. košnji na treh lokacijah (L1, L2, L3) in v treh obravnavanjih (PROT – zavarovano, REG – regeneracija, CONT – nezavarovano) v Starem Bregu v 2013. Številke nad stolpcem predstavljajo zmanjšanje pridelka (%) kot posledica paše jelenjadi. Različne črke označujejo vrednosti, ki se statistično razlikujejo (Newman-Keuls-ov preizkus) pri stopnji tveganja 0,05

ranged from 40 to 68%, while sward regeneration capability we determined only on 1 (52%) and 3 location (13%) (Fig. 2).

At the second cut in Stari Breg, 27 August 2013, we established in two locations in treatment PROT the significantly highest yield of herbage dry matter (1.3-1.4 t/ha) and yield reduction in CONT plots from 77 to 86%. We do not explain

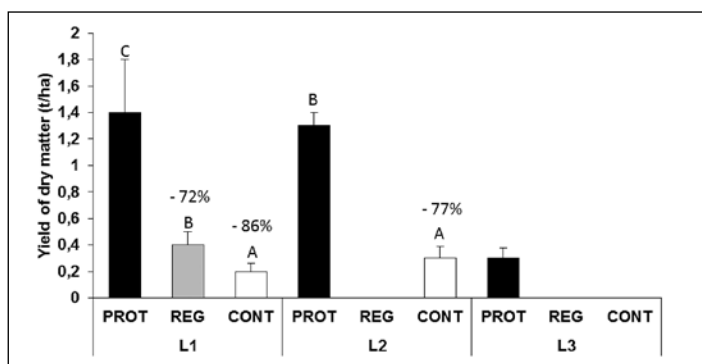


Figure 3: The yield of dry matter (t/ha) at the 2<sup>nd</sup> cut in three locations (L1, L2, L3) and in three treatments (PROT - protected, REG - regeneration, CONT - control) in Stari Breg in 2013. The number above the columns indicates yield loss (%) due to deer grazing. The different letters denote values which represent statistically significant differences (Newman-Keuls test) at the 0.05 significance level

Slika 3: Povprečni pridelek zračno suhega zelinja (t/ha) ob 2. košnji na treh lokacijah (L1, L2 in L3) in v treh obravnavanjih (PROT – zavarovano, REG – regeneracija, CONT – nezavarovano) v Starem Bregu v 2013. Številke nad stolpcem predstavljajo zmanjšanje pridelka (%) kot posledica paše jelenjadi. Različne črke označujejo vrednosti, ki se statistično razlikujejo (Newman-Keuls-ov preizkus) pri stopnji tveganja 0,05

the results of the third location, as cows trod on the experimental surface. At the first location we determined a 14% regeneration capability of grazed sward in the last three weeks before the cut took place (Fig. 3).

At the third cut in Stari Breg on 14 October 2013 (Fig. 4), we determined in all three locations in treatment PROT the significantly highest yield of dry matter (0.8-1.5 t/ha). The yield reduction on unprotected plots ranged from 71 to 94% or

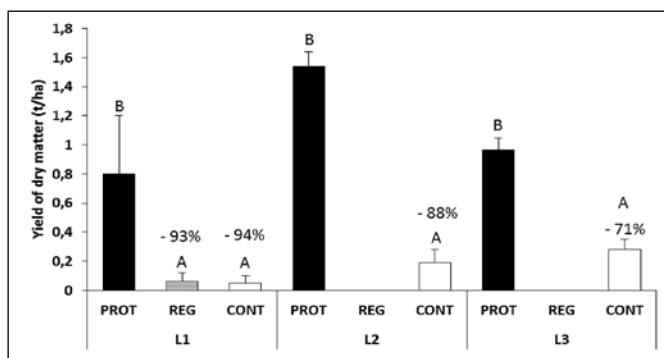


Figure 4: The yield of dry matter (t/ha) at the 3<sup>rd</sup> cut in three locations (L1, L2, L3) and in three treatments (PROT - protected, REG - regeneration, CONT - control) in Stari Breg in 2013. The number above the columns indicates the yield loss (%) due to deer grazing. The different letters denote values which represent statistically significant differences (Newman-Keuls test) at the 0.05 significance level

Slika 4: Povprečni pridelek zračno suhega zelinja (t/ha) ob 3. košnji na treh lokacijah (L1, L2 in L3) in v treh obravnavanjih (PROT – zavarovano, REG – regeneracija, CONT – nezavarovano) v Starem Bregu v 2013. Številke nad stolpcem predstavljajo zmanjšanje pridelka (%) kot posledica paše jelenjadi. Različne črke označujejo vrednosti, ki se statistično razlikujejo (Newman-Keuls-ov preizkus) pri stopnji tveganja 0,05

