Egypt. J. Anim. prod. Vol. 13, No. 2 pp. 99-107 (1973).

Varying Nitrogen Levels in Rations for Fattening Rahmany Lambs

1. The Effect of Nitrogen Levels in a Ration, Containing Moderate Proportion of High Quality Roughage, on Daily Gain and Feed Efficiency.

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In an attempt to study the effect of N-level in a ration containing moderate proportion of high-quality roughage, on daily gain and feed efficiency, 35 Rahmany lambs, averaging 5-6 month of age and 22 kg of body weight, were employed. They were divided into 5 equal groups randomly alloted to feeding treatments : (1) High-N ration (130 % of recommended allowances, 100% of which as plant protein); and 30% as urea N); (2) normal-N Control (100%, as plant protein (3) high-N ration (130% all of plant protein); normal-N 100% (of which 70% as plant protein and 30% as urea N); (5) low-N ration (70% of plant protein).

Decreasing N below the recomended level, significantly affected the daily gain and feed efficiency on energy and N- basis. increasing N-level above normal, slightly imporved daily body gain and feed efficiency (on energy basis). High N-levels in the ration significantly increased curde fiber intake and digestibility. Increased N-intake affected favorably the digestibility of nitrogenous compounds but had no effect on NFE digestibility.

Under local conditions of sheep nutrition, where roughages supply about 85% of the energy value of the different feed stuffs, while concentrates provide only 15% of the total energy, it seems of paramouth importance to investigate the factors which may affect maximum utilization of different roughages. The present experiment has therefore been disigned in an attempt to study the effect of nitrogen levels and sources on the feed efficiency and gain of sheep fed a ration containing moderate proportions of high quality roughages.

Material and Methods

This experiment was conducted in the experimental station of the Faculty of Agric., Ain Shams University. Thirty five Rahmany lambs of 3-4 months of age and 17 Kg of body weight were included in this investigation. In a 65-day pre experimental period, the animals recieved a daily ration consisting of Berseem (Egyptian clover) and co-op feed mixture. During the last two

weeks of this period, all lambs were shorn, then divided into five groups ; equal in numbers and initial weights. The different groups were randomly assigned to the following 5 experimental rations.

The first group recieved a high nitrogen ration containing 130% of the protein allowances recommended by Tommi (1963), 100% of which were of plant protein while the rest was of urea nitrogen.

The second group got the control ration, containing 100% of allowances, all of plant protein sources.

The third group was fed a ration containing 130% of the recommended level, all in plant protein form.

Group four was fed a ration containing the normal nitrogenous allowances (100%), 70% of which as plant protein and the rest as urea N.

Group five was fed a low nitrogen ration containing only 70% of the allowances as plant protein.

All rations were isocaloric and offered in equal quantity. Feed and water were offered twice daily at 8 a.m. and 4 p.m. Urea was added daily in a solid form to the concentrate mixture. Clover hay was the sole roughage covering about 40% of the energy value of the rations. Feed residues were weighed daily throughout the whole experiment ; records were kept for weekly weight changes. Two representative animals from each group were subjected to digestion and N balance trials as the average body weight of each of the first four groups fell within the range of 35-46 Kg. Concerning group V the animals were subjected to digestion and balance trials at the end of the experiment (about 38 Kg heavy), which was extended to 207 days. Daily rations for the different groups during the digestion and balance trials are illustrated in Table 1.

Analysis of variance was carried out according to Snedecor (1956).

Results and Discussion

The average daily weight gains of the different animal groups are presented in Table 2. It is clear that the lowest daily gain was that of group V, maintained on low nitrogen intake (70% of the recommended allowances). Almost the same averages were recorded for both the first and third groups (high level of Nitrogen intake). It is obvious that the increase in daily nitrogen intake was associated with a significant increased in daily body weight gain as it has been indicated by the analysis of variance. These results are in accordance with those reported by Preston *et al.* (1966), El-Ashry (1971), Robinson & Forbes (1970) and Meiske *et al.* (1955), who found that the addition of urea and biuret to a basal diet for fattening lambs containing 7% of the crude protein to bring its level up to 9%, improved rate of gain.

