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Growth Response of Djallonké Sheep Supplemented with Urea-Treated Rice Straw in the Dry Season

A short communique

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ABSTRACT

A study was conducted to determine the optimum level of urea inclusion in the treatment of rice straw as supplementary feed for improving the growth performance of Djallonké sheep in the dry season. Eighteen Djallonké sheep (6-9 mo; ~11.8 kg) were randomly assigned to one of the three dietary treatments in 84-d feeding trial to determine the effect of urea-treated straw on growth performance. Rice straw was treated with urea at 0% (T1), 5% (T2) and 7% (T3). Feed intake was greater (P = 0.001) for sheep that did not receive urea rice-treated compared to those that did but this difference did not reflect in growth performance (P > 0.05). Under the conditions of the present study, the benefits of feeding urea-treated rice straw to sheep in the dry season were negligible.

Keywords: Djallonké, dry season supplementing, rice straw, urea

INTRODUCTION

The Djallonké sheep is an important socio-economic animal providing meat, skin, manure and income to rural farmers. In the northern region, sheep gain weight during the wet season when there is sufficient forage and lose it in the dry season when there is limited availability of forage, often with poor digestibility. To prevent the phenomenon of ruminants gaining weight during the wet season and losing them in the dry season, supplementary feeding is encouraged. Rice straw is an abundant agricultural by-product which serves as roughage for ruminants. The utilization of rice straw by sheep is however limited by deposition of recalcitrant phenolic compounds that limit digestibility and nutritional value of the straw. Urea (~46% N) is a common fertilizer and local farmers have become accustomed to its handling. It poses no hazard to human health but farmers are generally concerned about toxicity to livestock, nonetheless urea by itself is not toxic, rather the ammonia produced from urea degradation in the rumen may pose risk to the animal and natural water bodies if there is excessive excretion. This study determined the growth performance of Djallonké Sheep supplemented with urea-treated rice straw in the dry season.

MATERIALS AND METHODS

Experimental animals, feeding and management

Eighteen Djallonké sheep (6-9 mo; ~11.8 kg) were stratified by sex (12 males; 6 females) and randomly assigned to one of three dietary treatments in 84-d feeding trial. Rice straw was treated with urea at 0% (T1), 5% (T2) and 7% (T3). The animals were kept in a house with a roof and concrete floor. They were released between 0730 h and 0845 h every morning. The supplementary feed was offered upon return from grazing. Prior to the start of the study, the animals were dewormed with Albevet 2.3%® and treated of external parasites with Alvomek®.

The animals were adapted for two weeks on the experimental diets before the commencement of the study. Each animal received the equivalent of 2% of its body weight. This was offered once, between 600 h and 800 h daily upon return from grazing on natural pasture. Water was provided *ad libitum*. Feeding lasted for 84 d.

Rice straw obtained by hand-thrashing was sun-dried and chopped to a theoretical length of 5-10 cm and then divided into three equal portions of 100 kg each. The first was sprayed with water (0% urea) whereas the second and third lots were sprayed with 5% and 7% before being ensiled. The urea solutions were prepared by dissolving 5 kg and 7 kg of urea in 100 L each of water in a plastic drum. For ensiling, each 100-kg treated straw was put on a plastic sheet spread on the concrete floor. The ends of the sheet were rolled over to cover the pile and compressed with concrete blocks. After 20 d of ensiling, the treated straw was air-dried for a day before commencement of the adaptation period during which the animals received their dietary treatments. Dry matter of the feed offered and of orts collected were similarly determined (60ºC for 48 h) weekly and used to estimate DM intake.

Intake of the supplemented diet was monitored throughout the experimental period. Feed offered and orts for each day for each pen were weighed daily for estimation of feed intake as the difference between the amount of feed offered and orts collected the next day. Animals were weighed weekly and the data was used to estimate average daily gain (ADG).

Experimental design and Statistical analysis

There were two sheep per pen and six sheep per treatment (n = 3). The animals were assigned to each treatment in a completely randomized design (CRD) and data was analyzed by the MIXED procedure of SAS (SAS Inst. Inc.) and separation of least square means where significant difference were observed, was done with Bonferroni adjustment. Difference between least square means were declared at P = 0.05 or less

RESULTS AND DISCUSSION

The ammoniation resulted in increased crude protein content of the rice straw (Table 1) due to the residual nitrogen from the ammoniation processes (Amaning-kwarteng et al., 2010). Feed intake was higher (P = 0.0001) for sheep in T1 compared to the other treatments (Table 2). There was an apparent linear decrease in feed intake as the level of urea in the straw increased. The lower intake by sheep fed the urea-treated straw was not evident in their growth performance as no negative effects on growth performance was observed. Average daily gain was not affected (P = 0.775) by urea application. It therefore appears there are no economic benefits to treating rice straw with urea at the levels tested in this study.

Urea is converted to microbial protein and NH_3 in the rumen by rumen microbes. The microbial protein flows past the rumen, for digestion and absorption mainly in the small intestine. The NH_3 is absorbed in the rumen, reticulum and omasum. It is carried in the portal vein to the liver, where it is detoxified to urea and recycled into the mouth through saliva.

Oral urea poisoning is basically poisoning due to excessive NH_3 production in the rumen. Normal levels of NH_3-N are 60-680 mg/L in rumen fluid and 0.8-2.5 mg/L in blood. When NH_3 levels in rumen fluid exceed 500-800 mg/L, NH_3 levels increase in the peripheral blood (Rogers, 1999). Cattle can tolerate up to 5% whereas sheep on a good diet can tolerate urea up to 6% of urea in feed DM, provided it is well mixed with forage and is fed over the whole day (Rogers, 1999).

Feed intake in T2 and T3 were lower. As the animals were relatively younger, feed intake was likely to be reduced because urea utilization is less efficient in younger animals and may cause poisoning when its concentration is greater than 8%. Severe signs of urea poisoning include cyanosis, severe respiratory distress decumbency and death. However, sub-clinical poisoning may show no obvious signs or negative effects on production except brownish mucosae.

REFERENCES

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Table 1. Chemical composition of experimental diets from (calculated from feed nutritional tables)

Item	0% urea (T1)	5% urea (T2)	7% urea (T3)
Dry matter (%)	81	74	72
Crude protein	0.670	2.011	2.347
Calcium (g/kg)	0.130	0.145	0.208
Phosphorus (g/kg)	0.032	0.034	0.041

Table 2. Effect of varying levels of urea inclusion on feed intake and growth performance of sheep

Item	Treatment			SEM	P-value
	0% urea (T1)	5% urea (T2)	7% urea (T3)		
Initial weight (kg)	12.25	11.75	11.58	1.334	0.875
Final weight (kg)	14.42	15.42	14.00	1.724	0.708
Feed intake (g/day)	64.51a	47.77b	40.19c	3.733	0.0001
ADG (g/day)	25.83	43.69	28.81	18.90	0.775
Feed conversion efficiency	0.451	1.32	0.885	0.696	0.465

abcMeans bearing different superscripts on the same row are significantly different ($P<0.05$)