

Voluntary intake of forages from permanent grasslands with different quality in suckler cows

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Introduction

In the Czech Republic, an expansion of the permanent grassland areas is expected. In this situation it is necessary to identify the most suitable methods of grassland management for the future. A good knowledge of voluntary dry matter intake of forage from grassland by various cattle categories is important for rational grassland management by means of cattle breeding. This paper presents the findings of a study of voluntary dry matter intake of silages made from the fodder from permanent grasslands with the higher content of dry matter on the basis of four feeding trials conducted from December 2008 to March 2009 on suckler cows.

Material and methods

The study was conducted within the framework of the experiment that was established in 2008 on permanent grassland sites in the locality Rapotín at 390–402 m a.s.l. Total annual rainfall is 693 mm, mean annual temperature is 7.2 °C. The experimental grasslands were managed with four intensities of utilisation: intensive (area 3.5 ha, 4 cuts per year – first on 15th May followed by cuts at 45d intervals); medium intensive (area 2.5 ha, 3 cuts per year – first on 30th May followed by cuts at 60d intervals); low intensive (area 0.8 ha, 2 cuts per year – first on 15th June, next cut after 90d) and extensive (area 1.6 ha, 2 cuts per year – first on 15th June with, next cut after 90 days). Each utilisation treatment was fertilised with mineral fertilisers (N₉₀P₃₀K₆₀; pure nutrients – model stocking rate: 1 LU ha⁻¹) except for the extensive utilisation treatment. Before each cut, the botanical composition and vegetation stage of the grassland were evaluated. The dominant species in the swards were *Dactylis glomerata*, *Poa pratensis*, *Lolium perenne*, *Trifolium repens* and *Taraxacum sect. Ruderalia*. The grass silage was made by cutting grass and leaving it to dry naturally in the field, after which the dry matter content was about 37 %. After the wilting the mowed fodder was compressed into the round bales (5 wrap layers) using the baling press with the chopping equipment. The fermentation process lasted 3 months for the ensuring of the optimal silage quality. The feeding trials were conducted using the silages made from the second cuts of all treatments of the grasslands utilisation. For the trials there were used 6 cows (700–750 kg L.W.) – crossbreds of Czech Fleckvieh with meat breeds from a suckler cow rearing system using the equipment (RIC Insentec B.V.). Four feeding trials lasted from December 2008 to March 2009. Each trial was divided into the habit forming period (one week) and the testing period (three weeks). The animals were offered grass silage ad-libitum. The nutrients crude protein (CP), crude fibre (CF), neutral detergent fibre (NDF) and acid detergent fibre (ADF) in samples grass silage were analyzed by the Czech State Standard (CSS) 46 7092 “Method for Feed Testing”.

The *in vitro* organic matter digestibility (OMD) was determined by the method of Tilley and Terry (1963) modified according Resch (1991). The NEL (net energy of lactation), PDIE (ingested digestive protein allowed by energy), PDIN (ingested digestive protein allowed by nitrogen) was predicted by means of the regression equation for organic matter digestibility (Pozdíšek *et al.*, 2001) and by means of the equations described by Petrikovič *et al.* (2000). For evaluation of the nutritive value in system NE, PDI is officially used in the Czech Republic. This system corresponds with the INRA system (Jarrige *et al.*, 1989).

The data were processed descriptive statistics and General Linear Models with fixed effects of cows, method of utilization and between effect (day in test) and its interactions with fixed effects using the SAS[®] 2007 software package. Post-hoc analysis was performed by using Tukey's HSD test. The level of significance was set at $P < 0.05$.

