BROILER LITTER AND UREA-TREATED WHEAT STRAW AS FEEDSTUFFS FOR ALPINE DOELINGS

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Abstract

Thirty-two Alpine doelings (15 wk of age, 12 ± 2.05 kg) were randomly allocated to four treatments to evaluate the use of deep-stacked broiler litter (BL) and urea-treated wheat straw (UWS) as feedstuffs. In all treatments, UWS or untreated wheat straw (WS) was fed for ad libitum consumption along with a concentrate supplement fed at a prescribed percentage of BW. Treatments were: U B a corn-based concentrate (1.3% N) fed at 1.5% BW with UWS (2.1% N); S B a corn:soybean meal concentrate (3.2% N) fed at 1.9% BW with WS (0.5% N); LL B a corn:BL concentrate (2.3% N, BL at 0.8% BW) fed at 2.2% BW with WS; and HL B a corn:BL concentrate (2.7% N, BL at 1.6% BW) fed at 3.0% BW with WS. Animals were housed individually and fed once daily. Body weights were determined at 2-wk intervals prior to daily feeding during the 12-wk trial; ADG was calculated by regression. HL doelings consumed a greater amount of DM ($P < 0.05$) throughout the trial than did LL, S and U animals (54.7, 45.0, 35.9, and 36.4 kg, respectively, SE = 11.64). ADG did not vary among treatments ($P > 0.05$) and was 66, 63, 70, and 61 g/d (SE = 7.1) for HL, LL, S, and U, respectively. Feed conversion efficiency was lower ($P < .05$) for HL and LL than for S doelings, whereas U doelings had a feed conversion efficiency similar to S and LL but greater than HL ($P < 0.05$) (170, 145, 122, and 103 g gain/kg DMI for S, U, LL, and HL, respectively; SE = 11.6). Results indicate that both BL and UWS can be used as feedstuffs for replacement Alpine doeling growth during the early post-weaning period. The possibility of using modified crop residues and animal by-products as feedstuffs for goats is very important in countries such as Ethiopia where the availability and use of more conventional feedstuffs is limited.

Introduction

Crop residues from cereal grain production represent a key element in ruminant nutrition. Crop residues are, however, low in protein and high in fiber, which limits their voluntary intake and digestibility by ruminants. The nutritive value of crop residues can be improved by various processing means. Ammoniation of crop aftermath using urea-ammonia treatment improves performance of ruminants, partly due to the added nitrogen and partly as a result of fiber solubilization bond breakage from the added alkali. However, the degree to which animal performance is enhanced by ammonia or urea treatment is limited because of ceilings to changes in digestibility and nitrogen concentration and in efficiency of use of added nitrogen. Supplemental feeds added to crop residues to boost the crude protein content, also improves the nutritive value of straws. One possible non-conventional supplement to crop residues that can increase the nitrogen content of the diet is broiler litter.

Broiler litter is a significant byproduct of poultry production, which is a mixture of excreta or manure, bedding, spilled feed, etc. Broiler litter is high in nitrogen, about 4.6% dry matter, and of low to moderate organic matter digestibility. Nitrogenous compounds in poultry litter, up to one-half are in the form of protein, are generally degraded rapidly to ammonia in the rumen. Whereas research has shown that broiler litter can be successfully included in the diets of beef cattle of different ages and physiological states, there is little data concerning the use of broiler litter in goat diets. Therefore, this experiment was conducted to compare intake, weight gain, and feed efficiency of growing Alpine doelings consuming diets based on wheat straw supplemented with different levels of broiler litter to that of doelings supplemented with a conventional protein source (soybean meal) or based on wheat straw ammoniated through urea treatment.