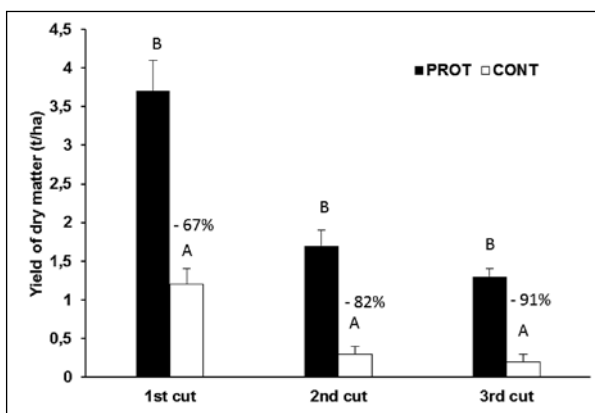


Figure 5: The yield of dry matter (t/ha) of all three cuts in Stari Breg in 2014. The number above the columns indicates the yield loss due to deer grazing. The different letters denote values which represent statistically significant differences (Newman-Keuls test) at the 0.05 significance level

Slika 5: Povprečni pridelek zračno suhega zelinja ob vsaki košnji v Starem Bregu v 2014 v obravnavanjih PROT – zavarovano in CONT – nezavarovano. Številke nad stolpcem predstavljajo zmanjšanje pridelka kot posledica paše jelenjadi. Različne črke označujejo vrednosti, ki se statistično razlikujejo (Newman-Keuls-ov preizkus) pri stopnji tveganja 0,05

from only 50 to 280 kg/ha. Also, the reenerative capacity was very low (1%), and which was determined due to the lack of water at the first location (Fig. 4).

In the year 2014 we conducted the first cut 12 days earlier than in year 2013. That led to a lower yield compared to the previous year and what we

got in treatment PROT (3.7 t/ha) 1.5 t/ha lower yield. In the total yield the first cut represented 55% of the whole yield. The yield loss due to red deer grazing increased through the season and cuts, and we measured 67, 82, and 91% of yield loss and was always a statistically significant lower amount (Fig. 5).

Table 2: The chemical composition (crude protein - SB, crude fibre - SVI, metabolize energy - ME, net energy for lactation - NEL) ( $\pm$ SE) of forage in Stari Breg at all three cuts in two treatments in 2014. The different letters within the cuts denote values which represent statistically significant differences (Newman-Keuls test) at the 0.05 significant level

Tabela 2: Vsebnost surovih beljakovin (CP), surove vlaknine (CF), presnovljive energije (ME) in neto energije za laktacijo (NEL) ( $\pm$ SN) zelinja v Starem Bregu ob vseh treh košnjah in v obeh obravnavanjih v letu 2014. Različne črke znotraj košnje označujejo vrednosti, ki se statistično razlikujejo (Newman-Keulsov preizkus) pri stopnji tveganja 0,05

Cut	Treatment	CP (g/kg DM)	SVI (g/kg DM)	ME (MJ/kg DM)	NEL (MJ/kg DM)
1.	PROT	98.93 $\pm$ 8.25a	274.63 $\pm$ 11.52b	8.02 $\pm$ 0.04a	4.57 $\pm$ 0.02a
	CONT	104.17 $\pm$ 1.99a	218.11 $\pm$ 22.01a	7.99 $\pm$ 0.08a	4.57 $\pm$ 0.05a
2.	PROT	158.53 $\pm$ 6.29a	236.13 $\pm$ 13.26a	8.45 $\pm$ 0.09a	4.86 $\pm$ 0.05a
	CONT	175.20 $\pm$ 7.71b	250.68 $\pm$ 19.86a	8.36 $\pm$ 0.05a	4.81 $\pm$ 0.03a
3.	PROT	156.03 $\pm$ 3.97a	189.52 $\pm$ 12.25a	8.38 $\pm$ 0.05a	4.83 $\pm$ 0.03a
	CONT	157.07 $\pm$ 9.03a	178.89 $\pm$ 5.81a	8.39 $\pm$ 0.05a	4.84 $\pm$ 0.03a

We determined the difference in the content of crude protein between treatments PROT and CONT only at the second cut and that it was statistically significantly higher in favour of the yield on unprotected plots (treatment CONT -175.20 g/kg DM). When considering this nutritional parameter of feed quality the value of hay (first cut) on protected plots was of undesirable quality and on unprotected plots was of good quality (Verbič et al. 2011). Nutritional value of yield from second and third cut in both treatments was of excellent quality. When comparing data of the crude fibre content in herbage between treatments PROT and CONT we confirmed significant difference (in favour of crude fibre on protected plot) only at the hay cut meanwhile the dry matter yield of second and third cut showed no significant differences in the content of crude fibre between treatments. When taking this parameter into account of herbage quality the dry matter yield of all three cut was of excellent quality (Verbič et al. 2011). Comparison of ME and NEL content between treatments showed no significant differ-

