THE EFFECT OF FEEDING DIETS OF VARIABLE ENER- GY CONCENTRATIONS ON GROWTH AND CARCASS COMPOSITION OF SUDAN DESERT LAMBS

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SUMMARY

In a feedlot experiment three diets containing low molasses (LM), high molasses (HM) or high sorghum (HS) were offered to three groups of Sudan Desert lambs (22 animals each) from an average of 25.4 Kg liveweight to 40.7 Kg slaughter weight. The mean daily liveweight gain for group LM, HM and HS was found 196, 161 and 179 g respectively. Significant differences (P < 0.05) were observed among the treatments in bone and fat percentages of the carcass. ,2 Statistical analysis of the pooled data from the cune nt and previous trials at this institution showed a high correlation of energy and protein intake with liveweight gain. Using regression analysis the extrap- olated maintenance energy requirement (499 KJ. Kg' 035) of the Sudan Desert lambs was found consistent with the reported literature.

INTRODUCTION

Livestock in the Sudan are mostly raised under nomadic conditions with traditional methods of management and natural grazing. Recent drought and desertification resulted in detrimental effects on the range with consequent increase in prices of feeds and animals. Therefore imple- mentation of proper feeding and farming practices particularly in the irri- gated areas of the country could not be overlooked. Adoption of such policy will secure optimum animal production with least cost. The previ- ous work conducted at this institute with Sudan Desert lambs investigated their growth and fattening potentials when fed on diets containing con- ventional and non-conventional ingredients (El Khidir et al, 1983, El Khidir et al, 1984 and Khalafalla and El Khidir, 1985). Along this line further research work is necessary to detemrine the energy and] or protein requirements of livestock under tropical environment. The current work is a study on the effect of feeding three diets of vari- able composition and energy concentration on feedlot performance and carcass analysis of Sudan Desert lambs slaughtered at 40 Kg liveweight. The data were also pooled with previous finding to examine energy and protein requiremets of growing lambs.

MATERIALS AND METHODS

Livestock: Sixty six, 4 to 5 month old, Sudan Desert male lambs of 21.1 :t 0.4 Kg liveweight were purchased from a local livestock market. They were immediately trucked to the site of the experiment at Kuku. On arrival the lambs were ear tagged, dewormed with systamex (Wellcome), sprayed against ectoparasites using Garnatox and given prophylactic doses of Ter-ramycrn. Feeds: Three iso-nitrogenous diets containing high molasses (HM), low mo- lasses (LM) and high sorghum (HS) were formulated (see Table 1). The high proportions of peanut hulls and molasses in diet HM were partially or wholly replaced by increasing percentages of cotton seed cake (CSC) and sorghum grain in diet LM and HS with presumalby increasing effect on energy concentration of the latter two diets respectively. Management, feeding and experimental design: Initially the lambs were kept for three weeks adaptation period during which a diet of 40% peanut hulls, 20% sorghum grain, 20% CSC, 19% wheat bran and 1% salt was offered. At commencement of the experi- ment the lambs were divided on live-weight basis into three groups of 22 lambs each referred to as HM, LM and HS according to the diet offered. Each group was housed in a separate pen with partial overhead shade and equipped with watering and feeding facilities. Daily feed allowances were offered for each group ad libitum (10% weigh back) in two equal meals at 8 and 16 h. Feeds offered and refused were subsampled weekly for chemical analysis. To avoid deficiency of vitamin A fresh alfalfa was of- fered to each group at the rate of 7 to 10 Kg] week. All lambs were weighed at regular weekly intervals before the morning meal. The experimental lambs were slaughtered when they reach a minimum of 40 Kg live weight.

Table 1: Composition and chemical analysis of the experimental diets.

