THE CARCASS CHARACTERISTICS AND CHEMICAL COMPOSITION OF THE ORGANS AND MUSCLES OF SHEEP AND GOATS FED BREWERS' DRIED GRAINS-BASED RATIONS

E A Adebowale[1] and A A Ademosun

Institute of Agricultural Research and Training,
University of Ife, P.M.B. 5029, Ibadan, Nigeria.

Forty-eight West African Dwarf sheep and goats (twenty-four of each) with liveweights ranging from 8 to 15 kg were allotted in groups of eight to six diets containing 0%, 15%, 30%, 45%, 60% and 75% brewers' dried grains (BDG) fed ad libitum together with 0.5 kg/head/ day fresh forage. After twenty-five weeks, all the animals were slaughtered and the carcass evaluated.

Brewers, dried grains did not have any significant effects on chilling and dressing out percentages. The different levels also did not affect most of the major cuts. The tendency of fat being deposited on pelvis and intestines with increase in BDG levels beyond 30% was observed. Lean meat was deposited faster in the sheep than the goats.

Key words: Brewers' dried grains,.carcass analysis, sheep, goats, fattening, West African Dwarf sheep, West African Dwarf goats

The idea of feeding brewers' dried grains (BDG) arose primarily from the desire to investigate cheap and alternative feeds for livestock. These alternative sources must not only be cheap but they must not form regular sources of feed for man.

From a previous study (Adebowale and Ademosun, 1980), it was observed that incorporating up to 30% BDG into the diet of goats and sheep did not affect growth rate and feed efficiency. However, the carcass quality of these animals needs to be estimated because the observed gains in weight might be due to accumulation of fat, tissue protein or even water (Maynard and Loosli, 1969).

The present experiment was planned to investigate the carcass quality, and the effect on chemical composition of the organs and muscles of both the sheep and goats when fed varying levels of BDG.

Materials and Methods

Forty-eight animals consisting of twenty-four West African Dwarf sheep (twelve rams and twelve ewes) and twenty-four West African Dwarf goats (twelve blocks and twelve does) all weighing between 8 and 15 kg were utilized. Eight animals (two each from the rams, ewes, bucks and does) were randomly placed on each of the six experimental diets. The control diet (A) contained no BDG, while diets B, C, D, E and F contained 15, 30, 45, 60 and 75% BDG respectively. These diets were fed ad libitum together with 0.5 kg/head/day of fresh forage (*Stylosanthes guyanensis*).

All the animals were slaughtered at the end of the experiment period of twenty-five weeks.

---

[1] *Present address: Department of Animal Science, University of Ife, ILE-IFE, Nigeria*

Slaughter technique and carcass evaluation: The rams and bucks were starved for 12 hours and weighed just prior to slaughter. The animals were bled by cutting the throat and then slaughtered by severing the head at its articulation with the atlas. The dressed carcasses were weighed after 24 hours chilling in a cold room maintained at -5°C. The chilled carcass weight divided by the liveweight before slaughter and multiplied by 100 was given as the dressing-out percentage. The chilled carcass weight was taken as the weight of the animal after the removal of the head, skin, thoracic, abdominal and pelvic cavity contents (including the diaphragm and the kidneys) and the limbs distal to the carpal and tarsal joints after storing in a chilling chamber for 24 hours. Other carcass components, organs and muscles were also weighed.

The procedure of Palsson (1939) for the jointing of the carcass for lambs wee followed for both sheep and goats. The frozen carcass was divided down the spinal column using a meat band saw. Each half was weighed. The left was divided into the following cuts. The leg (thigh) was severed at the attachment of the femur to the acetabulum, The loin consisted of the lumbar region plus a pair of ribs and the ends (spare ribs plus belly) of six abdominal ribs. The shoulder consisted of the scapula, humerus, radius, ulna, carpals and the sets which are made up of the breast and the neck. Each of the cuts was weighed and the weight was doubled in each case before being expressed as a percentage of the chilled carcass weight. The leg and loin cuts were then separated into muscles and bone with ligaments, these components were then pooled to obtain the meat to bone ratio, The liver, kidneys and meat from the loin plus leg were cut into pieces, homogenised separately and stored at -5°C until they were required for analysis. 2,0 g of the freshly-homogenised samples was weighed, frozen with liquid nitrogen and then freeze-dried to constant weight for dry matter determination.

Analytical procedure: The AOAC (1970) methods were used for the determination of the chemical composition of the carcass, organs and muscles.

