Reflect of adding three levels of urea to straw in feeding lambs (hamdani strain) on the performance and some blood biochemical traits

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Abstract

This study was conducted in the Shaqlawa Technical Institute of Erbil Polytechnic University in the Kurdistan region of Iraq (from 15/4/2019 till 15/6/2019). It is aimed at determining the effects of using non-urea-treated and urea-treated straw with two levels of nitrogen on the amount of daily feed intake, the weight gain, feed conversion rate and certain blood parameters. 24 Hamdani lambs with an average weight of 24.5 kg and ages of 4 to 6 months were randomly divided into 4 treatments groups: treatment group 1 (T0) without any addition of urea, group 2 (T1) addition of 10% urea, group 3 (T2) addition of 15% urea and group 4 (T4) addition of 20% urea. The results showed all treatments to be non-significant ($P \leq 0.05$) for initial weight. For the final weight, the best values were observed in T1 for both low and high levels of non-decomposed nitrogen, in T3 just for a high level of non-decomposed nitrogen. T1 also showed the best value for daily access weight (g). Feed conversion was significant ($P \leq 0.05$) in T1, followed by T2, both for high and low levels of non-decomposed nitrogen, respectively. For blood qualities, it was found that T3 and T4 (adding 15% Urea and 20%, respectively) had the most positive effect on blood components.

Hamdani lambs, performance and blood composition

Introduction

Livestock is an important resource in the Kurdistan region of Iraq, occupying a unique place in the national economy. It has therefore been necessary to focus on developing it in order to contribute to advancing progress in this sector. For many years, researchers have been interested in assessing the needs of ruminants for protein and energy. This is because of their great importance in improving the performance of these animals and thus obtaining maximum yields. Walls et al. (1988). Important in this respect is the provision in ruminants of roughage alongside concentrated feed to prevent mass formation in the digestive tract and indigestion as well as providing for the physiological needs of these animals (Hassan et al.,1998a).

Due to the severe shortage of roughage and natural pastures, it is important in the country to use large amounts of feed for ruminants since the rough feed in their rations – although its nutritional value is low – contains a high percentage of lignin, which leads to a low digestion factor. AL-Khawaja et al. (1978). This waste is considered very necessary in the feed of ruminants. It has important uses, including the prevention of environmental pollution, over 21 billion tons of which is produced annually, about 45% of which occurs in Asia (Wilke, 1992).

Blood plays a decisive role in the regulation of life processes. Blood status within the normal range shows that there is at least no pathological condition. Thus, when there is a change in the management and environment, or type feeding, it will be reflected in the blood biochemistry, e.g. in proteins, cholesterol, enzyme activity and other blood parameters. Furthermore, most researchers have been attempting to use certain physiological blood parameters as an indicator of diet markers for production (Horton and Nicholson, 1981).

Improvements in the intake of poor quality roughage are due to an improvement in digestion factors – owing to chemical treatment outside the animal body, or an improvement in the efficiency of the microorganisms inside the rumen, which increases the digestion factor of the different nutrients by providing a direct source of nitrogen and energy together.

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Therefore, the aim of this research is to study the effect on performance and blood traits of the use of different levels of urea-treated straw when feeding lambs (Hamdani strain).

Material and Methods

This study was conducted in the animal field of the veterinary department of the Shaqlawa Technical Institute, Erbil Polytechnic University.

Preparation of the diets used in the experiment

Treatment of barley straw with urea:

Barley straw was treated with urea containing 46% nitrogen. This treatment took four different forms: T0, without any added urea was the control treatment, whereas T1, T2 and T3 added 10%, 15% and 20% urea (equalling 1.8%, 2.7% and 3.72% of ammonia), respectively, with 60% of moisture based on dry matter. The straw was then incubated for a period 21 days. (Hassan et al., 2007a) and (Hassan et al., 1998b). The straw preparation method was performed according to (AL-Rawi et al., 190), (Hall, 2002) and (Hassan et al., 2005a). 24 Hamdani lambs were used in this experiment, with an average weight of 22.5+1.5 kg and ages of around 4-6 months. The lambs were divided randomly into four equal groups and put in boxes, each group comprising 6 identical individuals. Concentrated feed and straw feed (treated and untreated) was provided once a day at 8 am. The concentrated feed (Table 1) was only provided in a sufficient amount calculated to meet the energy requirements for maintaining growth at 50 g/day. Hassan et al. (1990a). The quantities supplied were recalculated every two weeks based on the change in body weight. The untreated and urea-treated straw were provided freely, with the remaining quantity not less than 10% of the total quantity. Before the next meal, the remainder of the treated and non-treated straw was collected, weighed and subtracted from the quantity provided the previous day in order to

Table 1. Initial materials in feed concentrates (g/kg dry matter)

Attribute (g/kg)	Level of non-decomposed nitrogen in the diets	
	Low	High
Barley	390	390
Yellow corn	390	390
Non-treated soybeans	200	–
Mineral mixture and vitamins*	10	10
Salt	10	10

*The "deluxe-type" combination of minerals and vitamins. Chemical composition per 1 gram of "Deluxe" contains vitamin A (3500), D (550), D3 and E (3 mg), iron sulfate (30 mg), copper sulphate (4 mg), zinc sulphate (6 mg), manganese sulphate (30 mg), manganese oxide (25 mg), carbonate E, D vitamin (0.05 mg), sodium selenite (0.075 mg), potassium iodine (0.5 mg), bi-calcium phosphate (25% calcium-18% phosphate) (25 mg).

