EFFECT OF BREWERS' DRIED GRAIN ON GROWTH AND LACTATION PERFORMANCE OF YANKASA SHEEP IN GUINEA SAVANNAH

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ABSTRACT
The aim of this experiment was to determine the effect of feeding varying levels of brewers dried grain on feed intake, body weight gain, milk yield and composition of Yankasa ewes. Five treatment diets designated D1, D2, D3, D4 and D5 were formulated with maize component substituted with BDG at 0 %, 10 %, 20 %, 30 % and 40 % respectively. The experimental animals were randomly allotted to the five treatments groups in four replicates, each comprising one lamb per replicate in a completely randomized design. The animals were sourced from Biotechnology Department of the National Animal Production Research Institute (NAPRI), Shika Zaria, with properly recorded dates of birth and weight at birth. The lambs were used for the experiment at twelve week. The animals were intensively managed given the experimental diets in the morning and supplemented with forage (Digitaria smutti) afterward. The oestrus of ewes was synchronized using a synthetic prostaglandin named Estrumate® administer through intramuscular injection to have a uniform gestation and parturition. The parameters measured were feed intake, body weight gain, milk yield and milk composition. One way ANOVA using SAS (2000) statistical package was used for analysis. A non-significant (P>0.05) difference was observed among the treatment groups in respect of feed intake with weight gain having a significant difference. However D5 had a better result (4.75 Kg, 22.08) in respect to weight gain and feed conversion ratio respectively. Milk composition and showed a significant (P<0.05) difference with D5, D4 and D3 (7.39%, 7.25 % and 6.63 % respectively. Milk yield showed a significant (P<0.05) difference at week two among the dietary treatment with treatment two (D2) having the best result ((0.11 Kg). It was concluded and recommended that maize can be replaced with BDG up to 40 %.

INTRODUCTION

BACKGROUND TO THE STUDY

Low protein intake, coupled with rapid human population growth, constitute a major problem facing developing countries. Animal protein consumption is among the most important components of human diet and varies from country to country (Okai *et al*., 2005). Rapid human population and low productivity of livestock has led to low protein intake of animal origin in developing countries like Nigeria (Okai *et al*., 2005). This has resulted to demand of this animal protein to exceed supply. To solve this problem, the need to improve animals and animal products production by putting a lot of effort in the production of highly reproductive animals becomes very paramount (Ani and Adiegwu, 2005). The feeding cost constitutes about 65-75 % total production expenses under intensive animal production system. This scenario is attributed to the struggle for foodstuff by livestock and man for some common and normal feed and foodstuff. This situation is so serious in third world countries such as Nigeria thereby necessitating the sourcing for cheaply available unconventional feedstuff that can meet the growth and reproductive requirements of the animals. In Nigeria, there abound untapped potentials for unconventional feed ingredients which can be utilized to feed sheep and other small ruminants. Among these, is brewers' dried grain (BDG) which is a major by-product of brewing industries. The primary purpose of sheep production is to supply wool, meat and milk. The need to increase the supply of milk and mutton is worrisome as seen in most cities in Nigeria. The high demand for milk and mutton could be as a result of its potential over other milk and meat. Low productivity level of production is due to nutritional constraints characterize Sheep production in Nigeria (Tolera *et al*., 2000). The aim of this work is to evaluate the effect of brewers dried grain on growth and lactation performance on Yankasa sheep in guinea savannah.

MATERIALS AND METHODS

EXPERIMENTAL LOCATION

This experiment was conducted at the Biotechnology department farm of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika - Zaria. Shika lies between Latitudes 11° and 12° N, and between Longitude 7° and 8°E and is located in the sub-humid zone of the Northern Guinea Savannah at the elevation of 640 meters above sea level. Shika experience an average annual rainfall of 1100mm from May to October. The peak of rainfall is witnessed between July and September record the peak of the rainfall Shika also has an average daily temperature of about 25°C with mean relative humidity of about 75 %. The wet period (rainy season) is preceded by dry season (dry period) that starts November to April, having an average daily temperatures ranging from 14 to 36°C and an average relative humidity of between 20 and 37 % (IAR, Meteorological report, 2009).