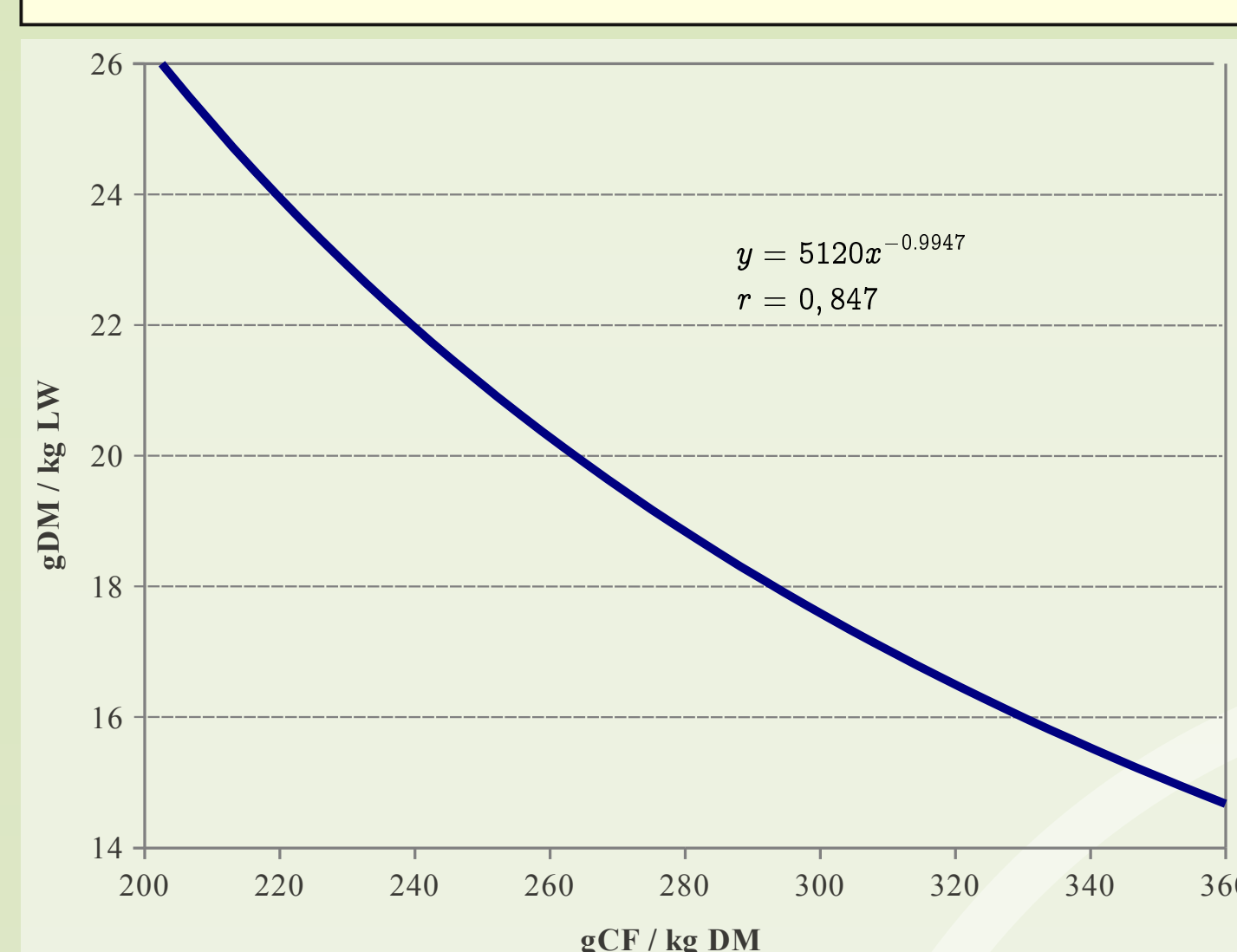
Results and discussion

The results are shown in Table 1. Voluntary dry matter intake of the ensiled forage obtained from the second cuts of grasslands ranged from 15.2 to 23.9 g DM/kg L.W in our conditions. There is a tendency for increase in dry matter intake in connection with increasing intensity of grassland management and decreasing content of crude fibre in the forage. Our findings are in agreement with Gruber *et al.* (2000), who investigated a similar issue in dairy cows. Compared to our results, they found a higher level of voluntary dry matter intake (19.9–27.6 g DM/ kg L.W). Pozdíšek *et al.* (1998) mention that dry matter intake of intensively managed grasses conserved by freezing was 24.3 to 30.7 g DM/kg L.W. heifers with L.W. 300 kg.

These findings indicate that both quality of feed and animal have effects on the variability of dry matter intake.

