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Forage quality of 'Perenne', a new perennial rye variety (*Secale cereale* x *Secale montanum*)

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ABSTRACT: 'Perenne' is a perennial rye variety of interspecific origin (*Secale cereale* x *S. montanum*) registered in Hungary. The green yield, dry matter, crude protein and fiber content of 'Perenne' were determined. Green mass at the early stem extension was 7.52 t ha^{-1} and at the late one 19.66 t ha^{-1}. Maximum green weight was measured at heading (23.91 t ha^{-1}) and started to decrease later. Dry matter content was found to be 1.35 t ha^{-1} at the early stem extension, whilst 3.91 t ha^{-1} at the late stem extension phase. Dry weather in spring (2003) explains slow rate of increase in dry matter content and the substantial decrease in green weight following heading. Fiber content was found to be 22 % in the tillering and the early stem extension stage, which was followed by a steady increase until heading (34.3 %) and a gradual decline following ripening stage. Crude protein changed more significantly than fiber content. Early stem extension had the highest value (30.7 %). A rapid decline was observed during late developmental stages. For grazing purposes the early stem extension stage seems to be the optimum ones, when the plant height is approximately 30 cm with the highest crude protein (30.7 %) and low fiber (22.2 %) content. For cropping purposes the late stem extension phase was shown to be the optimum one because this provides high green mass along with relatively high crude protein (23.2 %) content.

Key words: Forage quality – perennial rye – *Secale cereale* – *Secale montanum*

Introduction

The cultivated rye (*Secale cereale* L.) has been used as a grain crop and also for green forage mainly in the northern regions of Europe. In Hungary it is commonly grown under poor soil conditions which are insufficient for other cereals. The perennial mountain rye (*S. montanum* Guss.) is a native wild species in southern Europe, Morocco, Iran and Iraq (De Bustos & Jouve 2002). The value of *S. montanum* as a pasture crop has been tested successfully in the United States (Robert et al. 1988), Australia and New Zealand (Oram 1996). Remarkable efforts were made to cross these species although the hybrids had reduced fertility (Stutz 1957, Reiman & Gordon 1984) or weak perenniality (Cox et al. 2002).

In 1998, a perennial rye variety ('Perenne') of interspecific hybrid origin (*S. cereale* x *S. montanum*) has been registered in Hungary. 'Perenne' has acceptable fertility and good perenniality (Kotvics et al. 2001). Considering the strong tillering and plant height of 140 - 150 cm, the cultivar's advantages as a forage crop are obvious. The objectives were to analyse the quantity and quality of the green mass in 1st, 2nd, and 3rd years and various phenophases as well as to determine the optimum cutting period. In this paper yield, protein and fiber content in different phenophases are presented.

Materials and methods

The field experiments were carried out at the Experimental Station of the St. István University in Gödöllő (Hungary) on a brown forest soil (sandy loam physical type). 'Perenne' was sown in mid-September 2001 at a sowing rate of 2.5 billion seeds ha^{-1} with 24 cm row space and fertilized with 30 N, 30 P, and 30 K (kg ha^{-1}) in 2001 and 2002. Samples were collected in 2002 and 2003. The amount of precipitation was 515 mm and 385 mm in 2002 and 2003, respectively. Green mass and dry matter, crude protein and fiber content were determined in 7

phenophases (Table 1). Crude protein content was measured by the standard Kjeldahl method and the fiber content was analysed by the standard Henneberg-Stohmann method (Church & Pond 1988).

Table 1. Plant height and sampling date of 'Perenne' in different phenophases

	Phenophase						
	A[2]	B	C	D	E	F	G
DATE[1]	10/10/02	25/04/03	03/05/03	13/05/03	20/05/03	30/05/03	02/07/03
PH	10	30	60	90	110	155	155

[1] DATE, sampling date (DDMMYY); PH, plant height (cm)
[2] A, tillering; B, early stem extension; C, late stem extension; D, early heading; E, late heading; F, flowering; G, ripening

Result and discussion

Green mass varied between 1.58 t ha^{-1} at tillering and 23.91 t ha^{-1} at ripening. It increased significantly till heading, and it started to decrease later (Figure 1/I). Dry matter content between tillering and ripening increased continually, 1.35 t ha^{-1} measured at tillering and 7.45 t ha^{-1} at ripening. Following heading the rate of increase became moderate (Fig. 1/II). Dry weather in the spring of 2003 accounts for the moderate increase in dry matter content and a marked decline in green weight after heading. The amount of precipitation was 40 mm during the months of March, April and May. Fiber content was 22 % in the tillering and the early stem extension, increased until heading (34.3 %) and began to decrease at the ripening stage (Fig. 1/III). Crude protein content changed more substantially than fiber content. Early stem extension had the highest crude protein value (30.7 %), although it showed a rapid decrease during late developmental stages.