DESIGN AND MANAGEMENT OF THE EXPERIMENTAL ANIMALS

The experimental design used for the study was complete randomized design (CRD). Twenty Yankasa ewes aged between 5 and 6 months raised at the Biotechnology department farm of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Zaria, Shika station were used. The experimental animals were treated with ivomec to control the internal parasites and vaccinated against Pestes des Petite Ruminate (PPR), before allotting them to dietary treatments. The weights of experimental animals were taken on the farm and allowed a 14-day adjustment period and subsequently on a weekly basis. The experimental animals were fed at 1.5 % body weight. The experimental animals were allotted to five dietary treatments, D1 (control 0 % Brewers' Dried grains BDG), D2 (10 % BDG), D3 (20 % BDG), D4 (30 % BDG) and D5 (40 %) with each treatment having four animals and each animal constituting a replicate. The animals were managed intensively. Water and forage were given *ad libitum*. This experiment lasted for 90 days.

FEED COMPOSITION

Five different experimental feeds were compounded for the five treatments which were designated as D1, D2, D3, D4 and D5. Diet1 served as control containing 0 % BDG replacing maize, while D2, D3, D4 and D5 had 10 %, 20 %, 30 % and 40 % respectively of BDG replacing maize. The composition of the experimental diets is presented in table 1

BREEDING PROCEDURE AND OESTRUS SYNCHRONIZATION

Oestrus synchronization was done on all the twenty experimental animals during the feeding trial. This was aimed at having a uniform gestation and parturition period using Estrumate®; a synthetic Prostaglandin $F_{2\alpha}$ analogue (Coopers Animal Health Ltd, Berkhamsted, England) containing 263µg of Cloprostenol Sodium (Vet), equivalent to 250 µg Cloprostenol, and 0.1 % w/v Chlorocresol (BP). Intramuscular injection of 2 ml of the $PGF_{2\alpha}$ was administered to each animal. Following intramuscular injection of experimental animals with $PGF_{2\alpha}$, they were observed for oestrus continuously for 7 days (Voh Jr. 2004). Ninety nine (99 %) percent of the animals that came into oestrus during the first $PGF_{2\alpha}$ treatment were mated using rams of proven performance at the rate of one ram to 10 ewes (1:10) The experimental animals were twice daily (at 0700 and 1800 hours), observed for oestrus visually by trained inseminators. Pregnancy was determined through the use of Ultra sound Technology

Table 1: Composition of Experimental Diets

	Dietary Supplements				
Ingredients (%)	D1	D2	D3	D4	D5
Maize	37.87	34.08	30.30	26.51	22.72
BDG	0	3.79	7.57	11.36	15.15
Maize Offal	18.94	18.94	18.94	18.94	18.94
CSC	39.19	39.19	39.19	39.19	39.19
Bone Meal	2.50	2.50	2.50	2.50	2.50
Salt	1.50	1.50	1.50	1.50	1.50
TOTAL	100	100	100	100	100
Calculated Nutrients (%)					
CP	13.71	23.20	33.29	14.96	15.64
CF	10.07	14.40	18.72	10.99	11.43
ASH	3.11	4.32	6.04	2.90	3.04
EE	3.80	6.54	9.04	2.90	3.04
NFE	69.31	51.62	62.91	67.02	65.64
Calcium	18.28	17.59	16.91	16.03	15.28
Phosphorus	4.16	4.21	4.26	4.14	4.14
Methionine	0.21	0.35	0.50	0.24	0.25
Lysine	0.51	0.85	1.71	0.59	0.62
Energy (kcal/kg/ME)	3516	3624	3619	3757	3355

BDG –Brewers Dried Grains, CSC – Cotton Seed Cake D1 = 0 % BDG, D2 = 10 %, BDG D3 = 20 % BDGD4 = 30 % BDG, D5 = 40 % BDG CP = Crude Protein, CF = Crude Fibre, EE = Ether Extract, NFE = Nitrogen Free Extract

COLLECTION OF DATA

FEED INTAKE

Data on intake of feed was taken on daily basis. Feed that was offered to the experimental animals were weighed and unconsumed feed was collected and weighed in the morning of the preceding day. Feed intake was obtained by subtracting the leftover from the amount of feed offered in each treatment.

BODY WEIGHT GAIN

Body weight was taken at the beginning of the experiment *using CAMRY Scale of 150 Kg capacity made in China* Model NS-(100kg-150kg). Body weight gain for each week was determined by differences between the body weight of the present week and the preceding week.

MILK SAMPLES COLLECTION

Milking was done once daily using partial milking method. This was done by separating the lambs from their dams in the night and their weight taken in the morning before they are taken to their dams between the hours of 7-8 am. At noon their weight is taken again. The difference between the weight taken before they are taken to their dams and weight after they stay with their dams represent yield of milk. .

MILK COMPOSITION DETERMINATION

100 ml milk samples were taken weekly from each animal by hand milking and preserved with potassium chromate tablets and were used for the determination of milk protein - using the AOAC (2006) procedures.