ences at neither cuts and it ranged from 7.99 to 8.45 and 4.57 to 4.86 MJ/kg DM, respectively. When comparing ME and NEL values from experiment to appointed classes (Verbič et al. 2011) we got on protected and unprotected plots the lowest values in the first cut and that the following two cuts gave higher energy values (Tab. 2). If red deer grazing did not have major influence on nutritional value of conserved forage, the yield results of selected parameters (Tab. 3) yet changed differently. In treatment CONT the yields of dry matter, crude protein and NEL were at the each of the three cuts statistically significantly lower as in treatment PROT. Only at the first cut we determined in treatment PROT higher yield than 3 t/ha of dry matter, meanwhile in all other treatments through the season we harvested less than 1.8 t/ha of dry matter. Also crude protein yield only exceeded the value of 300 kg/ha at first cut in treatment PROT and later on the yield of crude protein only decreased in following two cuts. Only the first cut gave the yield of NEL higher than 15 GJ/ha and it happened merely in treatment PROT (Tab. 3).

Table 3: The yield of dry matter (DM), crude protein (SB), and net energy for lactation (NEL) ( $\pm$ SE) in Stari Breg at all three cuts and two treatments in 2014. The different letters within the cuts denote values which represent statistically significant differences (Newman-Keuls test) at the 0.05 significant level

Tabela 3: Pridelek sušine zelinja (DM), surovih beljakovin (CP), neto energije za laktacijo (NEL) ( $\pm$ SN) v Starem Bregu ob vseh treh košnjah in v obeh obravnavanjih v letu 2014. Različne črke znotraj košenj označujejo vrednosti, ki se statistično razlikujejo (Newman-Keuls-ov preizkus) pri stopnji tveganja 0,05.

Cut	Treatment	Yield of DM (t/ha)	Yield of CP (kg/ha)	Yield of NEL (GJ/ha)
1.	PROT	3.7 $\pm$ 0.4b	366.04 $\pm$ 3.30b	16.91 $\pm$ 0.00b
	CONT	1.2 $\pm$ 0.2a	125.00 $\pm$ 0.40a	5.48 $\pm$ 0.01a
2.	PROT	1.7 $\pm$ 0.2b	269.50 $\pm$ 1.26b	8.26 $\pm$ 0.01b
	CONT	0.3 $\pm$ 0.1a	52.56 $\pm$ 0.77a	1.44 $\pm$ 0.00a
3.	PROT	1.3 $\pm$ 0.1b	202.84 $\pm$ 0.40b	6.28 $\pm$ 0.00b
	CONT	0.2 $\pm$ 0.1a	31.41 $\pm$ 0.90a	0.97 $\pm$ 0.00a

## Discussion

With more than 60% of forest cover, Slovenia is the third most forest abundant European country. The consequence of this fact is that a large portion of agricultural land borders forests – and animals living in the forest search for feed on arable land, meadows, pastures, and farm facilities (damaging round bale silage, flat silage silo) of better quality more intensively than they do in their native living environment. When looking for feed and then also consuming that forage, the game can cause considerable damage (Lande et al. 2014). The fact is that grassland occupies around two thirds of agriculturally utilized land, and that voluminous feed from semi-natural and sown grassland with no regard to what future strategy for fodder production the state will have, the grass fodder will always present an important component of cattle or small ruminant nutrition (Verbič et al. 2011). Also, the most importance in animal ruminant nutrition ratio the grassland forage will have – as it has had until now exactly in forested areas of Slovenia (Kočevje, Ribnica, Notranjska regions, and defined areas of Novo mesto and Gorenjska region) and also grassland land use for the purpose of livestock feed – represents a measure against land abandonment and shrub encroachment (Trdan et al. 2000). On previously mentioned areas red deer grazing on grassland has more significance than on areas with more intensive crop (arable) production (Prekmurje region) (Gönter et al. 2007), as in such regions despite the known fact of unwanted activity – they do not pay much attention to it.

On the basis of the results of a two-year study of grass sward productivity on permanent grassland in the vicinity of forests in Stari Breg in the Kočevje region, where red deer grazing exhibits an important biotic factor of yield reduction, especially on cut meadows, we conclude the following:

