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The Effect of Feeding Different Roughage : Concentrate Ratios on the Performance of Yearling Rahmani Sheep

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TWO RATIONS containing 40-60 and 30:70 roughage to concentrate ration were formulated to supply the daily starch equivalent requirements, for yearling Rahmani sheep.

The results revealed that increasing concentrate ratio increased the digestion coefficients of all feed nutrients except for nitrogen free extract. Both daily gain and feed efficiency were increased by feeding increased concentrate. On the other hand, the dressing percentage based on either full body weight or empty body weight was better when using a roughage concentrate ratio of 40:60. The best values for the efficiency of energy and protein utilization were obtained when uisng 30:70 roughage/concentrate ratio.

It appears from a recent study by the authors (El-Serafy *et al.*, 1981) that the ingestion of increased proportions of concentrates seems to improve live body weight and feed efficiency of Merino sheep. El-Ashry *et al.*, (1976) found that increasing concentrates improved significantly growth rate and non-significantly the feed efficiency. However, the authors ((1981) reported that roughage : concentrate ratio of 40:60 was proper during the fattening period, while a roughage: concentrate ratio of 30:70 was more efficient in the growing period of Merino sheep.

The fat taied Rahmani sheep was subjected to the two ratios to investigate their effect on growth, feed efficiency and the deposition of protein and energy.

Material and Methods

Eleven male yearling Rahmany sheep averaging 42.5 kg live body weight were used. Experimental animals were fed a standard ration for 2 weeks standardization period. All animals were shorn, fasted for overnight, weighed and initial group of 2 animals were slaughered to determine body composition total energy. The remaining animals were randomly alloted into two groups. Each group was given the daily energy requirements by consuming one of two rations formulated to supply 60 and 70% of the energy requirements from

1. A.M. EL serafy, H.M. Aly, H.S. Soliman H.M. Khattab, M.A. El-Ashry and Sawsan Mansour Ahmed 1981. The effect of feeding different roughage: concentrate ratios on the performance of growing Merino Lambs. A paper submitted for publication in Egypt J. of Anim. Production.

concentrates and the rest from roughages. The Energy and protein allowances were those recommended by Tommi (1963). The rations used and their chemical composition are shown in Table 1. Feed was offered once daily and the residues if any were removed and weighed weekly. Salt blocks and water were available at all time. The intakes were adjusted according to the increase in body weight to meet the required allowances and the shrunk live body weight were recorded weekly. The nutritive value of the rations used expressed as total digestible nutrients (TDN) and digestible protein (DP) was determined by carrying out digestibility trials of three weeks duration, two weeks for adaptation and one week for collection. Feeds and feces were analysed for crude fibre, ether extract, crude protein, moisture and nitrogen free extract according to A.O.A.C. methods (1965). The gross calorific value of feed intake was calculated using the factors 5.65 Kcal/g for protein, 9.4 Kcal/g for fat, 4.15 Kcal/g for fibre and carbohydrates (Blaxter, 1966). The digestible calorific value were obtained by multiplying the calculated calorific value of each constituent of feed intake by its digestion coefficient. The metabolizable energy (ME) for different treatments were calculated according to Blaxter (1966).

TABLE 1. **Chemical composition (%) of feedstuff used. (DM basis).**

Feedstuff	Moisture	Ash	CP	EE	CF	NFE
Concentrate mixture	7.67	10.66	16.51	8.27	15.67	48.99
Yellow maize	7.52	1.22	8.81	3.44	4.38	82.15
Berseem hay (2*nd* cut)	12.47	15.61	12.81	3.96	33.66	33.96

Beside the initially slaughtered group, a final group was slaughtered after the end of the feeding experiment (112 days) to estimate the gains or losses of body components and total energy after slaughtering, the contents of the digestive tract were then removed and their weight were subtracted from the pre-slaughered live weight to give the empty body weight (EBW). The following measurements were taken, to evaluate corcoss characteristics. The weight of head, legs, skin, and warm carcass. The weight of rumen, small and large intestine (empty and full) lung and traches and liver in absolute and relative to fasting body weight.