Ingredients (% of DM)	Diets		
	High Molasses HM	Low Molasses LM	High Sorghum HS
Peanut hulls	50	35	20
Molasses	20	10	0
CSC	10	20	25
Dura grain	10	25	45
Wheat bran	8	9	10
Urea	2	1	0
Chemical analysis (g/ Kg)			
Ash	112	69	45
Crude protein	131	156	148
DCP	91	100	92
DOM	563	562	648
ME (MJ/ Kg DM)	8.499	8.484	9.782

N. B. All lambs had free access to salt licks.

Carcass preparation: Slaughtering and carcass preparations were done according to the method described by Gaili (1979). The warm carcass and intemal and ex- temal offals were weighed immediately. Thereafter the carcass was left in a refrigerator at 0 to 4 degree C for 24 hrs before being separated longitu- dinally into twotsymmetrical halves. The left side was dissected into sub- cutanious fat, intermuscular fat, muscles, bones and connective tissue. Whereas the right side was kept for sale as whole cuts. Digestibility trials: . The digestible organic matter (DOM) and digestible crude protein (DCP) for each diet (HM, LM and HS) was determined in-vivo by using three sheep housed individually in metabolic crates. Each trial started by seven days preliminary period followed by seven days faecal collection period. The metabolizable energy (ME) was calculated according to the fonnula; ME (MI/’ Kg) = DOM X 0.82 X 4.4 X 4.184

Statistical analysis:
Differences in liveweight changes and carcass composition were ex- amined for significance by analysis of variance; the ME and DCP intake withliveweight gain were examined by simple correlation and regression analysis according to the methods described by Snedecor and Cochran (1 967).

RESULTS AND DISCUSSION

Table 1 presents the DOM, ME and chemical analysis of the experi- mental diets. The high sorghum diet (HS) exhibited the highest energy concentration and DOM compared with the other two diets GJM and HM) which had similar levels of these nutrients. It had been assumed that in- creasing the peanut hulls fraction in the diets would lower the ME con- centration. However the observed results were not consistent with that assumption as addition of high levels of molasses with urea seems to augment digestibility of the organic matter in diet HM (El Khidir and Vestergaard Thomsen, 1982). The feed intake and liveweight changes of the lambs is presented in table 2. The dry matter intake (DMI) as percentage of liveweight was found 5.1, 5.2 and 4.2 for diet HM, LM and HS respectively. It is note- worthy that the mean liveweight for the whole experimental period was 32.1’; 0.5, 32.7i 0.4 and 33.1i 0.4 Kg for group HM, LM and HS re- spectively. This indicates that the observed differences in DMI between the molasses containing diets and the high sorghum diet is mostly due to the type of feed offered rather than an effect of variation in liveweight. In this respect the DCP intake of group LM was 15 and 31% higher than that observed for group HM and HS respectively. Whereas the ME intake of the former group was 4% greater than that observed for each of the lat- ter two groups. Consistently the highest liveweight gain was reckoned for group LM followed by HS and HM consecutively. The data of ME intake were furthermore pooled with previous find- ings for Sudan Desert lambs of similar liveweight and fattened from about 20 Kg to 40 Kg slaughter weight (El Khidir et al, 1983, El Khidir et ,‘ 1984 and Khalafalla and El Khidir, 1985). The energy intakes (Y = MJ. Kg ' 0‘,/5) were then regressed against the corresponding daily liveweight gains (X = Kg. day '1) of the lambs: Y = 0.499 + 2.432 X

$S_{y.x} = 0.082$

$S_b = 1.069$

$r = 0.63$

Table 2: Feedlot performance of the experimental lambs:

	Group			
	HM	LM	HS	SE of means
Days to slaughter	95.0	79.0	84.0	7.1 NS
Initial L. Wt. (Kg)	25.3	25.4	25.7	0.6 NS
Slaughter Wt. (Kg)	40.6	40.9	40.7	0.2 NS
L. Wt. gain (g/ day)	161 [a]	196 [b]	179 [ab]	8 **
DMI (g/ day)	1624	1699	1415	-
DCP (g/ day)	148	170	130	-
ME (MJ/ day)	13.8	14.4	13.8	-
Kg DMI/ Kg L. Wt. gain	10.1	8.7	7.9	-

In this and the following tables means in the same row having similar or no superscripts are not significantly different (NS, P > 0.05).

The calculated total energy intake for growth and maintenance were found consistent with that reported by Garrett et al (1959) and ARC (1980). Maintenance energy requirement estimated by extrapolation to zero gam (499 Kr ME. Kg “ °-75; is also in line with that reported by these references.