- The total yield of all three cuts in year 2013 in treatment PROT gave 7.2 t/ha and was statistically and significant higher than the yield of dry matter in treatment CONT (2.9 t/ha). Yield loss accounted for 4.0 t/ha or 56%.
- When considering results of all three cuts in year 2014 we established a yield loss of 75% (5.0 t/ha).
- With chemical analysis of sampled herbage in an experiment we determined that the content of crude protein in treatment CONT was always higher than in treatment PROT. This is due to red deer grazing which rejuvenate grass sward with progressive defoliation and removal of herbage and force grasses to form new leaves which also hold the most important part of fodder quality.
- On the contrary happened to crude fibre, which content was the highest in herbage in treatment PROT. Nutritional value of conserved feed at all locations was low as it not reached 5 MJ/kg dry matter even at the first cut. This we attribute to poor floristical composition of studied grassland (Trdan et al. 2014).
- Viewpoint, which is not included generally in similar research as this one, is that red deer does not reduce the yield on the grassland only



with the direct defoliation of grass but also because of seasonally early and permanent and uncontrolled grazing. The latter namely restricts the intensive growth of grass sward on sown meadows and lessens the growing vitality of grassland plants and makes floristic composition poorer (Trdan et al. 2014) and this leads to long term negative consequences for forage production (Verbič et al. 2013).

- Management of big game (harvest quotas, oriented grazing) must be significantly changed in the near future in the Kočevje region if we expect farmers to cultivate the land in a manner of sustainable coexistence with wildlife.

## Povzetek

Z več kot 60 % pokritostjo z gozdovi spada Slovenija s Finsko in Švedsko med tri najbolj gozdnate države v Evropski uniji. Posledično je divjad v Sloveniji pomemben biotični dejavnik zmanjševanja produktivnosti rastlinske pridelave. Gospodarsko najbolj škodljivi vrsti sta divjji prašič (*Sus scrofa*), ki povzroča škodo zlasti z ritjem po travnikih in objedanjem in tlačenjem koruze ter jelenjad (*Cervus elaphus*), ki je kot prežvekovalc, ki mu voluminozna krma predstavlja približno 50 % hrane, škodljiv zlasti s pašo na travinju. Obe vrsti divjadi povzročata velike težave govedorejcem in rejcem drobnice na Kočevskem, ki morajo zaradi izpada voluminozne krme le to kupovati, sanacija zemljišč in njihovo varovanje pred divjadjo pa je drago in predvsem – tudi zaradi velikega staleža divjadi na omenjenem območju – več ne zagotavlja učinkovitosti. Za škodo, ki jo pozroči divjji prašič na travinju, ki jo kmetje prijavijo, lahko pričakujejo ustrezno nadomestilo zaradi izpada pridelka, medtem ko je odškodnino za izpad pridelka zaradi paše jelenjadi od pristojnih organizacij težje pridobiti. V pričujoči raziskavi smo želeli s standardnimi in tudi v tujini uveljavljenimi postopki ovrednotiti izpad pridelka (voluminozne krme) in zmanjšanje hranilne vrednosti krme zaradi paše jelenjadi na travinju na Kočevskem. V prispevku predstavljamo rezultate dveletnega (2013 in 2014) poskusa na trajnem travniku v Starem Bregu, kjer predstavlja jelenjad že vrsto let pomemben biotični dejavnik izpada pridelka voluminozne krme. V poskusu

smo z varovalnimi železnimi kletkami ugotavljali zmanjšanje pridelka zaradi paše jelenjadi ob vsaki košnji, in sicer v letu 2013 na treh lokacijah in v letu 2014 na eni lokaciji v Starem Bregu. Poskus v letu 2013 je obsegal tri obravnavanja: zavarovano, regeneracija in nezavarovano, v letu 2014 pa samo obravnavanji zavarovano in nezavarovano. V letu 2014 smo odvzeli tudi 18 vzorcev zelinja za določevanje hranilne vrednosti. Zmanjšanje oz. izpad pridelka smo določili s košnjo in tehtanjem zelinja ter izračunom razlike med pridelki sušine na parcelah, ki so bile zavarovane z železnimi kletkami od začetka poskusa in pridelki sušine na nezavarovanih parcelah. Povprečni izpad pridelka mrve v letu 2013 je bil 56 %, v letu 2014 pa je znašal 75 %. Vsebnost surovih beljakovin je bila v letu 2014 na nezavarovani površini vedno večja kot na zavarovani površini trajnega travinja, kar pripisujemo stalnemu pomlajevanju travne ruše kot posledico obtrgavanja jelenjadi. Nasprotno je bila vsebnost surove vlaknine v povprečju večja v zelinju na zavarovanih mestih. Zaradi velikega zmanjšanja pridelka smo pri vseh treh košnjah na nezavarovanih parcelah ugotovili manjši pridelek surovih beljakovin ( $P < 0,05$ ), presnovljive energije ( $P < 0,05$ ) in NEL ( $P < 0,05$ ). V pričujoči raziskavi je bil preučevan samo izpad pridelka na travinju, ki nastane zaradi neposredne paše jelenjadi 3 do 4 tedne pred začetkom košnje. Ne smemo pa pozabiti tudi na posredni vpliv paše te velike parkljuste divjadi na travno rušo v poznem zimskem in zgodnjem spomladanskem času, s čimer prav tako zmanjšuje proizvodni potencial travinja.

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