The ribs number 9, 10 and 11 were taken from each lamb and weighed then stored in a sealed polyethene bags at-10⁰- for chemical analysis according to A.O.A.C. (1960).

Results and Discussion

1. Digestibility and nutritive value of rations

Table 2 presents the average chemical composition, digestion coefficients and nutritive value as TDN and DP of the two rations used in feeding Rahmany sheep.

Figures for the digestion coefficients of crude protein, ether extract and crude fibre, content of the ration I (containing 30% roughage and 70% concentrates) were higher than those of the ration II. The higher digestion coefficients for nitrogen free extract was found in ration II containing 40% roughage and 60% concentrates followed by ration I. The differences among treatments were not significant ($P > 0.05$), for crude protein and nitrogen free extract. Ether extract and crude fibre digestion coefficients differed significantly ($P < 0.05$) among treatments I and II with higher values for the treatment I.

TABLE 2. Mean (± SD) chemical composition, digestion coefficients and nutritive value of feed used for Rahmany sheep receiving treatments varying tin roughage ot concentrate ratio.

Item	Trestments (R/C ratio)	
	I(30 : 70)	II(40 : 60)
Chemical composition, %		
CP (Crude Protein)	14.52 ± 0.04	14.22 ± 0.04
EE (Ether Extract)	6.28 ± 0.06	5.90 ± 0.05
CF (Crude Fibre)	21.95 ± 0.32	23.63 ± 0.27
NFE (Nitrogen Free Extract)	45.24 ± 0.30	43.77 ± 0.63
Digestion coefficients %		
CP	59.77 ± 1.79	51.80 ± 3.85
EE	79.40 ± 1.31	69.71 ± 2.76
CF	37.90 ± 2.00	21.25 ± 3.36
NFE	70.92 ± 0.36	72.34 ± 1.70
Nutritive value (1) %		
TDN (Total Digestible Nutrients)	60.31 ± 0.28	53.30 ± 0.53
DP (Digestible Protein)	8.68 ± 0.59	7.36 ± 0.64

(1) Determined in a digestibility trial.

Statistical analysis of TDN values showed significant differences ($P<0.01$) among treatments. DP value did not differ significantly ($P>0.05$) among treatments.

However, the results discussed here are in agreement with those obtained by Rea *et al.* (1964), Robinson and Forbes (1970) and Singh *et al.* (1972).

Weight gains and feed effliciency

Average initial and final body weight, total gain, daily intake of DM, daily gain and feed efficiency (kg gain/kg intake), expressed on DM basis are presented in Table 3.

TABLE 3. Mean live weight gains and feed efficiency of Rahmany sheep receiving treatments varying in roughage to concentrate ratio.

Item	Treatments (R/C ratio)	
	I (30 : 70),	II (40 : 60)
Av. initial body weight (1), kg	47.60	51.87
A. final body weight (1), kg	57.40	58.25
Av. total gain, kg	9.800	6.375
Av. daily intake of DM, kg	1.5617	1.6759
ADG*, kg	0.0875±0.09	0.0569±0.07
Feed efficiency (2)	0.0560	0.0339

(1) Average of 5 & 4 animals in treatment I & II, respectively.
(2) kg gain/kg DM. intake.
(*) ADG Average daily gain.

Initial body weights for the two treatments were different and the final body weights were almost similar in the two treatments . Results given point that feed intake on DM basis was markedly decreased by increasing the concentrate : roughage ratio in Rahmany sheep rations. Slight differences in body weight occured between the two different dietary treatments.

When comparing growth rates during the experiment, it was found that the animals fed 60% concentrates gave lower values.

However, the average daily gains values showed no significant differences ($P>0.05$) among both treatments . By increasing the concentrates level in the ration, growth increased, a finding which agrees with the views of Weir *et al.* (1959) . Schneider *et al.* (1963), Van Niekark *et al.* (1966), Ghorban *et al.* (1970) and El-Shobokshy *et al.* (1976).