Consistently data of DCP were examined in a similar way and the found regression equation is:

Y (DCP, g. Kg ' 0-75) = 0.583 + 58.50 x (L. wt. gain, Kg. day ' 1)

s y_X = 0.981

sb = 12.312

r = 0.85

Although the analysis revealed a significant regression coefficient (P < 0_0l) it is noteworthy that a minimum level of protein is needed for every level of energy required for different rates of growth (Broster, 1973). In this contex the range of DCP intakes investigated here (142 to

219 gl day) are greater than the levels required for the observed gains in liveweight (ARC, 1980) Furthermore a rational assessment of DCP for ruminants should be done on the basis of microbial and host animal re- quirements (see Qirskov, 1982); and in this context the growth response to increasing levels of protein could be monitered if the latter protein re- quirement is formulated from substrates of low degradability in the rumen (Preston, 1971). The feed conversion efficiency was highest for diets-HS compared with diet LM and HM (Table 2). This was induced by the high content of sorghum in the former diet. Consistently similar results of improved effi- ciency of utilization due to increasing the grain fraction in the diet were reported by Blaxter and Wainman (1964). Table 3 presents the slaughter and carcass analysis data of the experi~ mental lambs. the high sorghum group exhibited the best performance compared with group HM and LM. In this respect the former group had the highest dressing percentage and lowest gut fill and bones i.e. greater percentage of edible meat. Nevertheless differences between the experi- mental groups are relatively small (P < 0.05). they also did not differ substantially with those of earlier reports (El Khidir et al, 1983, El Khidir et al, 1984 and Khalafalla and El 1985).

Table 3: Slaughter and carcass analysis data of the experimental lambs.

	Group			
	HM	LM	HS	SE of means
No. of lambs	22	22	22	-
Slaughter Wt. (Kg)	40.6	40.9	40.7	0.2 NS
Warm carcass Wt. (Kg)	17.5^{a}	18.6^{b}	19.4^{c}	0.2 *
Dressing% of L. Wt.	43.0^{a}	45.5^{b}	47.6^{c}	0.4 *
Gut fill (% of L. Wt.)	21.2^{a}	18.4^{b}	17.0^{c}	0.2 *
Muscles %	58.6	57.6	57.8	0.5 NS
Bone %	21.1^{a}	19.6^{b}	18.9^{c}	0.3 *
Sub. cut. fat %	10.1^{a}	11.7^{b}	11.9^{b}	0.4 *
Int. muscular fat %	7.1^{a}	8.1^{ab}	8.6^{b}	0.4 *
Connective tissue %	3.1	3.0	2.8	0.2 NS

N. B. Tissues are percentages of the carcass weight.

The external and internal offals are presented in Table 4. No signifi- cant differneces were observed between the groups due to diet treatment. However group HS had slightly significant ($P < 0.05$) lower percentage of empty alimentary tract. Funhermore the mean total weight of offals was found 30% of the mean liveweight of each group. Therefore consid- ering an over all average of 45% and 19% of liveweight calculated for dressing and gut fill respectively the remaining 6% could mostly be taken as losses in blood and some fluids of the slaughtered animals. The previ- ous work at this institution (unpublished) with lambs slaughtered at 40 Kg showed similar percentage of offals.

Table 4: Offals of the experimental lambs (% of slaughter Wt.).

	Group			
	HM	LM	HS	SE of means
Head (unskinned)	6.2	6.6	6.3	0.1 NS
Skin	8.6	8.4	8.4	0.2 NS
Heart	0.4	0.4	0.4	0.0 NS
Liver	1.7	1.8	1.8	0.0 NS
Lungs and trachea	1.0	1.1	1.0	0.0 NS
Alimentary tract (empty)	6.0 a	5.8 a	5.2 b	0.1 *
Spleen	0.2	0.3	0.2	0.0 NS
Omental fat	1.6	1.8	1.8	0.1 NS
Mesentric fat	1.2	1.3	1.3	0.1 NS
Feet	2.0	2.0	2.1	0.0 NS
Genitals	1.1	1.0	1.1	0.0 NS
Total offals	30.1	30.6	29.3	0.3 NS

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