Milk Fat content was determined using the Gerber Milk test procedure, while Total solid was calculated using the formular: TS = Lc/4 + (1.22 x % Fat) + 0.72,

Where Lc = lactometer reading. Solid non-Fat was determined by subtracting % fat from Total solids.

Ash content was determined by oven drying the samples at 550^{o}C for 2 days.

DATA ANALYSIS

Data collected were subjected to analysis of variance (ANOVA) using SAS. The separation of means and others are contained in the package.

Growth and Lactation Performance of Yankasa ewes fed varying levels of Brewers Dried Grains diet

Growth performance of Yankasa ewes fed varying levels of BDG diet is presented in Table 2. No significance (P>0.05) difference among the treatments with regard to feed intake, total feed intake and final body weight gain was observed. However a trend was observed, animals fed diet having 10 % BDG (D2) had the highest (28.70) value for final body weight, and animals fed diet having 30 % BDG (D4) had the lowest value (25.00 %). Body weight gain was highest (4.75 Kg) in treatment five where the animals were fed 40 % BDG. Animals fed diet containing 40 % BDG (D5) had the highest value (0.86 Kg) and D4 which contains 30 % BDG had the lowest value (0.75 Kg) for daily feed intake. As for total feed intake, D5 containing 40 % BDG has the highest value (78.49 %) while D4 which contain 30 % BDG had the lowest Value (68.25 %).

Table 2: Growth performance of Yankasa ewe fed graded levels of Brewers Dried Grain from Nigerian Brewery

Parameters (Kg)	D1	D2	D3	D4	D5	SEM	LS
Initial body weight	22.63	21.75	22.88	22.75	21.25	0.788	NS
Final body Weight	27.50	28.70	26.25	25.00	26.00	0.862	NS
Weight Gain (g)	2.87	1.95	2.37	1.25	4.75	0.862	*
Daily Feed Intake	0.83	0.78	0.79	0.75	0.86	0.261	NS
Total Feed Intake	75.08	70.98	71.66	68.25	78.49	2.353	NS

[abc] Means in the same row with the same superscript are significantly not different (P>0.05)SEM = Standard error of mean, NS = Not Significant LS = Level of Significance FCR = Feed Conversion Ratio, D1 = Diet 1 – 0 % BDG D2 = Diet 2 - 10 % BDG D3 = Diet 3 - 20 % BDG D4 = Diet 4 - 30 % BDG D5 = Diet 5 - 40 % BDG

Weekly milk Yield samples from Yankasa ewes fed varying levels of Brewers Dried Grain diet.

Table 4.8 shows the weekly milk yield from Yankasa ewes fed varying levels of BDG from Nigerian brewery Kaduna. There was no significant differences (P>0.05) within the diet groups except in week two where there was significant differences among the diet groups. D2 which contain 10 % BDG had the highest value (0.11 Kg) diet D5 which contain 40 % BDG had the lowest value (0.03 Kg).

Total milk yield was highest (0.40 Kg) in animals fed 10 % BDG (D2) and lowest (0.29 Kg) in D5 which contains 40 % BDG.

Table 3: Weekly Milk yield of Yankasa ewe fed graded levels of Brewers Dried Grain from Nigerian Brewery

Parameters (Kg)	D1	D2	D3	D4	D5	SEM	LS
Wk 1	0.07	0.08	0.08	0.05	0.04	0.014	NS
Wk 2	0.04[b]	0.11[a]	0.03[b]	0.08[ab]	0.03[b]	0.010	*
Wk 3	0.03	0.04	0.03	0.03	0.03	0.003	NS
Wk 4	0.02	0.01	0.02	0.03	0.03	0.003	NS
Wk 5	0.02	0.02	0.02	0.02	0.03	0.001	NS
Wk 6	0.02	0.02	0.02	0.03	0.02	0.002	NS
Wk 7	0.02	0.02	0.02	0.02	0.02	0.001	NS
Wk 8	0.01	0.02	0.02	0.01	0.02	0.001	NS
Wk 9	0.02	0.01	0.01	0.02	0.01	0.001	NS
Wk 10	0.01	0.01	0.01	0.02	0.01	0.001	NS
Wk 11	0.02	0.02	0.02	0.01	0.02	0.001	NS
Wk 12	0.02	0.02	0.01	0.02	0.12	0.001	NS
Wk 13	0.01	0.01	0.02	0.01	0.02	0.001	NS
WK 14	0.02	0.03	0.02	0.01	0.01	0.001	NS
TMYield	0.31	0.40	0.30	0.30	0.29	0.020	NS

