

Effect of particle reduction in barn dehydrated hay with an active solar roof collector system: goat intake

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Introduction Animal production systems can be represented by particular control points, such as production level, feeding and desired products. Adding forage with higher particle size in ruminant ration is a two way approach: it improves physically effective fiber, but it can increase selection, mainly by small ruminants. In an alpine goat herd, barn dehydrated herbage hay (stem particle size greater than 20 cm) was distributed as 60% of the ration, which resulted in reduction of intake capacity of lactating animals (Caillat, unpublished data). Chopping moist forage could reduce leaf losses during field loading of biomass but it can also enhance microbial development. The objective of this study was to evaluate the impact of haymaking approaches on goat intake.

Material and Methods The experiment was conducted at the UE FERLus of INRA. Nine non-pregnant and non-lactating alpine goats (66.2 ± 6.9 kg BW, mean \pm SD) were distributed in a triple 3x3 latin square design. The animals received, as feed, three source of hay. The main purpose of that was to evaluate the impact of the particle size reduction on hay nutritional value and, if the reduction could increase goat intake. Herbage hay was chopped at theoretical particle of 170 mm (long) or 85 mm (short) and dried in a barn dryer system (with an active solar roof collector system). As control treatment, hay was also dried and baled from the same field. Hays were offered at 40 g kg⁻¹ DM of BW to observe the real selection by the goats. Each experimental period had fourteen days, being seven for hay adaptation and five of data collection. Every day the quantity of the hay distributed, and the orts were measured. At the final of each experimental periods, samples were taken to characterize hays and orts. Samples were analyzed for DM, ash, NDF, ADF, CP, WSC and IVDMD. Hay composition during experimentation is showed in Table 1. The results of hay and orts chemical analysis were used to calculate the quantity of each component that was ingested by goat. Statistical analysis was performed using a MIXED procedure, considering treatments (source of hays) as fixed effect and the squares, animals and periods as random, according analyze proposed by (Tempelman, 2004). Means were compared by contrast, with objective to see the impact of drying technology (Field vs. Barn) and particle size in the barn (Barn Long vs. Barn Short), considering effects to be significant at 5% ($P < 0.05$)

Results and Discussion There were no differences among treatments for DM and OM ingested by goats (Table 2). The main impact observed on the component intake in this study was caused by hay quality, once the particle size did not differ so much (Table 1).

Table 1 Chemical and physical composition of the offered hay.

Item	Bale		Long		Short	
	Mean	SD	Mean	SD	Mean	SD
DM ¹	88.1 ± 0.44		88.1 ± 0.33		88.8 ± 1.34	
OM ²	90.6 ± 0.42		90.9 ± 0.43		91.2 ± 0.13	
NDF ²	50.6 ± 8.66		45.7 ± 0.36		48.8 ± 0.97	
ADF ²	27.9 ± 3.64		27.8 ± 0.48		29.8 ± 1.01	
CP ²	13.4 ± 1.63		13.9 ± 1.41		12.6 ± 0.34	
WSC ²	7.16 ± 2.10		8.56 ± 1.61		8.60 ± 0.86	
IVDMD ²	64.5 ± 5.03		66.8 ± 3.03		63.8 ± 3.42	
<i>Physical evaluation - Penn State Particle Separator</i>						
19 mm ²	81.6 ± 15.93		89.4 ± 2.26		81.4 ± 7.04	
8 mm ²	4.26 ± 1.72		5.59 ± 1.46		8.71 ± 3.52	
4 mm ²	4.88 ± 4.31		3.01 ± 0.56		4.58 ± 1.41	
Bottom ²	9.27 ± 9.94		1.96 ± 0.41		5.35 ± 4.61	
peNDF ²	427 ± 95.7		414 ± 23.7		393 ± 17.8	

¹g kg⁻¹; ²g kg DM⁻¹;

The difference in CP intake between barn dried hays could be explained by possible greater microbial activity during dehydration in short hay (Wittenberg, 1997).

Table 2 Dry matter and nutritional compounds of hay (g kg⁻¹ of BW) intake by goats (n, 27)

Item	Bale	Barn		SE	Contrasts	
		Long	Short		F vs B	L vs S
DM	28.3	29.5	28.6	0.57	0.184	0.146
OM	25.5	26.7	25.9	0.51	0.116	0.153
NDF	14.1	13.0	13.3	0.23	< 0.001	0.189
ADF	7.38	7.47	7.60	0.14	0.273	0.451
HEM	6.75	5.51	5.71	0.10	< 0.001	0.079
CP	4.01	4.33	3.89	0.07	0.263	0.001
WSC	2.11	2.66	2.61	0.05	< 0.001	0.375

Conclusion In this work, reducing dehydrated herbage particle size in barn system resulted in soluble compounds decrease, which negatively affected nutrients intake. The reduction range of particle size, evaluate in this study, did not improve goat intake.

References

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