For grazing the highest crude protein (30.7 %) and low fiber (22.2 %) content, the early stem extension phase seems to be the optimum one, when plant height is approximately 30 cm and green mass is 7.52 t ha^{-1}. Grazing is feasible until heading. For cropping purposes the late stem extension phase appears to be the best because this ensures a rather high green yield (19.66 t ha^{-1}) with relatively high crude protein (23.2 %) and low fibre (26.2 %) content. The optimum cutting season for most forage crop is at heading. Cutting perennial rye at heading is not recommended due to the low crude protein and high fiber content. Dry weather in the experimental year did not allow for second cropping.

Accurate characterization of the forage quality requires the analysis of a wider range of traits. Crude protein and fiber content together with ash, fat and polysaccharide content provide enough information for farmers to the optimal forage portion.

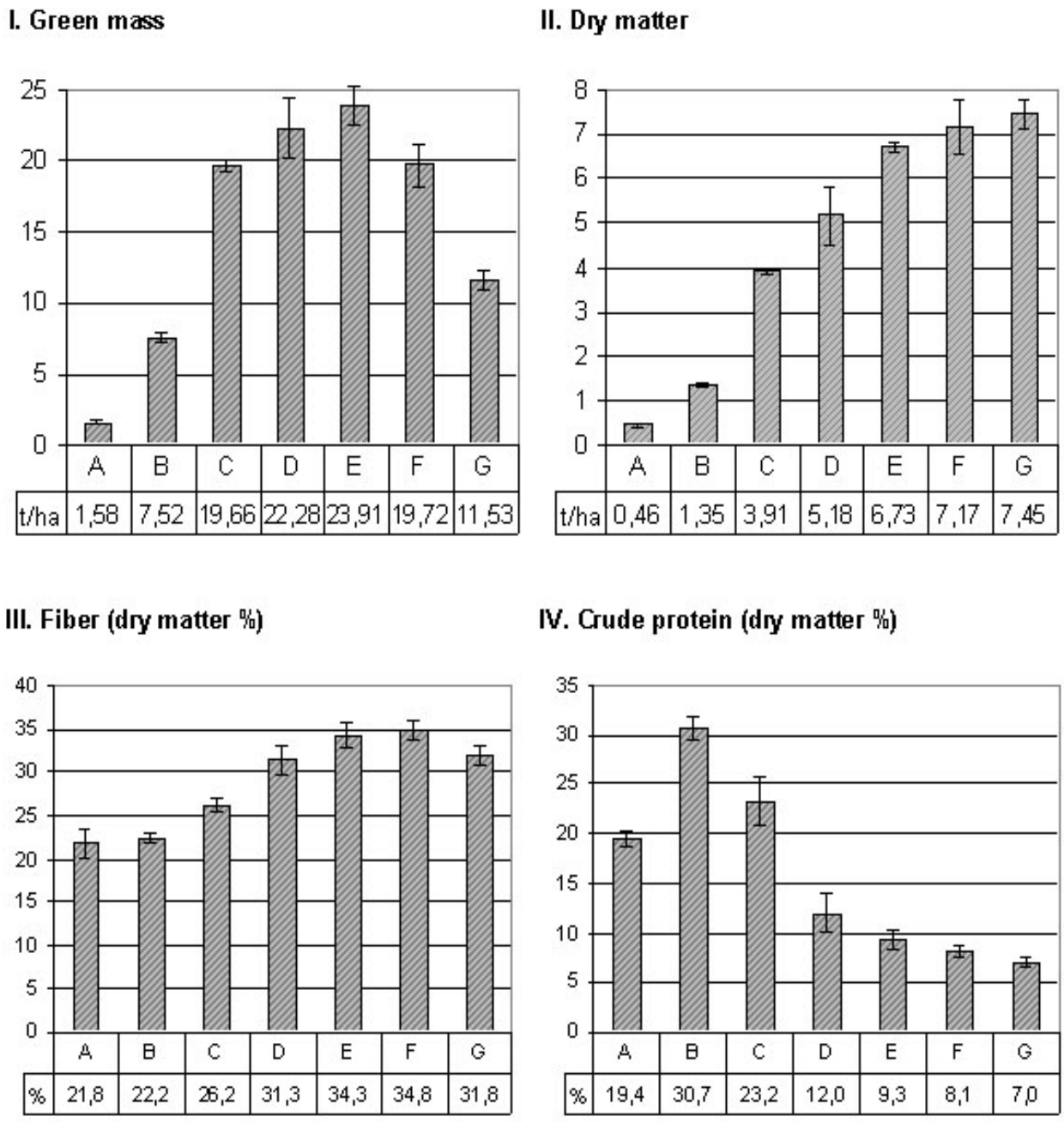

Figure 1. Effect of developmental stages on green mass (I), dry matter (II), fiber (III) and crude protein content (IV) of 'Perenne' (abbreviations for phenophases: see Table 1)

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