[abc] Means in the same row with different superscript are significantly different (P>0.05)

SEM = Standard error of mean NS = Not Significant LS = Level of Significance TMYield = Total Milk Yield D1 = Diet 1 – 0 % BDG D2 = Diet 2 - 10 % BDG D3 = Diet 3 - 20 % BDG D4 = Diet 4 - 30 % BDG D5 = Diet 5 - 40 % BDG

Composition of milk of Yankasa ewes fed varying level of Brewers Dried Grain obtained from Nigerian Brewery

Table 4 shows the composition of milk from Yankasa ewes fed varying levels of brewers dried grains. Milk Protein values of D3, D4 and D5 showed significant difference between D1 and D2. Milk protein is observed to have increased as the level of BDG increases. Total solids decreases from 20 % inclusion level as inclusion level increases. However, D1 and D3 differ significantly from D4 and D5 in total solids Milk fat, moisture and energy values showed no significant difference among the diet groups. Non- fat- solids values of D3 and D1 (control) are significantly different from those of D4 and D5 but are statistically similar to D2. Moisture is significantly higher in D3, D5 and D2 but is statistically similar with other diet groups. Ash values in D2 are significantly lower than other diet groups. Calcium and phosphorus values of animals fed D5 are significantly higher than those fed D1. It is also observed that Calcium and Phosphorus increases in the milk as the inclusion levels of BDG increases in the diet. Sodium values are significantly higher in D2, D3, D4 and D5 over D1 (control). Sodium is seen to have increased in the milk up to 30 % BDG inclusion in the diet. Potassium values of milk from animal fed D4, D3, D1 (control) and D2 were significantly higher than those of D5. The milk protein result shows that as the inclusion levels increases, the milk protein, fat, calcium and phosphorus also increase. This means that there is a correlation between milk protein increase and milk fat, calcium and phosphorus increase. This is supported by the work of Cunningham *et al*. (1996) who reported that milk protein is positively correlated with milk fat. The authors believe that that the behavior of the milk protein is influence by milk fat content.

Also the result agrees with the work of Duncan (1998) who reported that calcium and phosphorus in milk are known to be bounded to casein which is a major component of milk protein. The protein content of the milk increased with an increase in milk fat and decreases as milk fat content declined.

This might probably explain the pattern of behavior of calcium and phosphorus content in milk. The general composition of mineral composition in milk is connected to mineral content of the test ingredient (BDG) used. Pyne (1990) reported that nutrition has a major effect on milk composition.

Table 4 Composition of milk of Yankasa ewes fed varying level of Brewers Dried Grain obtained from Nigerian Brewery

Parameter (%)	DI	D2	D3	D4	D5	SEM	LS
Protein	5.31^{b}	5.84^{b}	6.63^{a}	7.25^{a}	7.39^{a}	0.254	*
Total Solids	17.56^{ab}	18.20^{ab}	19.73^{a}	16.49^{b}	16.24^{b}	0.453	*
Fats	5.87	6.19	6.28	6.63	7.06	0.267	NS
Solid-not-fat	12.41^{a}	11.14^{ab}	13.52^{a}	10.97^{b}	11.14^{b}	0.323	*
Moisture	67.53	83.23	83.38	81.54	83.28	3.110	NS
Ash	2.93^{a}	2.92^{a}	2.92^{a}	2.83^{a}	2.37^{b}	0.056	*
Energy (Kcal/Kg)	4199.15	4263.09	4164.06	4182.50	4166.57	15.232	NS
Calcium (ppm)	6095.50^{b}	6248.80^{ab}	6264.10^{ab}	6517.10^{ab}	6669.10a	77.652	*
Phosphorus (ppm)	2570.00^{c}	2583.80^{c}	3250.40^{b}	3603.40^{ab}	4002.70^{a}	5.273	*
Sodium (ppm)	75.74^{c}	130.92^{ab}	145.31^{a}	153.31^{a}	119.08^{b}	7.177	*
Potassium (ppm)	246.23^{a}	244.41^{a}	249.63^{a}	254.72^{a}	198.44^{b}	4.956	*

^{abc} Means in the same row with different superscript are significantly different (P<0.05)

SEM = Standard error of mean * = Significant level (P<0.05), NS = Not Significant

LS = Level of Significance D1 = Diet 1 – 0 % BDG, D2 = Diet 2 - 10 % BDG, D3 = Diet 3 - 20 % BDG D4 = Diet 4 - 30 % BDG D5 = Diet 5 - 40 % BDG

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