INFLUENCE OF LEVELS OF DIETARY PROTEIN ON PERFORMANCE AND CARCASS CHARACTERISTICS OF ZEBU STEERS FED HIGH ENERGY RATIONS

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The protein requirement of fattening Zebu steers fed high grain rations was studied with 30 steers. The three treatments were balanced to be isocaloric but differed in the levels of crude protein and were 11.6% 14.7% and 17.7% for the low, medium and high protein diets respectively. Judging from data on weight gain,feed intake, feed conversion and carcass characteristics. it would seem that for diets the" contain -bout 2.70 !Mcal metabolizable energy per kg dry feed, that 11.6% dietary protein was adequate for maximum growth.

Key words: Zebu cattle, cereal grains, protein levels, fattening

In an attempt to slowly get away from the present traditional and less efficient system of livestock production in Nigeria, efforts are underway to develop cattle ranches and commercial feedlots to more efficiently utilize the available feed resources of the country. It has been shown that, under good management and feeding, the growth rate of the Zebu cattle could be doubled (Woodhead et al 1971). The feeding of high energy rations to fattening cattle is therefore increasing in Nigeria (Olayiwole et al 1975) but the level of protein required for fattening Zebu steers has not been studied. Data on the subject based on temperate conditions abound but may not be strictly applicable to the tropics (Babatunde et al 1972; Umunna & Dakintafo 1978). That the Zebu beef breeds in Nigeria tend to fatten at low weights, about 330 kg, at which many temperate breeds enter the feedlot, further substantiates the inapplicability of protein levels recommended for fattening temperate beef breeds to the Nigeria beef stock. These studies were therefore initiated to investigate the optimum protein level for fattening Zebu steers fed high energy rations.

Experimental Procedure

The studies were conducted at the Shika Research Station and relevant climatic data have been reported (Umunna & Dakintafo 1978).

Experiment 1 - Growth trial: This involved the use of 30 Zebu steers (24 White Fulani or Bunaji and 6 Sokoto Gudali) which were assigned randomly on the basis of weight and breed to the three dietary protein levels 11.6% 14.7% and 17.7%. Five days prior to the start of the study, all animals were treated for intestinal parasites with Thibenzole (Merck, Sharp and Dohme). The stock were housed in a concrete floored barn and individually fed to appetite once daily, the experimental diets comprising of Gamba Grass hay (Andropogon gayanus) and concentrates (Table l). Initially, the steers received more hay than concentrate but these were adjusted every third day by about 10% towards more concentrate such that by the 12th day all animals were on the desired ration of 90% concentrate and 105 hay. At the end of day 80, the animals were weighed and slaughtered for carcass evaluation. The beginning and final weights were taken shrunk (without feed and water for about 16 hours).

Table 1:
Composition (%) of diets fed in the fattening and digestion studies

	Protein level		
	Low	Medium	High
Gamba hay	10.0	10.0	10.0
Guinea corn	84.60	76.84	68.92
Groundnut cake	2.90	10.91	18.98
Bonemeal	2.90	1.75	1.60
Salt	0.50	0.50	0 50
Commercial mineral block[1]	+	+	+
Vitamin A[2]	+	+	+
Chemical composition of dry matter, %			
Analyzed crude protein	11. 6	14. 7	17. 3
Calculated metabolizable energy (Mcal/kg)	2.72	2.74	2.75

[1] Provided ad libitum to each animal and contained 5.5% Ca, 4% P, 108.22 ppm Mg, 346.1 ppm Fe, 86.5 ppm Cu, 64.9 ppm Mn, 21.6 ppm CO, 21.6 ppm Zn and 5.4 ppm I.
[2] Each animal received 20,000 IU/head/day

Experiment 2 - Digestion study: Twelve Bunaji steers weighing on the average 261 kg were assigned at random to the same dietary treatments used in experiment 1 at the beginning of two periods of total faecal collection. The steers were fed their diets (1.8% of their body weight) once daily in the morning for a preliminary period of 15 days subsequent to a 7 day collection period. Dry matter and nitrogen determinations were according to AOAC (1970). Protein was determined by multiplying the nitrogen content by 6.25.

The performance and carcass data were subjected to the analysis of variance and treatment means were compared using Duncan's Multiple Range test (Steel & Torrie 1960).

