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# Effect of different protein sources in ensiled sugar beet pulp-based diets on the performance of fattening lambs

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**Abstract.** The aim of this study was to compare the effects of using different sources of protein in ensiled sugar beet pulp-based diets on production performance of lambs. Eighteen Moroccan synthetic breed lambs "Dman\*Boujaad" (19.7±1.07 kg initial body weight) were used to carry out this trial during 70 days preceded by a period of 15 days of adaptation to the experimental diets. Lambs were randomly assigned to three treatments (6 animals per treatment) and received a diet containing ensiled sugar beet pulp, barley straw, maize grain and three different protein sources:  $T_{TTS}$  (sunflower meal),  $T_{TS}$  (soybean meal) and  $T_{urea}$  (urea). Lambs were weighed at the beginning and at the end of the trial, and fortnightly in order to determine dry matter intake (DMI), average daily gain (ADG), feed conversion ratio (FCR) and feeding cost. The average daily gain was affected by the type of protein source (P<.0001). It was 173.4, 244.5 and 91.1 g/d for  $T_{TTS}$ ,  $T_{TS}$  and  $T_{urea}$ , respectively. Feed conversion ratio (kg DMI/kg ADG) was 6.65, 4.70 and 9.21 for  $T_{TTS}$ ,  $T_{TS}$  and  $T_{urea}$ , respectively. The feeding cost (Moroccan dirham (MAD)/kg ADG) was 20.5, 16.3 and 26.6 for  $T_{TTS}$ ,  $T_{TS}$  and  $T_{urea}$ , respectively. The inclusion of soybean meal in ensiled sugar beet pulp-based diets improves fattening performance of lambs.

Keywords. Protein source - Ensiled sugar-beet pulp - Lamb - Fattening.

#### Effets de différentes sources protéiques des rations à base de pulpe de betterave ensilée sur les performances d'engraissement des agneaux

**Résumé.** L'objectif de ce travail était de comparer les effets de différentes sources protéiques dans les régimes à base de pulpe de betterave ensilée sur les performances d'engraissement des agneaux d'engraissement. Ainsi, Dix-huit agneaux de race synthétique "Dman \* Boujaad" (19,7 ± 1,07 kg de poids vif) ont été utilisés pour mener cet essai durant 70 jours précédée par 15 jours d'adaptation aux régimes alimentaires. Les agneaux ont été répartis au hasard en trois traitements (6 agneaux chacun) et recevaient une ration contenant la pulpe de betterave ensilée, la paille d'orge, le maïs et trois différentes sources protéiques :  $T_{TTS}$  (tourteau de tournesol),  $T_{TS}$  (tourteau de soja et  $T_{urea}$  (Urée). Les agneaux ont été pesés au début et à la fin de l'essai et tous les quinze jours afin de déterminer le gain moyen quotidien (GMQ), l'indice de consommation (IC) et le cout alimentaire (CA). Le régime alimentaire a affecté significativement le GMQ (P<0,0001), les valeurs enregistrées sont 173,4, 244,5 et 91,1 g/j respectivement pour  $T_{TTS'}$ ,  $T_{TS}$  et  $T_{urea'}$ . L'indice de consommation (Kg MSI/ KG GMQ) était de 6,65; 4,70 et 9,21 respectivement pour  $T_{TTS'}$ ,  $T_{TS}$  et  $T_{urea'}$ . L'incorporation de tourteau de soja dans une ration à base de pulpe de betterave ensilée améliore les performances d'engraissement des agneaux.

Mots-clés. Source protéique - Pulpe de betterave ensilée - Agneaux - Engraissement.

### I – Introduction

Silage of sugar beet pulp is a technique recently introduced in Morocco allowing to reduce the preservation cost of this by-product in comparison with the dehydration technique. Karalazos and Giouzeljannis (1988) reported that sugar beet pulp can be ensiled when its dry matter content is

greater than 15%. In addition, Martelli *et al.*, (1999) indicated that nutritional qualities of ensiled sugar beet pulp are well preserved or even improved.

Several studies are shown that the use of ensiled sugar beet pulp has a high feed value and a positive effect on ruminal fermentation (Rohr *et al.*, 1986). In this regards, Murphy (1986) reported that the nutritional value of this feed is comparable to barley forage.

For a better utilization of this resource in ruminant diets, the choice of an adequate protein source is essential to ensure a good synchronization of energy and protein intake and therefore a better functioning of the ruminal microbiota. The objective of this work was to evaluate the effect of the nature of nitrogenous source in ensiled sugar beet pulp-based diets on the fattening performance of lambs.

## II – Material and methods

Eighteen Moroccan synthetic breed lambs "Dman\*Boujaad" with initial weight of 19.7±1.07 and age of 120 ± 20.4 days were used to carry out this experiment during 70 days preceded by 15 days for diet adaptation. Lambs were randomly assigned to three treatments (6 animals per treatment) and received a diet containing ensiled sugar-beet pulp, barley straw, maize and three different nitrogenous sources:  $T_{TTS}$  (sunflower meal),  $T_{TS}$  (soybean meal) and  $T_{urea}$  (urea). Diets are distributed as total mixed ration (TMR) twice daily (at 9h and 12h). All used diets are isoenergetic. Ingredients and chemical composition of used diets in this trial are presented in Table 1.