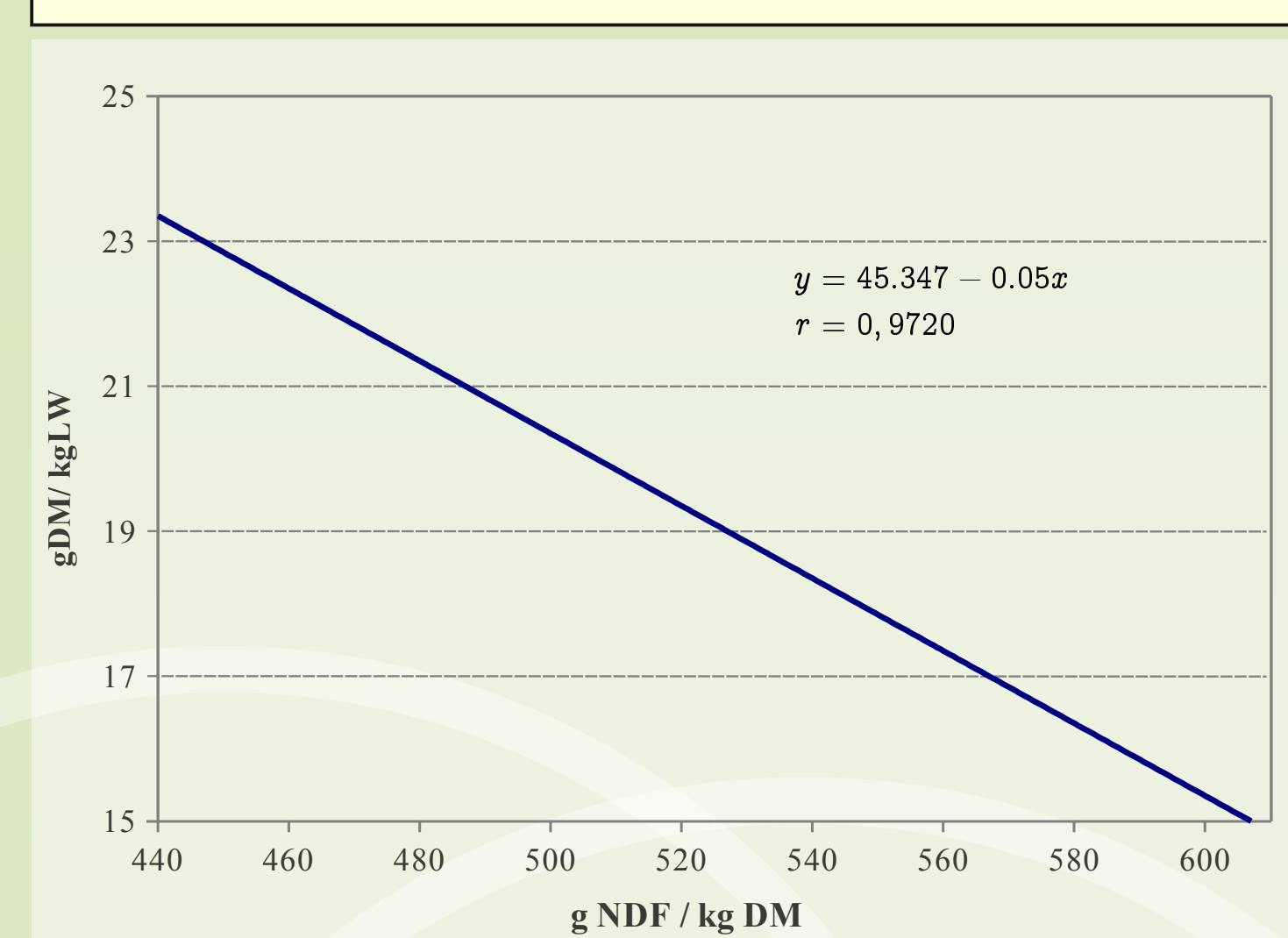
According to Jarrige *et al.* (1989), the optimal forage quality for cattle nutrition is when the PDIN/PDIE ratio approximates a value of 1. If this presumption is satisfied, animals have the minimum requirements for supplements. From this viewpoint, the most suitable PDIN/PDIE ratio (1.09) was discovered to be the intensive method of grassland use in our case. Post-hoc analysis confirmed highly significant differences in voluntary dry matter intake between intensive and low intensive ($P < 0.001$) and extensive utilisation ($P < 0.001$). Significant differences were also found between medium intensive utilisation and low intensive ($P < 0.05$) and extensive utilisation ($P < 0.05$).

Figure 1



Relationship between Voluntary intake and grassland CF content

Figure 2



Relationship between Voluntary intake and grassland NDF content

The treatments of the grassland management had the significant effects on the quality of the tested silages. As many authors mention (e.g. Gruber *et al.*, 2000) the forage quality is closely related to the voluntary dry matter intake. On the basis of our trials we have found the negative correlation ($r = -0.972$) between the content of NDF and the dry matter intake (regression equation: $y = 45.347 - 0.05x$). Furthermore, it was found the positive relation between the voluntary dry matter intake and the content of crude protein ($y = 0.1698x - 1.5803$; $r = 0.931$) and between the voluntary dry matter intake and the content of NEL ($y = 3.4497e^{0.3253x}$; $r = 0.881$). The increase of the intensity of utilisation has the positive influence on the increase of the dry matter intake. From this viewpoint on the basis of our results we can consider the four-cut regime of the grassland utilisation optimal.

Conclusion

It is possible to influence the quantity and quality of fodder by means of grassland management, i.e. through the number of cuts and fertilisation. Voluntary dry matter intake in cattle is influenced by intensity of grassland management. Further study of the voluntary intake by different cattle categories fed on grasslands is needed.

Table 1 Dry matter yield and forage quality at different grassland management (2003–2008)

T	CP	CF	ADF	NDF	OMD	NEL	PDIN	PDIE	PDIN/PDIE	VI*	S.D.*
			g / kg DM			MJ	g / kg DM			g DM / kg L.W.	
1	151.7	242.0	325.0	448.6	717.9	5.71	96.8	88.5	1.09	23.9	3.6
2	116.1	262.1	323.7	483.6	686.0	5.43	75.0	82.6	0.91	20.4	3.0
3	110.0	282.9	408.5	573.9	686.1	5.15	70.9	78.8	0.90	16.3	3.4
4	105.2	358.6	418.6	608.1	582.0	4.45	67.2	72.6	0.92	15.2	2.8

T – (treatment - type of utilisation): 1 – Intensive, 2 – Medium intensive, 3 – Low intensive, 4 – Extensive; VI* (voluntary dry matter intake); S.D.* – standard deviation (*for mean of whole treatment and group of the 6 cows)

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