Results and Discussion

The performance, carcass and digestibility data are given in Table 2. Differences in average daily gain, feed conversion, carcass weight, rib-eye area and back-faC thickness were not significantly ($P < .05$) affected by the treatments. Neither the other performance and carcass parameters nor dry matter and protein digestibilities revealed any marked treatment effects. There was a trend towards increased ADC, protein digestibility, carcass weight and rib-eye area with increase in the level of dietary protein. However, the response obtained from these studies indicated that 11.6% crude protein in high grain rations was adequate for Zebu cattle. This is nearly similar to the 11% crude protein recommended for fattening (from 250 kg) temperate beef breeds by Kay et al (1968).

The crude protein intake of the different groups increased with increase in dietary protein level. These were all nearly within the range recommended for fattening steers. For example, we obtained a mean intake of 0.70 kg for treatment 1 which compares well with the NRC (1976) recommendation of 0.76 kg.

Table 2:
Results of the fattening and the digestibility studies

	Protein level			SE[1]	Level of signicance
	Low	Medium	High		
No of steers	10	10	10		
Average initial weight, kg	257	259	259		
Average final weight, kg	300	306	307		
Adjusted daily gain, kg[3]	0.56	0.60	0 73	0.07	NS
Expected daily gain, kg	0.93	1.05	0 95		
Feed intake, kg	6.11	6.63	6.23	0.05	NS
Feed conversion	10.91	10.72	8.52	1.86	NS
Dry matter digestibility	70.0	70.0	66.7	2.84	NS
Protein digestibility	74.0	75.2	77.5	1.81	NS
Average protein intake, kg	0.70	0.93	1.00		
Carcass data					
Average hot carcass weight, kg	175	176	180	3.10	NS
Average dressing percent	57.9	57.3	58.6	0.57	NS
Average rib-eye area cm^2	63.1	66.2	66.7	2.50	NS
Rib-eye area, cm^2 /100 kg hot carcass weight	36.0	37.6	36.9	1.01	NS
Average backfat thickness, mm	5.1	5.6	6.8	0.01	NS

[1] Standard error
[2] NS-non significant
[3] Adjusted to 57% dressing

Steers fed the high protein diet required about 22% and 24% less feed for the same weight Rain than those on the low and medium protein diets respectively. However, these differences were not significant. Dry matter digestibility was not affected by the dietary protein levels and this is in agreement with the report of Jahn & Chandler (1976) but at variance with that of Ray et al (1968). On the other hand the increase in protein digestibility which accompanied each increase in dietary protein level concurs with the results of Ray et al (1968).

The expected daily gains were calculated according to Lofgreen & Garret (1967) and were about 40X, 43% and 23% for treatments 1, 2 and 3 respectively, higher than the daily gains obtained. The poor response could not be ascribed to insufficient protein and energy intakes since both were within the recommended range (NRC, 1976). Rather it might be explained in teems of the poor efficiency of the Zebu cattle, a point also noted by Zemmelink al (1973). It is further reflected in the poor feed conversion obtained in this study as compared with data obtained on temperate breeds (Greathouse et al 1974; Peterson et al 1973). It needs to be stressed also that the factors for calculating expected daily gains are based on data collected on temperate breeds (Lofgreen & Garret 1967) and may not be strictly applicable to the Zebu (tropical) breeds since their efficiencies differ. In fact, Rogerson et al (1968) showed that exotic cattle were more than twice as efficient as the indigenous cattle in converting feed to weight gain. This may account for the big difference between the actual and expected daily gains obtained in this study.

The low carcass weight and the rib-eye area are direct reflections of the size of the animals at slaughter. However, the fairly large rib-eye area per 100 kg hot carcass weight recorded also reflects the low hot carcass weight reported for these cattle as against the average for temperate cattle (Greathouse et al 1974). Backfat thickness increased linearly with increase in dietary protein level. Increasing levels (Table 1) of groundnut cake were used to achieve the medium and high protein levels and groundnut cake contained 5.2% fat. It follows therefore that the increasing levels of groundnut cake resulted in a corollary increase in ether extract which would explain the increase in back-fat thickness obtained.

Judging from data on both performance and carcass characteristics, and given the current price of groundnut cake (N270/metric ton; N1.0 = US$1.62) it would seem that 11.6% crude protein was adequate for Zebu cattle receiving about 2.7 Mcal metabolizable energy per kg of dry feed.

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