All data were subjected to analysis of variance and mean differences were tested by the Duncan's new multiple range test (Steel and Torrie, 1960).

Results

Table 1 shows the chemical composition of the diets and growth rate of sheep and goats fed on the different diets. The crude protein content of the six diets were fairly high while that of the *Stylosanthes guyanensis* meal was low.

The data obtained for both the sheep and goats on the same treatment were pooled together (Tables 2 and 3). The basic reason was to show clearly how the graded levels of BDG affect the different parameters determined.

Slaughter-weights, dressing-out and chilling percentages: When the overall results for slaughter weight, dressing-out percentage and chilling loss (loss in carcass weight during chilling) were compared along the six different treatments, it was observed that there were no significant differences among treatments means in any of the measurements (Table 2). Also there were no well established trends in the response to the treatments.

Cuts: The overall mean weights of leg, loin, sets, ends and shoulder expressed as a percentage of the chilled carcass were 25.84 ± 1.86, 13.79 ± 1.58, 10.82 ± 1.63, 10.06 ± 0.73 and 25.40 ± 2.07 respectively, there being no significant effect of treatment.

Table 1:

Chemical composition of the diets and forage, and growth rate of sheep and goats fed on the different diets

	Level of Brewers' Dried Grains in the diet (%)						Forage[1]
	0	15	30	45	60	75	
Brewers' Dried Grains (BDG) Levels (%)	0.	15.0	30.0	45.0	60.0	75.0	
Crude Protein (%)	19.8	23.1	20.4	20.6	18.9	19.6	4.6
Crude Fibre (%)	3.6	4.4	6.8	10.3	14.7	21.6	24.7
Gross energy (MJ/kg)	17.9	18.2	18.9	19.1	19.6	20.3	19.9
Growth rate (g/day)							
Sheep	53.4	64.6	64.1	39.1	40.4	32.3	
Goats	45.4	56.1	49.3	38.9	31.6	28.9	

[1] *Stylosanthes guyanensis*

Table 2:

Effect of levels of Brewers' Dried Grains on mean slaughter weights, dressing-out percentage and chilling loss of carcasses

Parameter	Level of Brewers' Dried Grains in the diet (%)						Overall mean
	0	15	30	45	60	75	
Liveweight at Slaughter (kg)	18.9	26.3	26.6	23.1	23.7	22.7	23.5 ± 2.85
Dressing-out percentage	47.8	46.7	47.7	48.6	48.1	48.6	47.9 ± 0.70
Chilling loss (%)	4.73	4.81	3.26	3.81	5.00	4.87	4.24 ± 0.70

Table 3:

Effect of levels of Brewers' Dried Grains on heart fat, crude protein of heart and leg plus loin meat

Parameter	Level of Brewers' Dried Grains in the diet (%)						Overall mean
	0	15	30	45	60	75	
Heart							
Crude protein (g/100 g DM)	73.7	73.8	74.8	71.7	73.0	73.4	73.4 ± 1.00
Fat (g/100 g DM)	9.3	10.8	11.3	11.1	11.9	12.7	11.2 ± 1.16
Leg plus loin meat							
Crude protein* (g/100 g DM)	86.5^{abc}	87.4^{a}	85.9^{bc}	84.7^{bc}	83.4^{c}	86.7^{ab}	86.1 ± 2.01

*Means bearing the same superscripts within this row are not significantly different ($P < 0.05$)

Similarly, there was no effect of the treatments on bone to lean meat ratio (overall mean 0.34 ± 0.026) or lean meat fat content (overall mean 9.43 ± 0.33 g/100 g DM) of the leg plus loin meat.

The chemical composition showed that there was a significant difference ($P< 0.05$) between the lean meat crude protein obtained from the various treatments. Diet B (15% BDG) with the highest crude protein content (Table 1) gave the highest lean meat crude protein content (87.4 ± 1.61%) although this this was not higher ($P >0.05$) than the control (86.5 ± 1.61%) (Table 3).

Fat: The overall mean kidney plus pelvic fat percentage was 1.99 ± 0.2 g/100 g DM, the differences between treatment means were not significant. The intestinal fat deposition was significantly lower on the control diet (3.76 g/100 of empty liveweight) than on the brewers' dried grains diets (overall mean 5.98 g/100 g of empty liveweight) ($P< 0.05$) there being no significant difference between the brewers' grains diets.