	•		
		Diet	
	T <sub>TTS</sub>	T <sub>TS</sub>	T <sub>urea</sub>
Ingredients (%, Dry matter weight basis)			
Ensiled sugar beet pulp	30	30	30
Wheat straw	30	35	33
Maize grain	10	13	32
Sunflower meal	30	0	0
Soybean meal	0	22	0
Urea	0	0	5
Chemical composition (% Dry matter)			
Dry matter	68.7	67.8	68.2
Organic matter	94.7	94.7	96.0
Ash	5.3	5.3	4.0
Crude protein	13.3	16.2	20.7
Neutral detergent fiber	50.3	41.7	39.9
Acid detergent fiber	36.7	30.2	27.4
Lignin	8.6	5.8	5.2
Fat	1.7	1.8	2.0

Table 1	I. Ingredients	and chemica	l composition	of experimental	diets
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 $T_{TTS}$ : Diet containing sunflower meal as protein source;  $T_{TS}$ : Diet containing soybean meal as protein source;  $T_{Urea}$ : Diet containing urea as protein source.

The intake amounts were determined daily. Lambs were weighed before morning feeding, at the beginning and the end of the trial and every 15 days during the trial. Free clean water and mineral block were available all the time.

The effect of the nature of nitrogenous sources used in the diet on final weight and average daily gain (ADG) was analyzed was analyzed by means of a one-way analysis of variance according to the model:  $Y_{ij} = \mu + T_i + \varepsilon_{ij}$ , where  $T_i$  represents the diet effect and  $\varepsilon_{ij}$  the experimental error. The PROC GLM procedure of the SAS statistical package was used for the analysis. Comparisons among mean values were tested using the LSD test.

# III – Results and discussion

### 1. Fattening performances

Table 2 shows the fattening performances of lambs fed diets containing different protein sources. Lambs fed ensiled sugar beet pulp-based diet with soybean meal as protein source ( $T_{TS}$ ) presented the higher performances (P <0.01) in comparison with lambs fed  $T_{TTS}$  and  $T_{Urea}$ . The lowest final body weight and average daily gain were recorded in lambs receiving urea as protein source in the diet, while lambs fed  $T_{TTS}$  diet achieved intermediate performances. This difference might be due, in addition to the nature of the protein source, to the protein content of the different diets.

Our obtained results were superior to values reported by Deniz *et al.*, (2002) on fattening lambs using 4 diets: EM (corn silage), F (grass hay), SBPSM (beet silage + 1 % urea + 5% beet molasses) and SBPHM (beet silage + 0% urea + 5% beet molasses)). The ADG found over a 60-day period are 4.62; 5.93; 2.85 and 3.45 kg for EM, F, SBPSM and SBPHM, respectively.

#### Table 2. Fattening performance of lambs fed diets with different nitrogenous sources

	Diet			SEM	Р
	T <sub>TTS</sub>	T <sub>TS</sub>	T <sub>Urea</sub>		F
Initial body weight (kg)	18.6	17.6	18.3	_	_
Final body weight (kg)	33.1 <sup>ª</sup>	36.5ª	24.6 <sup>b</sup>	1.74	0.0013
Average daily gain (g/d)	173.5 <sup>b</sup>	244.5 <sup>a</sup>	91.2°	13.49	<.0001

 $T_{TTS}$ : Diet containing sunflower meal as protein source;  $T_{TS}$ : Diet containing soybean meal as protein source;  $T_{Urea}$ : Diet containing urea as protein source; SEM: standard error of the mean; P: probability of the differences; <sup>a,b,c</sup> Means with different superscripts are significantly different (P<0.05).

### 2. Intake, feed conversion and feeding cost

The obtained results related to the intake, feed conversion ratio and feeding cost are shown in Table 3. The intake amounts were 1.14, 1.13 and 0.82 kg DM/d for  $T_{TTS} T_{TS}$  and  $T_{Urea}$ , respectively. The low feed intake in  $T_{Urea}$  lambs may be due to ammonia nitrogen produced in the rumen (Bartley and Deyoe, 1975). The feed conversion ratio was 6.65, 4.7 and 9.21 Kg DMI/ kg ADG for  $T_{TTS} T_{TS}$  and  $T_{Urea}$ , respectively. The feeding cost was 20.52, 16.30 and 26.62 MAD/kg ADG for  $T_{TTS} T_{TS}$  and  $T_{Urea}$ , respectively. The feeding cost was 20.52, 16.30 and 26.62 MAD/kg ADG for  $T_{TTS} T_{TS}$  and  $T_{Urea}$ , respectively.  $T_{TS}$  diet showed the lowest feed conversion and feeding cost, which may be to the high content of essential amino acids such as lysine and methionine in the soybean meal (Huber, 1991). Satter and Roffler 1975) reported that urea use is better when incorporated with a rapidly fermentable energy source.

Table 3. Intake, feed conversion and feeding cost of ensiled-sugar-beet-pulp based diets containing different protein sources

		Diet		
	T <sub>TTS</sub>	T <sub>TS</sub>	T <sub>urea</sub>	
Intake (kg DM/d)	1.14	1.13	0.82	
Feed conversion (kg DMI/kg ADG)	6.65	4.70	9.21	
Feeding cost (MAD/kg ADG)	20.52	16.30	26.62	

 $T_{TTS}$ : Diet containing sunflower meal as protein source;  $T_{TS}$ : Diet containing soybean meal as protein source;  $T_{Urea}$ : Diet containing urea as protein source; DMI: Dry matter intake; ADG: Average daily gain; MAD: Moroccan dirham (1 MAD= 0.09 €).

### **IV – Conclusions**

The results of this work show that soybean meal is a good protein source in an ensiled sugar beet pulp based diets for lamb fattening. However, the inclusion of urea at a level of 5% does not present a good alternative to reduce the feeding cost and feed conversion. From these results, it is interesting to carry out others trials in order to find the adequate incorporation level of urea in ensiled sugar beet pulp based diets.

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