Table 2. Chemical composition of concentrates and materials of composition (g/kg dry matter)

Chemical composition	Component				
	level of non-decomposed nitrogen in diets		Barley	Yellow corn	Non-treated soybeans
	Low	High			
Dry matter g/kg wet matter	942	938	951	937	939
Organic matter	902	882	914	927	877
Ether extract	24.7	22	12.4	34	26.3
Total nitrogen	26.3	26.3	18.5	13	70
Decomposed nitrogen in rumen*	18.6	13.7	14.8	7.8	49
Non-decomposed nitrogen in rumen*	7.7	12.6	3.7	5.2	21
Metabolic energy (megajoule/Kg dry matter)**	11.8	11.8	4.5	5.0	2.3

* The value of decomposed and non-decomposed nitrogen was calculated based on (Hassan et al., 2005b).
* * Metabolic energy was calculated based on (AL-Khawaja et al., 1978).

Table 3. Effect of straw treated with different levels of urea and two levels of non-decomposed nitrogen on the rumen and on certain production traits

Type of straw	T0		T1		T2		T3	
level of non-decomposed nitrogen in the rumen	Low	High	Low	High	Low	High	Low	High
Initial weight (kg)	23.68 ± 0.02b	25.54 ± 0.11a	23.19 ± 0.02c	22.19 ± 0.02b	25.35 ± 0.44a	23.09 ± 0.44b	23.15 ± 0.04c	23.13 ± 1.30b
Final weight(kg)	27.35 ± 1.04b	28.42 ± 1.48b	30.30 ± 0.91a	29.06 ± 1.99a	29.37 ± 0.58d	27.23 ± 0.05c	28.55 ± 0.55b	29.21 ± 0.03a
Daily access weight (g)	65.35 ± 6.15b	54.01 ± 4.60b	91.42 ± 7.54a	94.64 ± 10.96a	51.42 ± 0.28d	71.77 ± 0.46c	73.73 ± 0.50b	77.56 ± 0.50b
Feed Conversion Ratio (dry matter g/ access weight g)	12.16 ± 1.39c	15.64 ± 0.79d	10.54 ± 1.21b	9.94 ± 1.28a	11.31 ± 0.10a	10.14 ± 0.24b	10.30 ± 0.09b	9.94 ± 0.07c

T0: non urea-treated straw; T1:10% urea-treated straw; T2:15% urea-treated straw; T3:20% urea-treated straw
*Significant ($P\leq0.05$) ** Significant ($P\leq0.01$), a,b,c mean with different superscript within row are significantly different ($P< 0.05$) and values increase from values (a) to (c) value. Values mean ±S.D. Standard Deviation of 6 lambs

calculate the amount of straw consumed daily. Also, drinking water was provided daily in special containers and the barns were cleaned daily to remove manure. The experiment lasted for 8 weeks, preceded by a preliminary period of two weeks, to familiarize the lambs with the experimental diet and feeding system. Prior to the formation and mixing of the experimental diets, representative samples were taken from all primary materials consisting of concentrated fodder and straw.

Concentrated feed ingredients were mixed and after mixing stored in bags, before representative samples of each feed was sent for chemical analysis (Table 2).

After the experiment was completed, the lambs were weighed to calculate the total weight increase. Two blood samples were obtained from each lamb from the jugular vein using a vacutainer tube, with the first sample containing EDTA (ethylene diamante tetra acetic acid) to measure the haemoglobin concentration, packed cell volume, erythrocytes, leukocytes and sedimentation rate, while other samples without EDTA were used to separate the serum and then kept in a refrigerator (4ºC) for about 3 hours, before the serum was obtained by spinning the sample (3000 rpm/min for 10 min) and storing it in a chest freezer (-20ºC) until the total serum protein, alkaline phosphatase and glutamic oxaloacetic and pyruvic transaminase enzymes were measured. Haemoglobin concentration was measured according to the cyanm etha emoglobin method of Van Campen and Tijltra م 1, while ESR was determined by using the Wintergreen pipette after diluting the blood to about 1/4 with normal saline (0.9% NaCl) and left in the pipette for 24 hrs. The percentage of the packed cell volume was calculated using a haemotocrit tube and spinning at 15,000 rpm for 7.5 min in a haemofuge (Haereus, Hanau, Germany) according to Schalm. (Hassan et al., 2005b) and (Hassan et al., 2007b). The total serum protein value was obtained using the Biuret method (Magen, 2001) Alkaline phosphatase activity was measured according to King–Armstrong (Tawfiq, 2004), while the Reitmann and Frankel method of Walls et al. (1988), was used to calculate the concentration of glutamic oxaloacetic and pyruvic transaminase enzymes. The models of the concentrated feed ingredients and the urea-treated and non-urea-treated straw were dried at 60 °C for 48 hours and then ground in a laboratory mill and sieved through a 1 mm diameter sieve before starting subsequent chemical analyses for dry matter, ash, total nitrogen, ether extract (Tilley et al., 1963) and extracted fibre, as well as neutral, acidic and acetylene properties (A.O.AC. 1984). The amount of digestible organic matter was estimated for the dry matter of dried straw models using laboratory method; digestion data were analysed according to method [9], using a complete random design method (Factorial CRD) field experiment [22], with the use of Duncan's MRT to test the significant differences at (0.05) for field and (0.01) for laboratory between averages using a ready-made system (SPSS v.23, 2017).

