تأثير اليوريا والكبريت على معاملات الهضم فى الأغنـــام

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تم اجراء ثلاث تجارب هضم على عدد ٦ ذكورمن الأغنام الأوسيمى بعد تقسيمها الى ثلاثة مجاميع.

غذيت المجموعة الأولى على شعير وكسب قطنورده وتبن قول بينما استبدل الكسب فى المجموعة الثانية باليوريا التى حلت محل نصف كمية البروتينفى العليقة . وفى المجموعة الثالثة أضيف كبريت بنسبة ٢ جرام لكل كيلو من العليقة . وقد تبين أناليوريا تحسن من معامل الهضم وخاصة منهاالبروتين والكربوأيدرات بينما قللت من معامل الهضمالخاصبالدهون . وحسن الكبريت من معامل هضم الألياف بينما ظهر له تأثير غيرمفيد على هضم المواد الغذائية.

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EFFECT OF UREA AND FREE SULFUR ON DIGESTIBILITY IN SHEEP

(with 5 tables)

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SUMMARY

Three digestibility trials had been done on 6 Osimy rams divided into three groups. The first group was fed on barley, cotton-seed meal, coarse wheat bran and bean straw, while in the second the cottonseed meal was substituted by urea which replaced as much as one-half of the protein content of the ration. Free sulfur was added to the third group at the rate of 2 g/Kg ration.

Urea improved the digestibility especially that of protein and N.F.E., while the digestibility of ether extract highly decreased.

Sulfur markedly improved the digestibility of fibre and had a deterimental effect on the digestibility of other nutrients.

INTRODUCTION

With our present livestock population insufficient amount of protein supplements are available to balance properly the rations for all the farm animals. The ruminant's ability, due to symbiotic relationships between the animal and the microorganisms in the rumen, to utilize non-protein nitrogen (NPN) sources has resulted in Concentrated research on evaluating various NPN sources. The ability of the ruminant to utilize urea-N for microbial protein synthesis has long been recognized. Each pound of urea which is very simple nitrogenous compound contains as much nitrogen as 2.9 pounds protein, MORRISON, 1959.

Regarding the value of urea as a protein substitute, MORRISON (1959) mentioned that when urea is added to a concentrate mixture which has the usual amount of cereal grains, the conversion into protein is satisfactory as the starch in the grain furnishes plenty of energy for the bacteria, and several metabolism experiments have proved that under proper conditions sheep can use urea as a partial substitute for protein. But in most such studies urea has

not equalled a protein supplement. PERRY *et al.* (1967) Said that high urea supplements fed with natural diets appear be to equally utilized for growth when compared to plant proteins. CLIFFORD *et al* (1968) found that in diets where urea contributed the major proportion of nitrogen, gains and feed efficienicy appear to be inferior to gains obtained with plant protein sources.

As a result of several experiments, it was found that urea may affect the digestibility of the organic matter in the ration. SWIFT *et al* (1947) found in digestibility trials with sheep that casein and urea, as might be expected, materially increased the amount of crude protein digested, and the casein, and to a less extent the urea, reduced the amount of fibre digested. EL-SHAZLY *et al.* (1959) stated that in experiment of 76 days with 80 lambs fed on barley, undecorticated cottonseed cake and rice bran half the lambs gven 10g urea in place of the equivalent N in cottonseed cake, it was found that urea had nc significant effect on rate of gain, dressing percentage or efficiency of feed conversion. And in a digestion trial he found that urea significantly depressed digestibility of fat.

On the other hand FELINSKA *et al.* (1962) found that on replacing third of the digestible crude protein, in ration of Merins wethers, by urea and digestibility was estimated, variations between wethers were greater with urea and on average, digestibilities fell by, for dry matter 5.5, Crude protein 3,4, ash 7.6, fibre 11.1, ether extract 16.2, N-free extract 7.3 precentage units. SOBCZAK (1963) found that when urea, equivalent to 28, protein, was given to Tsigai wethers, digestibity was improved.