Feed efficiency (kg gain/kg DM intake), improved with the increase in the concentrates in the ration (Table 3).

Animals fed 70% concentrates produced the higher gain per unit of DM intake than those fed 60% concentrates. These results. however, are in line with those reported by Glimp (1971) and AL Ashry *et al.* (1976).

Carcass characteristics

Table 4 shows the carcass characteristics of Rahmany sheep fed different roughage: concentrate rations.

The dressing percentage values relative to FBW or EBW, in treatment II (60% concentrates) was higher than treatment I (70% concentrates). Differences among treatments were not significant (P>0.05).

TABLE 4. **Carcass characteristics of Rahmany sheep receiving treatments varying in roughage to concentrate ratio.**

Item	Initial slaughter[a]	Treatments (R : cratio) I(30 : 70) Final	II (40 : 60) slaughter[c]
Fasting body weight, kg (FBW)	28.50	57.40	58.25
Warm carcass weight, kg (WCW)	13.50	27.20	29.50
Empty body weight, kg (EBW)	25.847	52.968	52.455
Dressing percentage, %			
Relative to FBW	51.16	50.70	53.52
Relative to EBW	56.56	54.91	59.54
Edible offals[c], %			
Rumen	2.91	2.55	2.86
Small intestine	2.30	0.97	1.10
Large intestine	2.09	1.57	1.21
Heart	0.46	0.48	0.37
Liver	1.65	1.10	1.13
Lung + trachia	1.60	1.12	1.28

a. Average of 2 animals.
b. Average of 5, 4 animals in treatments I & II, respectively.
c. Relative to fasting body weight.

TABLE 5. Dry matter, protein, fat and energy deposited in bodies of Rahmany sheep receiving treatments varying in roughage to concentrate ratio.

		Average fleece-free FBW(kg)	Average fleece-EBW(kg)	%	Content of fleece-free fasting body weight							
					DM	CP(2)		EE(2)		Energy (Mcal)		
					amount (gk)	%	amount (kg)	%	amount (kg)	from[1] protein	from[1] fat	Total
I	Initial slaughter	28.50	25.847	31.28	8.91	51.37	4.58	25.66	2.29	25.51	21.42	46.93
30:70	Final slaughter	57.40	52.968	53.01	30.43	35.44	10.78	56.58	17.22	60.045	161.07	221.12
R:C		Amount deposited			21.52		6.20		14.93			174.18
		Amount "/kg EBW gain			0.79		0.229		0.55			6.42
		/day kg EBW gain					0.002					0.05
II	Initial slaughter	28.50	25.847	31.28	8.91	51.37	4.58	25.66	2.29	25.511	21.421	46.93
40:60	Final slaughter	58.25	52.455	46.28	26.96	36.55	9.85	54.38	14.66	54.864	137.130	191.99
R:C		Amount deposited			18.05		5.27		12.37			145.06
		Amount "/kg EBW gain			0.678		0.198		0.46			5.45
		/day/kg EBW gain					0.0018					0.04

(1) Each kg protein = 5570 Kcal, kg fat = 9354 kcal (Garrett, 1959)

(2) Percentage of CP and ether extract on DM basis.

The figures given in Table 4 for edible offals relative to FBW show that the rumen weight in treatment II (60% concentrates) was markedly higher than that of animals in treatment I (70% concentrates).

The present work revealed that, on the low concentrate, level (60%), increasing protein intake caused a marked increase in dressing percentage. Such findings may be due to the fact that on the low concentrate intake, the excess of protein spared energy (Church *et al.*, 1966).

Chemical composition of cracass

Table 5 shows the amount of DM, CP, EE and energy deposited in carcass of Rahmany sheep fed different raughage : concentrate ratios.

The amounts deposited (DM, CP, EE and energy) expressed per kg EBW gain, were calculated on the basis of the amounts deposited, in FBW divided by the EBW gain in kg for the different treatments, to take care of the differences among treatments, which may be attributed to filling of the gastrointestinal tract. It is clear from the results given in Table5, that the amounts of DM, CP, EE and energy deposited/kg. EBW gain was higher in treatment I (70% concentrates) than in treatment II (60% concentrates).