The data show that the highest feed efficiency was achieved by group III followed by group I. Such results may be attributed to the possibility that high N- rations might have caused activation of rumen microorganisms which, accordingly has improved dry matter, crude fiber and nitrogen digestibility and feed utilization.

Lowest feed converting ability based on ingested starch value (Kg) or nitrogen (gm) per Kg gain in weight was obtained in the low nitrogen group. The feed efficiency was almost doubled as the ration was supplemented with urea to bring up the nitrogen level to the recommended level in group IV. Increasing the level of nitrogen by 30% above the allowances improved feed effeciency. These results are in agreement with those reported by El-Ashry (1971), Allam (1970) and Meiske *et al.* (1955). It is noteworthy that, in the high nitrogen groups, Animals required more nitrogen per Kg gain *e.g.* the best nitrogen efficiency was that of the control group. However, Partial substitution of plant protein with urea nitrogen (group IV) showed a slight but not significant increases in both energy and protein required per Kg gain. Repps *et al.* (1955) reported that, replacing 50% of the protein nitrogen in ration for fattening lambs with N.P.N. had lowered gains. Nevertheless, lambs fed rations with 15-30% replaced nitrogen, made gain equal to those on conventional protein sources.

Considering the digestibility trial Table 3, it is clear that average crude fiber intake varied widely in the different treatments. Animals of group I had the highest intake followed by those of group II. On the other hand, animals of the low nitrogen group showed the least intake. The addition of urea to the ration for animal group IV increased significantly crude fiber intake as compared with the intake of group V. It is noteworthy that urea supplementation to either low or normal (70 or 100%) protein diet increased the crude fiber intake. Also the output of dry matter in feces were increased which is in accordance with Beames and Morris, (1967). The addition of diluted solutions of urea to reticularumen of cows offered oat-straw improved digestability and reduced time of retention of food residues in the alimentary tract and was associated with an increase in voluntary intake of 39%, more straw (campling *et al.* 1962). It was also reported by several workers that increasing the nitrogen intake was accompanied with an increase in volantary intake *e.g.* (Hemsley & Moir, 1963). The results of this study indicate that increasing the nitrogen level from 70% (Group V) up to 100% of the allowances was associated with a noticeable increase in crude fiber daily intake of about 59 and 45% more for group II and IV respectively, while such increase reached its maximum 72 and 52% for the first and third group, respectively. The decrease in crude fiber intake in the low nitrogen group (V) could be explained by a reduction in cellulolytic activity of rumen microflora, which may increase time of retention of the digesta in the alementary tract. Very wide difference in the amount of the digested crude fiber in different treatments was recorded *i.e.* the crude fiber digested in the control group was almost doubled that in the low nitrogen group (V). The maximum crude fiber digestibility coefficients were noticed in the high nitrogen groups (I & III). Digestibility coefficients were 12.03 and 11.04% higher in group I & III,

TABLE I. Daily rations for animals on different treatments during the digestibility trials (at 10 - 13 months of age).

Group	I			II			III			IV			V		
	Amount Kg	S.E. Kg	D.P. gm	Amount Kg	S.E. Kg	D.P. gm	Amount Kg	S.E. Kg	D.P. gm	Amount Kg	S.E. Kg	D.P. gm	Amount Kg	S.D. Kg	D.P. gm
Clover hay	1.060	0.3519	83.74	1.060	0.3519	83.74	1.06	0.3519	83.74	1.06	0.3519	83.74	1 00	0.3320	79.00
Co-op Feed mixture	0.510	0.2743	65.79	0.510	0.2743	65.79	—	—	—	0.040	0.0213	5.16	0 050	0.0260	6.40
Barley	0.360	0.2656	22.32	0.360	0.2656	22.32	0.150	0.1107	9.30	0.700	0.5166	43.40	0 620	0.4575	38.44
Horse bean	—	—	—	—	—	—	0.600	0.422	136.00	—	—	—	—	—	—
Urea* gm	18.620	—	49.50	—	—	—		—	18.620	18.620	—	49.50	—	—	—
Total	1.948	0.8913	221.35	1.9308	0.3918	171.85	1.810	0.8846	228.0	1.818	0.8900	181.80	1.670	0 8155	123.80
D.P. %	—	—	11.3	—	—	8.8	—	—	12.6	—	—	10	—	—	7.4

Group I : fed ration containing 100% of the allowances from plant protein + 30% as urea N.
Group II : fed ration containing 100% of the allowance from plant protein (control group).
Group III : fed ration containing 130% of the allowances from plant protein.
Group IV : fed ration containing 70% of the allowances from plant protein + 30% as urea N.
Group V : fed ration containing 70% of the allowances from plant protein (low N group).