Similarly TYLECEK *et al.* (1963 mentioned that urea markedly increased digestibility of N substances but utilization of N in the ration was low, 17.52% of N intake. COLOVOS *et al.* (1967) said that urea improve the digestibility of fiber in rations when included in the better quality concentrate mixtures, but had opposite when fed in a high fiber (8%) concentrate,

As for the need of sheep for sulfur, MORRISON (1959) mentioned that if urea replaces a considerable part of the protein, the utllization may be improved by adding a sulphate, or even free sulfur, or else by adding methionine, the sulfur containing amino acid. However, even then the nitrogen in urea is apt to be less efficient than that in real protein. Also MAYNARD (1962) stated that benefits have been demonstrated in ruminant from adding either elemental sulfur or sulfate to purified rations low in sulfur and having a part of the protein replaced by urea, on the other hand several experiments have failed to find any advantage from adding inorganic sulfur to practical

rations. MODJANOV (1959) fed sheep on timothy hay 700, oat straw 500, fodder beet 1200, carrots 300, Oats 170, maize 200, urea 13 and salt 8g daily, and 5 g soduim sulphate for he experimental group. The basal diet contained 0.15 % organic and 0.06% inorganic S, that with added sulphate 0.1 % inorganic S.He found that the added S did not miprove utilization of N. He metioned also that in a second, similar experiment on their farm increasing the total sulfur content from 0.15 to 0.205 per cent by adding sodium sulphate again did not affect utilization of N. On the other hand SOKOLOWSKI *et al.* (1969) stated that addition of elemental sulfur to raise the inorganic sulfur equivalent of the diet to 0.50 % appeared to increase the utilization of added dietary nitrate-nitrogen by the growing fattening lamb. The nitrate was added as KNO_3 at a level of 3.2 % of the ration. It was pointed by GARRIGUS (1969) that the dietary sulfur requirement, as determined by several authors, varies considerably. Estimates ranging from 0.14 to 0.29 % of the diet or even higher have been reported.

In our digestibility trials, we tested the effect of urea on the digestiblity of organic matter in sheep, and if the addition of free sulfur to rations, supplemented with urea, has any beneficial effect.

MATERIAL AND METHODS

Six Osimy rams were used and designated from 1 to 6 and divided into the following groups.

Group I consisted of rams Nos. 1 and 2.

Group II consisted of rams Nos. 3 and 4.

Group II consisted of rams Nos. 5 and 6.

Every ram was kept in a separated pen supplied with a manger and a bucket for water. Each group was fed as follows :

Rams in group 1 were fed on a dry ration composed of : crushed barley; 1 part, coarse wheat bran; 0.5 part, decorticated cottonseed cake; 0.5 part, and beans straw; 2 parts.

Rams in group 2 were fed on the ration given to the first group with the utilization of urea as a substitute for the cottonseed meal, replacing as much as one-half of the protein content of the ration. Urea was added daily at the rate of 19 g/Kg ration.

Rams in group 3 receivd the dry ration given to second group with the addion of free sulfur at rate of zy.

During the experimental period the requirements of rations were submitted to the rams once daily and directly after collection of faeces.

Preliminary and collection periods :

In the trial the residues of previous food present in the alimentary canal of the animals to be examined, ought to be swept away through a preliminary period of feeding experimental diet. This period was 12 days (RINGEN; 1940, LIOYD *et al;* 1956). Accordingly, it was possible to determine a constant level of daily food intake with reasonable certainty and which could be offered each day.

During a period of 16 days (RINGEN; 1940) the feces of each ram was collected every 24 hours in a water proof collecting bag.

The daily amount of the undigested portion of the ration was weighed and a representative sample 1/10 of the amount, was taken and dried in hot air oven.

However directly before collecting the feces, the remaining food from the previous day was collected to determine the actual amount of food intake.

Samples of the different feedingstuffs used were chemically analysed.

Representative samples of feces for each ram, throughout the collection period, were thoroughly mixed separately, then the obtained composite samples were Kept for the chemical analysis.

Chemical analysis

The percentage of the following constituents was chemiclly determined after the (A.O.A.C.) in each feedingstuff and faecal sample.

1 — Moisture %
2 — Crude fibre %
3 — Crude protein %
4 — Ether extract %
5 — Nitrogen free extract %
6 — Ash %

Calculation of digestion coefficient :

The coefficient of digestibility is merely the quantity of the nutrient ingested that is subsequently not recovered in the feces, expressed as a percentage of the intake. CRAMPTON and LLOYD (1959).

DISCUSSION

From Tables 3,4 & 5 it is shown that the average amount of ration consumed per ram within 16 days (collection period) in the three groups was 21316.40, 20816.00 & 20729.30g (on dry matter basis) respectively.

The amount of fecal output within 16 days was 9289.50, 8397.00 & 8533.00g in the three groups (on dry matter basis) respectively. By using table 1 & 2, the digestion coefficients of the different nutrients were calculated and found to be for the dry matter, 56.42, 59.66 & 58.84; crude protein 43.23, 50.23 & 40.17 ; crude fibre 47.71, 49.81 &63.67 ; ether extract 52.23,22.20 & 19.04 ; and N.F.E. 68.54, 73.06 & 67.41% in the three groups respectively.

