Chemical evaluation of forages and haylage of different winter cultivars

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Keywords fiber digestibility, NDF, lignin, pre-flowering stage.

Introduction The use of forages and pre-drying of winter cereals have become important in the feeding of ruminants, mainly in the South of Brazil where the climate is favorable to the cultivation of these forages (Oliveira, 2009). However, the optimum harvest point requires further studies to evaluate the phase of better forage chemical composition for animal feeding and/or silage production. In the pre-flowering stage, high levels of crude protein and high digestibility fiber are observed, but at the same stage they have a low level of dry matter (Borreani et al., 2007) and therefore require pre-drying. Therefore, the objective of this study was to evaluate the chemical composition of forage and haylage of the following winter cultivars: black oats (Avena strigosa) cv. EMB 139 and cv. IAPAR 61; White oats (Avena sativa) cv. IPR 126 and cv. URS Taura; Barley (Hordeum vulgare) cv. BRS Brau and cv. BRS Cauê; Wheat (Triticum aestivum) cv. BRS Umbu and cv. BRS Tarumã; Rye (Secale cereale) cv. Temprano and cv. BRS Serrano; And triticale (X Triticosecale) cv. IPR 111 and cv. BRS Saturn, harvested at pre-flowering stages.

Materials and Methods The experiment was conducted at the Núcleo de Produção Animal (NUPRAN) of the State University of MidWest, located in Guarapuava - PR. The crop was planted in a no-tillage system, with a row spacing of 0.17 meters, 2 cm depth and a density of 300 seeds/m^2. The experimental area consisted of 48 plots of 9 m^2 each (4.00m x 2.25m), and the experimental design was a randomized block design consisting of 12 treatments and 4 replications. The materials were harvested at the pre-flowering stage, near the scale 10 of Feeks and Large (1954). The contents of hemicellulose (HEM), cellulose (CEL) and lignin (LIG) were determined. The data were submitted to the Tukey test of comparison of multiple means at 5% significance, through the SAS program (1993).

Results and Discussion The forages black oats cv. EMB 139 and barley cv. BRS Brau presented lower lignin contents ($P<0.05$), with values of 5.7 and 5.2%, respectively. The black oat cv. EMB 139 presented the highest cellulose content (42.3%), a component that is obtained through the fractionation of the fibrous portions of the plant, and a high NDF content, thus the quality of the black oats cv. EMB 139 is lower than that of barley cv. BRS Brau. Such portion of the plant has a direct influence on animal consumption, so forages with high levels of NDF have limited consumption (Van Soest, 1994). In the bromatological composition of haylage, barley cv. BRS Brau and wheat cv. Tarumã presented higher levels of hemicellulose in relation to the other cultivars ($P<0.05$), which also can be observed when these cultivars were used as forage. According to Coan et al. (2001), the drying up process of the plant raises the hemicellulose content, and decreases cellulose and lignin, as can be observed. The increase in the percentage of hemicellulose in the plant tends to improve the quality of the NDF, giving to these cultivars a greater capacity of consumption and better digestibility of the fibers (Macedo Júnior et al., 2007). As regards the lignin contents, triticale cv. BRS-Saturn had the

lowest value with 5.1%. This result was equivalent to that found by Coan et al. (2001), working with triticale haylage, which found lignin contents of 5.2%. In addition, the cellulose and lignin content of cv. BRS-Saturn presented lower values in the haylage compared to the forage, a fact that probably occurred due to the pre-drying process as previously mentioned.

Table 1 Hemicellulose, cellulose and lignin contents (DM basis) of forage and haylage of the different winter cereals harvested at the pre-flowering stage

Espécie – Cultivar	Forragem			Silagem pré-secada		
	HEM	CEL	LIG	HEM	CEL	LIG
Black oats – EMB 139	23.7 e	42.3 a	5.7 de	27.3 def	37.5 ab	9.4 abc
Black oats – IAPAR 61	25.1 de	37.1 abc	9.0 bcd	26.2 ef	37.3 ab	8.6 abc
White oats – IPR 126	24.8 de	40.8 ab	6.4 cde	26.1 ef	34.7 ab	10.2 ab
White oats – URS Taura	27.6 bcd	28.4 f	13.6 a	28.2 cde	32.6 bc	6.1 bc
Barley – BRS Brau	31.9 a	34.4 cde	5.2 e	31.4 a	32.4 bc	6.8 bc
Barley – BRS Cauê	28.2 bcd	31.1 de	6.6 cd	29.9 abc	31.7 bc	7.1 abc
Wheat – BRS Umbu	29.7 abc	32.9 def	9.36 bcd	28.6 bcd	34.4 ab	6.9 bc
Wheat – BRS Tarumã	30.5 ab	33.1 def	10.4 ab	30.2 ab	33.7 ab	6.3 bc
Rye – Temprano	27.9 bcd	36.2 cde	9.7 bc	25.7 f	35.7 ab	8.3 abc
Rye – BRS Serrano	25.0 de	36.3 cde	10.7 ab	27.4 def	33.5 ab	9.4 abc
Triticale – IPR 111	26.2 cde	31.8 def	8.1 cd	27.7 def	26.6 c	11.5 a
Triticale – BRS Saturno	29.9 ab	39.5 abc	6.4 cd	29.9 abc	39.2 a	5.1 c
Média	27.5	35.3	8.4	28.2	34.1	8.0
P>F	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
CV, %	5.21	6.11	18.01	3.42	7.16	22.94

Averages followed by different lowercase letters in the column differ from each other by the Tukey test at 5%.

Conclusions The use of barley in the pre-flowering stage presents a proportion of structural carbohydrates more digestible than the other winter cereals, becoming a good option to be used in the diet of ruminants for periods of forage shortage. In addition, the pre-drying process provides an improvement in the quality of the material, as hemicellulose increase and reduction of cellulose and lignin occurs.