Table 4 shows the differences in the carcass quality of sheep and goats when fed the BDG-based diets, Most of the parameters evaluated showed that the values obtained for goats were higher than the sheep. This was true for the chilling and dressing-out percentages, loin, ends, shoulder, intestinal fats, bone to lean meat and liver. No significant differences were obtained between sheep and goats with respect to leg, sets, head and kidney plus pelvic fat.

Table 4:

Comparison of the carcass qualities of goats and sheep fed Brewers' Dried Grains based diets[1]

Characteristics		Goats	Sheep	Significance of difference[2]
Chilling loss	%	5.33	3.72	*
Dressing-out	%	49.53	45.48	**
Leg	%	24.02	27.65	n.s.
Loin	%	16.77	10.80	**
Sets	%	10.63	11.00	n.s.
Ends	%	12.94	7.18	**
Shoulder	%	34.63	16.16	**
Kidneys + pelvic fat	%	1.89	1.86	n.s.
Intestinal fat	%	6.03	5.30	*
Bone to lean Meat ratio	%	0.41	0.26	**
Liver	%	2.12	1.52	**
Head	%	8.33	8.60	n.s.

[1] Leg, loin, sets, ends and shoulder were calculated as percentages of chilled carcass weight while others except chilling and dressing-out percentages were calculated as percentages of empty liveweight

[2] n.s = not significant* = $P < .05$; ** = $P < .01$

Discussion

Miller, Jones and Burt (1943) obtained a range of 48 to 52% for the dressing-out percentage of Angora wethers, while Akinsoyinu et al (1975), obtained between 50 and 51% for goats. The dressing-out percentage rangeing between 47 and 49% (mean 47.9 ± 0.70%)obtained in this study indicates: that brewers dried grains did not reduce carcass quality of the animals appreciably.

Preston and Gee (1957) pointed out that some sample joints are suitable index for estimating the composition of the total carcass. Further, Barton and Kirton (1961) observed that the leg plus loin could be used with success in estimating the bone, muscle and fat of the carcass since leg is relatively late developing while loin is early developing. The constant ratio of bone to lean meat of leg plus loin meat obtained in this study showed that the deposition of bone and meat was not radically affected by the BDG incorporation into the diets. Table 4 however shows that the lean meat was being deposited faster in the sheep than in goats. The fact that there were no differences between the kidney plus pelvic fats deposition within the varying levels of BDG suggests that the liveweight gain of the experimental animals could not have been due to excessive accumulation of fat.

McMeekan (1940) in a series of experiments confirmed that the crude protein content of the liver reflects the degree of utilization of dietary nitrogen. There were no differences between the liver crude protein of the animals fed control and other diets in this study. It is therefore reasonable to deduce from the results that the different sources of nitrogen intake were equally and effectively utilized by the animals.

Acknowledgements

The authors are grateful to Mr Gbade Oladapo who analysed some of the data and Mr O Bankole with Mrs Bisi Coker who carried out the chemical analyses of the carcass and organs.

References

Adebowale,.E A and Ademosun, A A (1980) Studies on the utilization of brewers' dried grains by sheep and goats I Growth studies Animal Health and Production (In press)

Akinsoyinu, A O, Mba, A U and Olubajo, F O (1975) Studies on the comparative utilization of urea and groundnut cake rations by young growing West African dwarf goats II Effect on carcass quality and chemical composition of the organs and muscles Nigerian Journal of Animal Production 2 (1):8-88

AOAC (1970) Association of Official Agricultural Chemists, Official Methods of Analysis Washington, D C

Barton, R A and Kirton, A H (1961) A comparison of whole milk with butterfat in the rearing of calves for veal. II Slaughter and carcass composition data Animal Production 3:41-50

Maynard, L A and Loosli, J K (1969) Animal Nutrition (llth ed) McGraw-Hill Book Company, New York and London . :

McMeekan C P (1940) Growth and development in the pig with special reference to carcass quality characters II The influence of the plane of nutrition on growth and development Journal of Agricultural Science Cambridge 30:387-437

Miller, J C, Jones, J M and Burt, C R (1943) Feed lot and carcass studies of Angora wethers Bulletin Texas Agricultural Experimental Station No 63 pp 14

Palsson, H (1939) Meat qualities in the sheep with special reference to the Scottish breeds and crosses Journal of Agricultural Science Cambridge 29:544-556

Preston, T R and Gee, I (1957) Effect of hexoestrol on carcass composition and efficiency of food utilization in fattening lambs Nature 179, 247-249

Steel, R G D and Torrie J H (1960) Principles and Procedures of Statistics New York, McGraw-Hill Book Company Inc

Received October 15 1980