(*) Urea contained 42% nitrogen.

TABLE 2. Average daily gains and feed effeciency values of different groups during the experimental period (207 days).

Group	Initial body weight Kg	Final body weight Kg	Daily gain gm	Total gain × 100 control gain	S.E. Intake day Kg	Effeciency S.E./Kg gain	D.P. Intake/day gm	Dig N/Kg gain gm	D.P. per Kg gain Kg
Group I (100+30%)	24.05	52.39	136.25	106.25	0.67	4.91	188.32	221.14	1.5825
Group II (100% control)	23.90	50.48	127.77	100.0	0.65	5.16	138.57	173.52	1.0840
Group III (130%)	23.98	53.43	141.73	110.92	0.68	4.79	186.79	210.96	1.3180
Group IV (70 + 30)	25.18	50.21	120.33	94.17	0.65	5.40	144.32	191.88	1.1990
Group V (70%)	24.33	38.33	65.84	51.53	0.60	9.11	109.18	266.47	1.6650

TABLE 3. The results of the digestibility trial and N balance of the different experimental groups.

Group	I	II	III	IV	V
Average daily D.M. intake gm	1665.0	1550.0	1556.8	1545.5	1218.0
Average daily fecal D.M. (gm)	553.26	523.46	484.22	527.03	430.02
Average daily D.M. digested (gm)	1111.9	1026.5	1072.7	1017.5	787.9
D.M. digestibility %	66.8	66.2	68.8	65.8	64.69
Average daily crude fiber intake gm	427.72	395.6	376.3	354.8	248.2
Average daily crude fiber digested gm	312.39	257.72	273.1	219.0	133.92
Crude fiber digestibility %	73.03	65.14	72.57	61.72	53.94
Average daily NFE intake gm	760.85	742.74	755.0	776.79	629.54
Average daily NFE digested gm	523.06	548.33	505.90	577.62	490.48
NFE digestibility %	68.74	73.82	67.00	74.53	77.91
Average daily N intake (gm)	48.1	40.68	44.98	38.69	25.25
Average daily fecal N (gm)	13.83	14 96	13.89	13.17	9.93
Average dig. N (gm)	34.27	25.72	31.09	25.52	15.32
Dig. of N comp. %	71.24	63.22	69.11	65.96	60.67
Urinary volume cc	2519.7	2311.4	2475.00	1626.40	1104.90
Daily urinary N (gm)	25.30	19.12	23.22	18.79	12.90
Nitrogen balance (gm)	8.97	6.60	7.87	6.73	2.42

respectively, compared to the control group (II). These data agree well with those of Raliegh and Wallace (1963), who reported that N level significantly affects the digestibility of cellulose, dry matter and organic matter.

On the other hand, the highest N.F.E. digestibility was obtained in group V followed by group IV, while the lowest value was that of group III followed by group I. Such data may indicate that there is a negative correlation between the digestibility of crude fiber from one side and nitrogen free extrate from the other side. Also, it must be noted that increasing the nitrogen level under the present experimental rations had no effect on NEF digestability. Similar results were reported by Soliman (1971).

The apparent digestibility values of nitrogenous compounds in the different treatments are summarized in Table 3. A positive correlation between the level of nitrogen in the ration and its digestibility was observed.

Comparing the control group to group IV where 30% of the nitrogen allowances was replaced with urea nitrogen, it is clear that such substitution did not appreciably affect the average fecal nitrogen and average daily digested nitrogen. Generally, the addition of urea to both low and normal protein diets (group IV & I, respectively) significantly affected daily digested nitrogen (gm) and digestibility coefficient. However, it must be noted that the addition of urea to the low protein diet (group IV) significantly increased fecal N compared with group V. incresing nitrogen level in the ration, regardless of its source. above the recommended allowances (Rations I & III) has no effect on fecal nitrogen.