Results and Discussion

Table 3 shows the effects of different treatments for different levels of urea with different levels of nitrogen (low and high levels of nitrogen) and varieties of straw. It was found that there were no significant differences in the initial weight of lambs, while there were significant differences at

($P \leq 0.05$) for the final weight only for the types of straw treated with urea with different levels of nitrogen, where it was found that the best treatment was (T1), i.e. the first level of 10% urea-treated straw, with low and high levels of nitrogen. This, then, offers a guide to the speed of the representation and increase in the proportion of bacteria in the rumen, which helps increase the daily access weight as shown in the table by significant differences ($P \leq 0.01$) and is reflected in the best food conversion coefficient ($P \leq 0.01$). This applies especially at the high level of nitrogen, which is linked to amino acids in the rumen. With regard to an increase the composition of protein and growth (Hassan and Al-Sultan, 1995a, Hassan et al.,1998b, Hassan et al.,1990a and Hassan and Al-Sultan, 1995b). These results are almost consistent with the results of each of these studies. Another lesson is that whenever we use a diet treated by 10% or less than, these results agreed with the studies of (Hassan et al., 1990b Can et al., 2004 and Al-Jassim et al., 1996), which are positive in relation to the composition of amino acids and protein.

Table 4. Effect of straw treated with different levels of urea and two levels of non-decomposed nitrogen on certain blood traits (number of red blood cells, white blood cells, haemoglobin, and volume of blood cells) in Hamdani lambs.

Blood traits Treatments		Haemoglobin g/100ml	Packet cell volume (PCV)%	Erythrocyte 10^6 X/mm^3	Leukocyte 10^6 X/mm^3
Average	General	9.757 ± 0.06	32.21 ± 0.07	8.72 ± 0.08	9.40 ± 0.05
T0	Low	9.234 ± 0.09 d	33.31 ± 0.06c	7.34 ± 0.10g	9.89 ± 0.08b
	High	9.71 ± 0.03c	34.04 ± 0.07ab	7.77 ± 0.07f	9.42 ± 0.06c
T1	Low	10.02 ± 0.07bc	34.16 ± 0.11a	7.61 ± 0.09f	9.34 ± 0.04c
	High	10.18 ± 0.04ab	33.89 ± 0.09b	7.92 ± 0.67e	9.26 ± 0.05cd
T2	Low	10.27 ± 0.05a	33.07 ± 0.06d	8.24 ± 0.04c	8.97 ± 0.04d
	High	9.85 ± 0.01cd	31.78 ± 0.05f	8.31 ± 0.04d	8.32 ± 0.04e
T3	Low	10.28 ± 0.05a	33.40 ± 0.06c	10.75 ± 0.07a	10.64 ± 0.06a
	High	10.03 ± 0.06b	32.35 ± 0.09e	10.25 ± 0.08b	10.04 ± 0.08b

Table (4) shows the effect of different levels of urea treatment on certain blood traits. There were significant differences ($P \leq 0.01$) for all haemoglobin (PCV, Erythrocyte and Leukocyte).

The best treatments were T 2 and T3 (10.27, 10.28, respectively). This can be interpreted to the increase in urea, and as the consequent stimulation of the kidney, spleen and also liver physiology, and the formation of red blood cells, as well as an increase the proportion of haemoglobin. (Ashton, 1958 and Bagci, 1993). In terms of PCV, the best treatment occurred with T1 and a low level of nitrogen (34.1%). This is inversely proportional; there were compatible higher ratios with T3 with a low level of nitrogen, and we suggest an analogous reason to the one we gave for haemoglobin. These results are similar to results of (Baker et al., 1987, Luet al., 2005 and Goering et al., 1970).

Conclusion

It has been shown that a 10% urea-treatment of straw produces the best results in terms of productivity, which is important when regarding the economic aspects of animal production. In terms of blood traits, however, it was shown that the groups T2 and T3, using a higher percentage urea-treated straw (15% and 20%, respectively) had the optimal effect in terms of improving blood components.

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SPSS INC. ARMONK, NY - 02 Oct 2017: IBM (NYSE: IBM) announced it has completed its acquisition of SPSS Inc. (Nasdaq: SPSS), a publicly-held company headquartered in Chicago. IBM announced a definitive agreement to acquire SPSS on July 28

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