The amount of body components (DM, CP, EE and energy) increased with increasing concentrates level in the rations. These results are in contrast with those obtained by Burton and Reid (1969) who concluded that body composition was not related to energy intake; it was only slightly associated with age and mainly with body weight.

Efficiency of protein and energy utilization

Efficiency of protein and energy utilization of Rahmany sheep receiving treatments varying in roughage : concentrate ratios are presented in Table 6.

Values of DE and ME intake, expressed per kg. EBW gain were calculated on the basis of the DE and ME intake divided by EBW gain in kg. The efficiency of protein utilization was expressed as percentage of protein intake and the efficiency of energy utilization was expressed as percentage of DE and ME.

It is clear from the results that efficiency of protein utilization increased, as the concentrates percentage increased in the rations. These results agree with the view of Robinson and Forbes (1970) . Also, efficiency of energy utilization increased as the concentrates level increased in the rations. These results, however are in line with Daccord (1972) who found that, the efficiency of energy utilization, of 5 yearsold sheep was 50, 47 and 30% for concentrate alone or with hay and hay alone, respectively . Efficiency was related to fibre content of the ration and to the proportion of acetic acid in the rumen. Also, these results agree with the view of Searle and Garham (1972).

TABLE 6. **Efficiency of protein and energy utilization of Rahmany sheep receiving treatments varying in roughage to concentrate ratio.**

Item	Treatments (R: Cratio)I	
	I (30:70)	II (40:60)
DE intake/day(1) . . . . . , Mcal	4.0610	3.7973
DE intake/day/kg EBW gain . . . . . ,Kcal	149.74	142.71
ME Intake/day(1)	3.3300	3.1138
ME intake/day/kg EBW gain . . . . . ,Kcal	122.78	117.02
Protein intake Mcal/day(1)	1.2633	1.3181
Protein intake Kcal/day/kg EBW gain . . . . p	46.58	49.54
Protein retained kg/day/kg EBW gain(2)	.0020	.0018
Protein retained kcal/day/kg EBW gain	11.14	10.03
Energy retained/day/kg EBW gain(2), Kcal	57.35	48.68
Efficiency of protein utilization . . . . . % of protein intake, (Kcal)	23.91	20.25
Efficiency of energy utilization . . . . . % of DE (Digestible Enezgy)	38.30	34.11
% of ME (Metabolizable Energy)	49.71	41.60

(1) From Table (6).
(2) From Table (5).

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دراسة أثر التغذية باستخدام نسب مختلفة من المواد الخشنة والمواد المركزه على أداء الأغنام الرحمانى ٠

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اجريت الدراسة بهدف التعرف على أنسب نسبة من المواد الخشنة الى المواد المركزه يمكن استخدامها فى تسمين الاغنام الرحمانى تامة النمو وذلك عن طريق دراسة معاملات الهضم ومعدلات النمو والكفاءه التحويلية ومعدلات الاستفادة من الطاقة والبروتين ٠

وأستخدم فى التجربة ذكور تامة النمو من الاغنام الرحمانى متوسط أوزانهم ٤٩ كجم ثم تغذيتهم لمدة١١٢ يوما على نوعين من العلائق تحتوى أما ٧٠٪ مواد مركزة أو ٦٠٪ مواد مركزة و ٣٠ أو ٤٠٪ مواد خشنة واشارت النتائج المتحصل عليها الى :

١ ـ زيادة معدلات هضم جميع المركبات الغذائية بزيادة نسبة المواد المركزه باستثناء مستخلص المواد الخالية من الأزوت ٠

٢ ـ زيادة نسبة المواد المركزة أدت الى زيادة معدلات النمو اليومية والكفاءة التحويلية للغذاء ٠

٣ ـ زيادة نسبة المركزات أدت الى انخفاض نسبة التصافى بالذبيحة ٠

٤ ـ بزيادة نسبة المواد المركزة فقد زادت كمية البروتين والطاقة المترسبة فى الذبيحه ٠