

PRODUCTION AND FORAGE QUALITY OF GRASS STRAW

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Abstract

Data from the Czech Republic show that straw yields vary by species, ranging from about 2.0 to 12.1 t·ha⁻¹, with values comparable to hay. Grass straw is high in fibre (typically over 650 g·kg⁻¹ NDF) and low in crude protein (approximately 26–92 g·kg⁻¹ DM), with digestibility limited by lignin content. Despite this, it is a useful feed for ruminants and horses, mainly as a source of structural fibre that supports rumen function. Compared to cereal straw, it generally has higher nutritional value and represents a practical feed resource and additional income for producers.

Keywords: perennial ryegrass, Italian ryegrass, crude protein, dry matter content, NDF, ADF

INTRODUCTION

In past grass straw was commonly used as a fodder for cattle and horses feeding. In the worldwide largest grass seed production area in the Pacific Northwest USA, field burning of grass straw was a common practice until the middle of 1990s. This method was advantageous for farmers as it was cheap and solved sanitary problems with diseases, pests and weeds, recycled mineral nutrients and supported autumn tillering of the grasses. Due to air pollution and a hazard of fires spreading to nature, this management is banned. Farmers had to find another way of straw disposal. The most important market was found as a source of roughage for ruminants and horses. After dry years, there is limited supply of hay and its price rises and especially beef and horse farmers replace lower quality hay by grass straw, if available. Unfortunately, there is very limited number of data available concerning grass straw yield and quality evaluation.

MATERIAL AND METHODS

This study aims to review available information on grass straw yields and the quality from the point of view livestock nutrition. Most published data on grass straw comes from Oregon (USA) where grass seed multiplying is concentrated (e.g. Younberg and Yough, 1977). Data presented in this paper comes from unpublished research of authors in the area of Czech Republic. The most comprehensive data comes from Italian/annual and perennial ryegrass which are the most commonly cultivated species for seed production in Europe. Results come from Forage research station of Mendel University in Vatin (49.52N, 15.97E) and from Grass research station of Oseva PRO in Zubří (49.47N, 18.07E) (Hejduk and Macháč, 2019, unpublished data). Plot area harvested by combine was 10 m². Some data were obtained from farm fields where samples were taken from an area of 1 m² in three repetitions.

Immediately after harvest, the sample of grass straw was taken from fields for dry matter (DM) content and DM yield evaluation. For a nutrient content, samples of dry straw were homogenised by a laboratory mill with openings size 1.0 mm.

Three samples from each species, location and year were used, crude protein (CP), neutral detergent fibre (NDF), acid detergent fibre (ADF). Ash content was measured after ignition at the temperature 550 °C for 6 hours. NDF and ADF concentration by using the method ANCOM (2017a, 2017b). The Kjeldahl method was used to determine N concentration (AOAC, 1984); crude protein was calculated as N content multiplied by factor 6.25.

RESULTS AND DISCUSSION

As the DM content is below 50% (immediately after direct combining) it is necessary to cure the straw before baling. Some farmers use two stages / windrow harvest and in this case, straw is usually dry enough after the threshing. Straw yield depends namely on species, cultivar and year and the values are similar as for grassland hay (Table 1).

The quality of grass straw is comparable to late-harvested meadow hay. However, there are significant differences between individual species related to the content of leaves. The highest proportion of crude protein is found in the straw of Kentucky bluegrass, while the lowest is found in meadow and red fescues. Next to species, the content of crude protein also depends on the dose of nitrogen fertilizers, yield (with high values, nitrogen is diluted) and the weather at harvest (leaching by rain).

Tab. 1: Production of dry straw at different grass species (trials in the Czech Republic, 2016-2017)

Species	Range of yield (t·ha ⁻¹)
Timothy	8.1 – 12.1
Perennial Ryegrass	3.3 – 11.4
Italian Ryegrass	3.3 – 11.3
Red Fescue	2.0 – 7.8
Meadow Fescue	5.3 – 9.1
Kentucky Bluegrass	6.9 – 7.8

Tab. 2: Mean nutrients content in grass straw (g·kg⁻¹ DM) (trials 2017, Czech Republic)

Species	Crude protein	NDF	ADF	Ash
Timothy	81	629	412	71
Perennial Ryegrass	64	656	442	68
Italian Ryegrass	74	680	442	68
Red Fescue	26	762	523	41
Meadow Fescue	26	671	452	37
Kentucky Bluegrass	92	672	410	60

Roughly 60–70% of grass straw is cellulose and hemicellulose. Together they should make up an excellent energy source for ruminants. The inability of ruminants to avail themselves of the energy from these carbohydrate sources is explained by high lignin content which acts as an inert barrier between the carbohydrate and the digesting enzyme, then by highly crystalline cellulose which hampers quick enzyme action and finally by silica content which inhibits carbohydrate digestibility. Guggolz *et al.* (1971) found out that steam and hydroxide treatment improved digestibility of the straw significantly.

From a nutritional point of view, straw is characterized by a high fibre content (mostly over 65% NDF) and, conversely, a low nitrogen content and energy. Therefore, its use in cattle nutrition is specific. It serves primarily as a bulk feed with the function of „diluting“ energy-rich feed rations and as a source of structural fiber supporting proper rumen function. A sufficient supply of fibre stimulates rumination and salivation, which helps stabilize rumen pH and prevent metabolic disorders (Havekes *et al.*, 2020). Grass straw could serve as a superior alternative to the commonly used cereal straw in cattle diets.

CONCLUSIONS

This paper examines the yield and quality of grass straw after the seeds harvest. Straw from perennial grasses is currently little used for animal feeding. However, it represents a valuable reserve, especially in dry years when sufficient hay cannot be harvested from grasslands. For horses and beef cattle, it can represent a significant proportion of the diet and for seed grass growers it can provide a side income in addition to the sale of seeds. When the grass straw is used for feeding purposes its quality is higher compared with cereal straw in terms of higher crude protein content and lower NDF and ADF concentration.

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