
Effect of feeding urea-treated wheat straw on rumen environment in Awassi sheep

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Abstract :

The effect of daily feeding of urea- treated wheat straw on physicochemical properties and microbial activity in rumen liquor of Awassi sheep was investigated. Colour, odour, viscosity, methylene blue reduction test, sedimentation activity test and glucose fermentation test were not affected by urea-treated straw. Slight effect on pH and microbial concentration and motility was observed but simultaneously corrected. It is concluded that feeding of urea-treated straw has no adverse effects on rumen environment in sheep.

Introduction:

Wheat straw is the most abundant agricultural residue in Saudi Arabia. It is widely used as cheap source of bulk feed in ruminants. The feed value of wheat straw is, however limited by its low available energy, low protein, minerals and vitamins (Chung *et. al.*, 1992). High content of structural carbohydrates and silica and low nitrogen content of these straws lead to low palatability and poor nutrients utilization in ruminants. Incorporation of these poor quality roughages in complete diets improves both palatability and nutrient utilization (Reddy and Reddy 1986, Sengar *et. al.*, 1999). It is now an established practice in some parts of the world to upgrade the protein content of low quality roughages by urea treatment (Hussein *et. al.*, 1991). Rumen environment is greatly influenced by nature of the diet, roughage to concentrate ratio, frequency of feeding and protein quality (Yan *et. al.*, 1998). This study was conducted to investigate the effect of urea-treated straw on the activity of ruminal microflora and physicochemical properties of ruminal fluid.

Materials and Methods:

Animals :

Ten mature Awassi sheep (2-3 years old) of both sexes were used in the study. They were housed in pens with free access to Rhodes grass, water and salt licks.

Treatment of straw:

Wheat straw samples were sprayed with urea solution (12%) at 40ml/100g of straw. The urea-treated straw was then kept in air tight container for urealysin reaction for 8 weeks as previously reported (AL-Shami and AL-Sultan, 2006).

Feeding trail:

Animals were divided randomly into two groups. Group 1 (5 sheep) was given daily 200g wheat straw. Group 2 (5 sheep) was given daily 200g urea treated straw for 21 days. Feeding usually commenced at morning times.

Sampling:

About 10 ml of rumen liquor was collected with the help of paraffin lubricated stomach tube from all animals before starting of feeding trail and at 4, 8, 12 and 16 hours after feeding.

Analysis of samples:

Rumen liquor was immediately evaluated for physical characteristics (Rosenberger, 1979), pH by portable pH-meter (Hitachi, Japan), protozoal count and viability according to Mishra *et. al.*, (1972), glucose fermentation test (Nicholas and Penn 1958), sedimentation activity test and methylene blue reduction time (Rosenberger, 1979) were also measured. The data was analysed statistically according to Snedecor and Cochran (1967).

Results and Discussion:

Physicochemical properties (Table 1) of rumen fluid such as colour, odour, viscosity, methylene blue reduction test, sedimentation activity test and glucose fermentation test were similar in both group 1 (control) and group 2 (urea-treated straw) suggested that feeding of urea-treated straw did not affect rumen environment adversely at least regarding these parameters. The value of pH in group 2 tended to be acidic but not significantly. The pH was affected by production of nitrogen and volatile fatty acids (Reddy and Reddy 1986, Yan *et. al.*, 1998). Moreover, quality of dietary protein alters pH, total volatile fatty acids, dry matter disappearance and microbial protein synthesis (Yan *et. al.*, 1998). The increase in protozoa concentration and motility observed in animals of group 2 compared to group 1 probably to cope with feeding of urea or nitrogen. Ruminant microorganisms are known to carryout a wide variety of biotransformation reactions including reduction, hydrolysis, dealkylation, dehydrogenation, deamination and ring fission (Jenkins, 1988). The changes in pH and microbial activity were

occurring at 4 hours post feeding and disappeared at 8 hours post feeding. The subsequent decline in pH and microbial activity at 8 hours post feeding maybe due to changes in rumen volume through inflow of saliva (Murali *et al.*, 1989).

Treating roughages with urea is very important from the point of improving their palatability and digestibility and to enhance protein synthesis within the rumen. It is now an established practice in some parts of the world to upgrade the protein content of low quality roughages by urea treatment (Hussein *et. al.*, 1991, and AL-Shami and AL-Sultan, 2006) and this treatment improves both their palatability and nutrient utilization (Reddy and Reddy 1986, Sengar *et. al.*, 1999).

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Table (1)
Physicochemical and microbial changes during urea-treated wheat straw in sheep

Parameter	Group1						Group2					
	0	4	8	12	0	4	8	12	0	4	8	12
	LG	LG	LG	LG	LG	LG	LG	LG	LG	LG	LG	LG
Colour	LG	LG	LG	LG	LG	LG	LG	LG	LG	LG	LG	LG
Odour	A	A	A	A	A	A	A	A	A	A	A	A
Viscosity	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV
pH	6.72	6.70	6.71	6.70	6.72	6.40	6.65	6.70	6.72	6.40	6.65	6.70
Methylene blue reduction test (min)	3.65	3.70	3.72	3.65	3.65	3.70	3.60	3.70	3.65	3.70	3.60	3.70
Sedimentation test (min.)	12.16	12.20	12.15	12.20	12.15	12.70	12.20	12.15	12.15	12.70	12.20	12.15
Glucose fermentation (ml/hr)	1.65	1.66	1.70	1.65	1.67	1.54	1.65	1.65	1.67	1.54	1.65	1.66
Protozoa concentration	+++	+++	+++	+++	+++	++++	+++	+++	+++	++++	++++	+++
Protozoa motility	+++	+++	+++	+++	+++	++++	+++	+++	+++	++++	++++	+++

LG=light green, A=Aromatic, SV=Slightly viscous, ++++= High number or motility, +++ = Abundant number or motility

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تأثير إطعام التبن المعالج باليوريا على بيئة الكرش في الأغنام

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الملخص :

لقد تم دراسة تأثير الإطعام اليومي للرووس المعالج باليوريا على الخواص الفيزيوكيميائية و نشاط ميكروبات الكرش في الأغنام العواسي. وحيث تم ملاحظة عدم التغير في اللون و الرائحة واللزوجة و اختبار المثالين بلو الاختزالي و اختبار الترسيب وكذلك اختبار تخمر الجلوكوز. وأيضا تم ملاحظة تأثيرات طفيفة حالما عادت الي طبيعتها في مقدار الاس الهيدروجيني و نشاط ميكروبات الكرش. لقد تم استنتاج إن إطعام الرووس المعالج باليوريا ليس له تأثيرات جانبية على بيئة الكرش.