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EFFECT OF UREA SUPPLEMENTATION ON THE DIGESTIBILITY IN SHEEP (With 3 Tables)

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تأثير اضافة اليوريا على معاملات الهضم في الأغنام

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أُجريت أربعة تجارب هضم على الكباش لدراسة تأثير اليوريا على معاملات هضم العليقة وقيمتها الغذائية وكذلك مقارنة تأثيرها كمصدر رخيص وغير تقليدي للنيتروجين يكسب بدوره القطن كمصدر طبيعي للبروتين. وقد أشارت نتائج البحث إلى أن اضافة اليوريا بمعدل 1.35% أدت إلى تحسن ملحوظ في معاملات هضم البروتين الخام والألياف الخام بينما أدت إلى انخفاض معاملات هضم كل من المادة الجافة، المادة العضوية، مستخلص الأثير والكربوهيدرات الذائبة. وقد أشارت النتائج أيضا إلى أن اليوريا مع أنها معوض جيد لنقص البروتين رخيص الثمن فإنه يقل قليلا في كفاءته عن مصادر البروتين التقليدية.

SUMMARY

Four feeding plans and four digestibility trials were experimented on rams to study the effect of urea addition on the digestibility of the ration and its nutritive value and compare it with the natural protein supplement.

The obtained data indicated that the addition of urea at the level of 1.35% markedly improved the digestibility coefficients of crude protein and crude fiber, while the digestibility coefficients of each of the dry matter, organic matter, ether - extract and nitrogen - free extract were decreased. The total digestible nutrients of the ration nearly remained without detectable change.

On the other hand, the results obtained showed also that in spite of the beneficial effect of urea as a good and cheaper source for nitrogen, yet it did not reach to the efficiency of the natural protein supplement.

INTRODUCTION

Conventional feed resources such as grains, legumes and oilseed meals are much too expensive for feeding of ruminants in contrast poultry. Moreover, grains and seeds directly compete with human nutrition. For ruminant nutrition, urea found to be the more economic substitute for oil cakes and legumes, while molasses can replace the grains (HASANAIN, 1983).

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The gap between available and required amounts of animal feed in Egypt is estimated to be about 9 million tons, of which 4 million tons are concentrates and the remainder are roughages. Annual production of animal feed in Egypt meets no more than about 60% of the calculated requirements of the existing animal population. This low nutritional level is reflected on the productivity of Egyptian animals, with local production of animal protein meeting only one - third of the minimum needs of the Egyptian population (NAGA and EL-SHAZLY, 1982).

Under such conditions, the utilization of untraditionally consumed feed by - products from one - hand, and urea on the other hand to substitute oil cakes or legumes becomes an obligation.

Nitrogen supplements are often fed to animals consuming low quality forages (less than 7% CP) to improve nitrogen status of the ration and to increase voluntary intake of the forage (AMMERMAN et al., 1972 and FICK et al., 1973).

Supplementation with urea, at levels between 0.5% and 2%, improves digestibility of the nutrients in the whole ration. The total digestible nutrients content of artichoke crown leaves were progressively improved by increasing levels of urea supplementation. Total digestible nutrients of corn stalks or bagasse were found to be increased from 44% and 45% to 56% and 54% respectively, due to urea supplementation (MOHAMED et al., 1971 and BORHAMI et al., 1975).

As a result of several experiments, it was found that urea may affect the digestibility of the organic matter of the ration. EL-SHAZLY et al. (1959) stated that urea significantly depressed the digestibility of fat, while FELINKSA and FELINSKI (1962) found that urea decreased the digestibilities of each of dry matter, crude protein, crude fiber, ether - extract, and nitrogen - free extract by an average of about 5.5, 3.4, 11.1, 16.2 and 7.3% respectively.

TYLECEK et al. (1963) mentioned that urea markedly increased digestibility of nitrogen substances, while COLOVOS et al. (1967) found that urea improved the digestibility of crude fiber when included with the better quality concentrate mixtures.

Urea supplementation improves the digestibility of each of the organic matter, crude protein, crude fiber, and nitrogen - free extract (ABDEL-HAFEEZ and TONY, 1975; HORTON and NICHOLSON, 1981 and MARTIN et al., 1981).

The present investigation was proposed to study the effect of urea addition on the digestibility coefficients of the ration nutrients and its nutritive value with comparison for its supplementation with cottonseed meal as a natural protein supplement.

MATERIAL and METHODS

Three rams nearly of the same weight (53 Kg), age (20 months) and parasite - free were chosen for performing four digestion trials.

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The average daily feed consumption during the preliminary period was taken in account when offering a fixed amount of feed during the collection period. The food was offered twice daily at 10 A.M. and 3 P.M. Water and common salt were available *ad libitum*. The daily feed allowances were weighed at the beginning of the experiment and kept in paper bags.

Two trials were performed in which grain sorghum, cottonseed meal (CSM) and dried horsebean fodder (DHBF), as the commonly used feedingstuffs in Upper Egypt area, were experimented on. In the first trial the digestibility of a mixture of grain sorghum and DHBF determined before and after being supplemented with urea (rations 1 & 2). In the second trial urea was compared with CSM as a supplement for nitrogen where each was mixed in percentage giving nearly the same level of protein (rations 3 & 4). The rest of the 100 parts of the ration formulas was balanced by adding the commonly used dried horsebean fodder. The chemical composition of the feed ingredients and rations is shown in table 2 where the physical composition of the four tested rations is illustrated in table (1).