In was noted that urea slightly improved the digestibility of the dry matter and fibre and markedly improved that of protein and N.F.E. this is in agreement with TYLECEK, *et al.* (1963), SOBCZAK, (1963) and COLOVOS *et al.* (1967), and does not agree with FELINSKA *et al.* (1962) who mentioned that urea minimise the digestibilites of nutrients, and SWIFT *et al.* (1947) as he stated that urea reduced the amount of fibre digested.

Regarding the ether extract, urea markedly reduced its digestiblity by about 30%, a fact which is similar to that found by EL-SHAZLY *et al.* (1959) and FELINSKA *et al.* (1962).

From table 5, it is clear that addition of free sulfur to the ration which was found to contain about 0.131 % total sulfur (according to MORRISON tables) does not improve the digestibility of protein, a fact similar to that found by MODJANOV (1959), and stated by MAYNARD (1962 . In our digestibility trials addition of free sulfur reduced the amount of protein, ether extarct & N.F.E. digested but markedly improved the digestion of fibre.

This may be interpreted that urea may have a growth promoting effect on most of the microorganisms in the rumen, and addition of free sulfur to practical rations may be disadvantageous as it may have a bad effcet on the

growth of bacteria and other microorganisms although it promotes the growth of the cellulosedigesting one, making it beneficial to be added to rations with high fibre content.

TABLE 1. **Chemical analysis of feedingstuffs (on dry matter basis)**

Feedingstuffs	Cr· prot. %	Cr.fibre %	Ether extr %	N.F.E. %	Ash %
Barley	8.13	8.31	2.79	76.44	4.33
Coarse wheat bran	3.87	13.64	1.78	76.49	4.22
Decorticated cottonseed meal. .	39.64	7.80	6.82	39.07	6.67
Bean straw.	4.42	34.87	1.23	37.90	11.58

TABLE 2. **Chemical analysis of faecal output (average) in the three groups (on dry matter basis).**

Croups	Cr·Prot. %	Cr.fibre %	Ether extr. %	N.F.E. %	Ash %
I	12.51	26.42	2.60	41.06	17.41
II	13.75	29.50	3.30	39.27	14.18
III	16.12	20.83	3.35	46.34	13.36

TABLE 3. **Exp. No.(1) : Apparent digestibility of the dry ration* (Average) by the two rams of group 1 (Data for sixteen-day period)**

ITEMS	Gude Protein	Carbohydrates		Ether extr
		Cr.fibre	N.F.E.	
Intake of 21316.40g dry matter containing,(g)	2047.69	4694.02	12169.13	505.57
Output of 9289.50g facal dry matter containing, g	1162.12	2454.28	3828.20	241.53
Digested nutrients 12026.90 g dry matter, containing g	885.57	2239.74	8340.93	264.04
Digested dry matter 65.42%				
Digested nutrients per cent	43.23	47.71	68.54	52.23

* Composed of barley, bran, cottonseed meal and bean straw.

TABLE 4 Exp. No. (2) : Apparent digestibility of the dry raton* (Average) by the two rams of group 2 (Data for sixteen-day period).

ITEMS	Crude Protein	Carbohydrates		Ether extr
		Cr. fibre	N.F.E.	
Intake of 20816.00g dry matter containing, g	2320.08	4935.75	12240.66	356.19
Output of 8397.00g faecal dry matter containing, g	1154.59	2477.12	3297.50	277.10
Digested nutrients 12419.00g dry matter, contaiining,g	1165.49	2458.63	8943.16	79.09
Digested dry matter 59.66 %				
Digested nutrients per cent	50.23	49.81	73.06	22.20

* Composed of barley, bran, and bean straw with the addition of 19 gm urea/Kg of the ration.

TABLE 5. Exp. No. (3) : Apparent digestibility of the dry ration* (Average) by the two rams of group 3 (Data for sixteen-day period)

ITEMS	Crude Protein	Carbohydrates		Ether extr
		Cr. fibre	N.F.E.	
Intake of 20729.30g dry matter containing, g	2299.19	4892.67	12133.82	353.08
Output of 8533.00g faecal dry matter containing, g	1375.52	1777.42	3954.19	285.86
Digested nutrints 12196.30 g dry matter, conotaining, g	923.67	3115.25	8179.63	67.22
Digested dry matter 58.84 %				
Digested nutrients per cent	40.17	63.67	67.41	19.04

* Composed of barley, bran, bean straw and 19 g urea/Kg with the addition of 2 g free sulfur / Kg ration.

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