Materials and Methods

Thirty-two Alpine doelings (15 wk of age, 12 _ 2.05 kg) were randomly allocated to four treatments to evaluate the use of deep-stacked broiler litter (BL) and urea-treated wheat straw (UWS) as feedstuffs. UWS was prepared by mixing coarsely ground wheat straw with a solution of feed grade urea (46% N) and water to raise the moisture level to approximately 36% and provide a level of added N equivalent to 3% DM. Treated straw was then tightly sealed in heavy duty plastic bags for at least 3 wk prior to use. Broiler litter was harvested from a local commercial production unit at a moisture level of 20 to 25%, then deep-stacked for at least 3 wk before mixing with other diet ingredients. In all treatments, UWS or untreated wheat straw (WS) was fed for ad libitum consumption along with a concentrate supplement (Table 1) fed at a prescribed percentage of BW. Treatments were: U B a corn-based concentrate (1.3% N) fed at 1.5% BW with UWS (2.1% N); S B a corn:soybean meal concentrate (3.2% N) fed at 1.9% BW with WS (0.5% N); LL B a corn:BL concentrate (2.3% N, BL at 0.8% BW) fed at 2.2% BW with WS; and HL B a corn:BL concentrate (2.7% N, BL at 1.6% BW) fed at 3.0% BW with WS. Animals were housed individually, fed once daily, and had free access to water. Body weights were determined at 2-wk intervals prior to daily feeding during the 12-wk trial; ADG was calculated by regression. During the trial, three animals were removed due to health reasons.

Data was statistically analyzed by General Linear Models procedures of SAS, with a model consisting of treatment. Differences among means were determined by least significant difference with a protected F-test ($P < 0.05$).

Results

Urea treatment of wheat straw showed expected increases in N content and in-vitro DM disappearance (IVDMD; Table 2). Throughout the trial the concentrate portion of the diets was totally consumed. HL doelings consumed a greater amount of DM ($P < 0.05$) throughout the trial than did LL, S and U animals (Table 3). Intake as a percentage of BW was higher for treatments fed BL, with greater levels of concentrate supplementation, than for U and S animals. However, higher intakes for diets with BL did not lead to greater ADG, which was similar among treatments ($P > 0.05$). Feed conversion efficiency was lower ($P < 0.05$) for HL and LL than for S, whereas U had a feed conversion efficiency similar to S and LL but greater than for HL.

Conclusions

Results from this trial indicate that both BL and UWS can be used as feedstuffs for replacement Alpine doeling growth during the early post-weaning period. The possibility of using modified crop residues and animal by-products as feedstuffs for goats is very important in countries such as Ethiopia where the availability and use of more conventional feedstuffs is limited.

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Table 1. Composition (% DM) of concentrates fed in the following treatments: U - fed at 1.5% BW with urea-treated wheat straw; S - fed at 1.9% BW with wheat straw (WS); LL - fed at 2.2% BW with WS; and HL - fed at 3.0% BW with WS.

	Treatment			
Ingredient	S	LL	HL	U
Ground corn	69.62	57.97	42.95	88.60
Dried molasses product	5.36	4.46	3.30	6.81
Chromic oxide	0.32	0.27	0.20	0.41
Trace mineral salt	0.80	0.20	0.15	1.02

Vitamin premix	0.80	0.70	0.50	1.02
Soybean meal	21.42	0.00	0.00	0.00
Broiler litter	0.00	35.67	52.85	0.00
Deccox	0.08	0.07	0.05	0.10
Dical	0.80	0.33	0.00	1.02
Limestone	0.80	0.33	0.00	1.02

Table 2. Feed Composition (%) of untreated (WS) and urea-treated (UWS) wheat straw and four concentrate diets: U - fed at 1.5% BW with urea-treated wheat straw; S - fed at 1.9% BW with wheat straw (WS); LL - fed at 2.2% BW with WS; and HL - fed at 3.0% BW with WS.

Feed	Composition						
	DM	OM	N	NDF	ADF	ADFN	IVDMD
Straw							
UWS	65.4	95.1	2.07	76.0	56.7	0.22	67.8
WS	89.3	95.0	0.47	82.3	55.0	0.08	47.7
Concentrate							
HL	82.2	87.4	2.66	25.2	11.0	1.29	94.6
LL	84.5	89.7	2.35	21.1	9.2	1.06	94.6
S	88.8	92.9	3.16	11.3	6.1	0.39	96.0
U	88.5	94.3	1.27	11.1	5.1	0.08	95.1

Table 3. Dry matter intake over the whole trial(DMI), intake as a percent BW (IBW), daily gain (ADG), and feed conversion efficiency (FC) for Alpine doelings fed either urea-treated (U) or untreated wheat straw with a control (C) or broiler litter-containing concentrate (LL, HL).

	Treatment				
	S	HL	LL	U	SE
DMI, kg	35.9b	54.7a	45.0b	36.4b	11.64
IBW, %	2.95b	4.16a	3.67a	3.05b	0.195
ADG, g/d	70	66	63	61	7.1
FC, g gain/kg DMI	170a	103c	122bc	145ab	11.6

Row means with different superscripts differ, P <0.05

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