The daily excreted urine significantly differed among the different animal groups. The highest volumes were those of the high nitrogen groups, while the lowest was that of the low group V. The differences in urinary volumes were reflected on the average urinary nitrogen excretion. The highest values of N were 25.3 and 23.2 gm/day for group I & III, respectively, while both group II & IV showed medium values. It is evident that the level of nitrogen in ration affects significantly the urinary N excretion.

Concerning the relationship between N level in feed and N retention, (Holter & Reid 1959, Preston *et al.* 1966 ; Deif, El Shazly and Abou Akkada 1968, Dief, *et al* 1970 ; Yousri 1970), reported that, the nitrogen retention was increased by increaseing N intake, which is in general agreement with the results obtained in the present study. Also Robinson and Forbes (1970) indicated that there was a significant quadratic relationship between the apparently digested N in gm/day and nitrogen retained in gm per day. However, the present results indicated that changing the nitrogen levels and source had no significant effect on the nitrogen retentions (especially in groups IIV). Although Chalupa (1968) found that nitrogen retention on diets containing plant proteins is usually superior to that on diets containing non-protein, nitrogen.

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مستويات مختلفة من النتروجين فى علائق تسمين الحملان الرحمانى

اولا : تاثير مستوى نتروجين العلائق المحتوية على نسبة معتدلة من الاعلاف الخشنة الجيدة على معدلات الزيادة اليومية وكفاءة تحويل الأغذية

عثمان شحاته ـ فخية صالح ـ محمد العشرى

قسم الانتاج الحيوانى ـ كلية زراعة شبرا الخيمة

فى محاولة لدراسة أثر مستوى النتروجين فى العلائق المحتوية على نسبة معتدلة من الاعلاف الخشنة الجيدة على متوسط الزيادة اليوميةوالكفاءة التحويلية استخدمت فى هذه التجربة ٣٥ حمل رحمانى فى عمر من ٥ـ٦ شهور متوسط وزن حى حوالى ٢٢ كجم ـ قسمت الحيوانات الى خمسة مجموعات متماثلة من حيث متوسط الوزن،ثم وزعت عشوائيا على المعاملات الغذائية التالية :

١ ـ عليقة غنية فى النتروجين (١٣٠٪ من المقررات) ١٠٠٪ من المقررات مصدرة بروتينات نباتية ، ٣٠٪ نتروجين يوريا •

٢ ـ عليقة مقارنة (١٠٠٪ من المقررات) النتروجين فيها مصدره البروتين النباتى •

٣ ـ عليقة غنية فى النتروجين (١٣٠٪ من المقرارات كله من مصادرنباتية•)

٤ ـ عليقة تحتوى على ١٠٠٪ من المقرارات الغذائية النتروجينية (٧٠٪ منها فى صورة بروتين نباتى ، ٣٠٪ الباقية فى صورة (زوت يوريا)•

٥ ـ عليقة فقيرة فى النتروجين (٧٠٪ من المقررات) كله فى صورة بروتين نباتى •

وقد اوضحت النتائج مايلى :ـ

* أنخفاض معنوى فى معدلات النمو اليومى وكذلك انخفضت الكفاءة التحويلية مع أنخفاض مستوى النتروجين فى العلائق التجريبية عن مستواه فى العليقة المقارنة •

* استعمال علائق غنية فى النتروجين (اعلى من المقررات) حسنت قليلا من معدلات الزيادة اليومية وكذا الكفاءة التحويلية للاغذية محسوبة على أساس الطاقة المستخدمة لأنتاج وحدة وزنية •

*رفع مستوى الازوت فى العلائق صحبة زيادة معنوية فى كمية المأكول من الالياف الخام وكذا معدلات هضمها كذلك تحسنت معدلات هضم المركبات الازوتية الا أنه لم يلاحظ أى تغيير يذكر على معدلات هضم مستخلص المادة الخالية من الازوت (الكربوايدرات الذائبة) •