Each of the four digestibility trials extended for 20 days with 10 for the preliminary period and the rest for the collection period. Between each two successive trials the animals were allowed a rest period of 10 days in order to nullify any effect for the previous mixture.

During the collection period, faecal matter was collected from each animal, weighed, thoroughly mixed and representative samples were taken in plastic bags for moisture determination. The dried samples of each animal, were mixed at the end of the period, ground and kept for chemical analyses. Samples of the experimental feedingstuffs were also chemically analysed. All the analyses were carried out according to the conventional methods of the AOAC (1984) for the determination of moisture, crude protein (CP), ether - extract (EE), crude fiber (CF) and ash.

The digestible protein (DP) and total digestible nutrients (TDN) were calculated for each of the four tested rations.

RESULTS

The physical composition of the four tested rations is illustrated in table 1, while table 2 shows the average chemical composition of the rations and their ingredients.

The digestion coefficients of the various nutrients of the four tested rations and their nutritive values were calculated and recorded in table 3.

DISCUSSION

Trial I was performed to investigate the effect of urea on the digestibility coefficients of the ration nutrients and its nutritive value. Urea was added at the level 1.35% for rations 2. The obtained data (table 3) revealed that supplementation

with urea depressed the digestible coefficients for each of the dry matter (DM), organic matter (OM), EE and NFE by about 2, 3, 4 and 4% respectively. This finding is similar to that reported by EL-SHAZLY *et al.*, 1959; FELINSKA and FELINSKI, 1962 and ABDEL-HAFEEZ and TONY, 1975. At the same time its addition improved the digestible coefficients of CP and CF by about 13% and 5% respectively. This coincides with that mentioned by TYLECEK *et al.*, 1963; COLOVES *et al.*, 1967; ABDEL-HAFEEZ and TONY, 1975; HORTON and NICOLSON, 1981; and MARTIN *et al.*, 1981, who stated that urea supplementation improved the digestibility coefficients of both CP and CF. This led to the increase in DP by about 4% in the urea - supplemented mixture while there was no improvement in the TDN value as the increase in the digestibility of CF was neutralized by a decrease in other nutrients.

Table 3 shows that the addition of CSM improved the digestibility of thertion more than in case of urea by about 2, 3, 9, 22 and 17% for DM, OM, CP, FE and CF respectively, while the digestibility of NFF was slightly decreased (2%).

On the other hand, the results presented in table 3 showed that the nutritive value of the CSM - ration as DP was higher than that of the urea - ration by about 4%. In spite of containing more CF and less NFE the CSM - ration showed a value of TDN comparing well with that of the urea - ration.

It could be concluded that urea has no bad effect on the digestibility of nutrients when added to low - protein rations although it does not compare well with the natural protein supplements as cottonseed meal.

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Table (1): The physical composition of the four tested rations.

Items	Ration ingredients (%)			
	Grain sorghum	DHBF	Urea	CSM
Trial I:				
Ration 1	50.00	50.00	----	----
Ration 2	43.65	55.00	1.35	----
Trial II:				
Ration 3	53.35	45.00	1.65	----
Ration 4	20.00	60.00	----	20.00

DHBF = dried horsebean fodder

CSM = cottonseed meal

Table (2): The chemical composition of the four tested rations and their ingredients

Rations and their ingredients	on dry matter basis						
	DM	OM	CP	EE	CF	NFE	Ash
Ration ingredients:							
Grain sorghum	90.30	97.30	9.17	2.67	2.71	82.75	7.70
CSM (decort.)	90.30	92.50	38.25	3.12	10.25	40.88	7.50
Urea	-----	-----	290.0*	-----	-----	-----	-----
DMFF	94.00	89.75	6.15	1.12	33.50	48.98	10.25
Trial I:							
Ration 1	92.15	93.53	7.66	1.90	18.11	65.86	6.47
Ration 2	91.12	93.18	11.30	1.79	19.61	63.06	6.82
Trial II:							
Ration 3	90.48	93.95	12.44	1.92	16.53	66.19	6.05
Ration 4	92.52	91.80	13.17	1.82	22.69	54.12	8.20

DM = dry matter

CP = crude protein

CF = crude fiber

OM = organic matter

EE = ether-extract

NFE = nitrogen-free extract

* The value according to that cited by McDonald et. al., 1973.

Table (3): The digestibilities and the nutritive value for the four tested ration

Trial No.	Ration No.	Digestion coefficients (%)						Nutritive value (DMB)*	
		DM	OM	CP	EE	CF	NFE	DP*	TDN*
I	1	72.54	75.35	53.81	79.59	51.49	83.67	4.12	72.38
	2	70.32	72.48	66.52	75.31	56.69	80.06	8.22	72.85
II	3	71.25	73.19	62.55	56.87	49.13	82.68	7.79	73.11
	4	72.99	75.82	71.25	79.05	66.54	80.70	9.38	71.39

DMB = dry matter basis

DP = digestible protein

TDN = total digestible nutrients