

NUTRITIVE VALUE OF SOME AGRO-INDUSTRIAL BY-PRODUCTS AS SUPPLEMENT TO GUINEA GRASS (*PANICUM MAXIMUM*) BY SOKOTO GUDALI CALF

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ABSTRACT

Supplementation value of some agro-industrial by-products was assessed by 12 Sokoto Gudali calves in a Completely Randomized Design. Four test diets were formulated: Palm Kernel Cake (PKC), Brewer's Dried Grain (BDG), Wheat Offal (WO) and combinations of PKC + BDG + WO based diets while Guinea grass was fed as the basal diet. Diet A (33.25 % PKC), diet B (33.25 % BDG), diet C (33.25 % WO) and diet D (11.08 % PKC + 11.08 % BDG + 11.08 % WO) were included in the formulated diets. The proximate composition of the diets and performance characteristics of calves on these diets were assessed using standard procedures. Diet D was observed to have the highest CP, CF and ether extract (28.3, 34.0 and 20.0 % respectively) while diet C followed a direct inverse trend of this in terms of DM, CP and CF (55.8, 22.6 and 23.0 % respectively). Results also showed that there were not significant differences among the treatments in final weight, weight gain, daily weight gain and the feed conversion ratio but diet A was significantly different ($P < 0.05$) from other treatments in feed intake. It is concluded that brewer's dried grains and wheat offal can be interchangeably used as well as combinations of the two in addition to the palm kernel cake as supplement to grass by Sokoto Gudali cattle for production and management.

Keywords: Palm kernel cake, Brewer's dried grain, Wheat offal and performance characteristics, Proximate composition, Sokoto Gudali calves.

Contribution/ Originality

This study is one of very few studies which have investigated the effects of combining industrial-by products on the performance of cattle. Also, the study was able to identify the by-products that can be interchangeably used in rearing Sokoto gudali calves.

1. INTRODUCTION

Forages are high in moisture, protein, vitamin A but low in crude fibre and minerals safe for phosphorus at the on – set of rain. However, as maturity sets in and rainy season turns dry, there is an inverse relationship of what is obtainable in the early rainy season. Supplementation of limiting nutrients (protein and minerals) is therefore inevitable if ruminants in the tropics will fully exhibit their genotypical traits in terms of reproduction and growth. Several agro–industrial by–products have been reported to be of immense value for supplementation in ruminant nutrition. [Abonyi and Uchendu \[1\]](#) reported that palm kernel cake (PKC) was successfully fed to ruminants. Cotton seed cake has been recognized as an excellent and economic source of protein for starter and grower rations of dairy calves [\[2\]](#) while PKC has the reputation of increasing the butter fat content of milk [\[3\]](#). The limitation of PKC is in its grittiness, high fibre content and low digestibility [\[4, 5\]](#). Heavy salivation during mastication in ruminants has been attributed to the dryness and gritty nature of the PKC [\[6\]](#). Brewer’s dried grain is intermediate in protein, ranking above rice bran. It is suitable for inclusion in dairy, beef cattle, sheep and goat up to 25 - 30 % while only between 3 and 6 % inclusion in pig and poultry feed because of the high fibre content [\[7\]](#). Protein supplements can increase forage intake and digestibility and improve the performance of animals [\[8\]](#). This study therefore investigated the nutritive value of palm kernel cake, brewer’s dried grain, wheat offal and the combinations as supplement to Guinea grass in growing Sokoto Gudali calves.

2. MATERIAL AND METHODS

2.1. Location of Study Site

The feeding experiment was carried out at the Teaching and Research Farm (TRF), University of Ibadan, Nigeria (7°27 N and 3°45 E at altitude 200 – 300 m above the sea level, mean temperature: 25 – 29 °C and average annual rainfall: 1250 mm).

2.2. Experimental Animals and Their Management

Twelve Sokoto Gudali calves of six to nine months weighing 63 – 103 kg were randomly allotted to four groups of three calves each. The animals were obtained from the cattle unit of the TRF, University of Ibadan. Guinea grass was fed as the basal diet as cut and carry, while the test diets were fed as supplement in form of concentrate. The calves were housed in pens, three animals per pen per diet. Clean water and salt lick were offered *ad libitum*. Neck tags were used as the identification method. Calves were weighed before the commencement of the experiment and subsequently, fortnightly to determine initial weight, average daily gain, final weight and weight gain.

2.3. Experimental Treatments

The Guinea grass was obtained from the existing pasture in the TRF, University of Ibadan. Diet ingredients were acquired from Adom Feed Mill centre except cassava peels which was

gotten from Gari processing centre, Mokola, Ibadan. There were four experimental diets comprising of wheat offal, brewer's dried grain, palm kernel cake and a combination of the three in same proportion.

Table-1. Ingredient composition of experimental diets

Ingredients	Diets			
	A (kg)	B (kg)	C (kg)	D (kg)
Cassava peels	50.00	50.00	50.00	50.00
Palm kernel cake	33.25	-	-	11.08
Brewer's dried grain	-	33.25	-	11.08
Wheat offal	-	-	33.25	11.08
Groundnut cake	15.00	15.00	15.00	15.00
Urea	1.00	1.00	1.00	1.00
Salt	0.50	0.50	0.50	0.50
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100

2.4. Feeding Trial

The calves were fed experimental diet twice daily (09.00 h and 16.00 h) at 2 % animal body weight and *ad-libitum* given fresh Guinea grass and clean water. Feed offered and feed refused were weighed each morning and daily feed intake was determined by deducting remnant from the amount offered for each group. The feeding experiment lasted for 105 days.

2.5. Proximate Analysis

The diets were oven dried at 100 °C for 48 hour to determine the DM content; the oven dried samples were milled with a hammer mill to pass through a 1 mm sized screen before analyzing in duplicates. Analysis of proximate fractions – crude protein, crude fibre, ether extract and ash were assessed using the procedures outlined by the AOAC [9].

2.6. Statistical Analysis

Data were subjected to analysis of variance (ANOVA) using procedure of SAS [10] in a complete randomized design. Where means were significantly different, Duncan multiple range test [11] was used to compare the means.

3. RESULTS AND DISCUSSION

Shown in Table 2 is the proximate composition of the formulated of PKC, BDG, WO-based diets and the combination of the three. It was observed that diet D had the highest values of CP, CF and EE as 28.3, 34.0 and 20.0 % respectively. Reason for the high nutrients in this diet than others may be due to the combined effects of the three agro-industrial by-products. Diet C showed an inverse relationship of diet D, having the least values for DM, CP and CF as 55.8, 22.6 and 23.0 respectively. Aina, et al. [12] reported the proximate composition of PKC to be 18.0, 6.0, 12.0 and 4.8 % CP, EE, CF and ash respectively. However, the observed proximate composition for diet A comprising of PKC differed from that reported [12]. The differences may be due to the

source of the raw material used and extraction method the PKC was subjected to, thereby affecting the nutrient composition. Similar trend was observed for BDG and WO.

Table-2. The proximate composition (%) of the formulated experimental diets containing palm kernel cake, brewer's dried grain, wheat offal and the combination of the three

Diets	Parameters					NFE
	DM	CP	CF	Ash	EE	
A	57.06	23.80	24.00	13.00	17.00	22.2
B	64.73	27.30	26.00	25.00	18.00	3.70
C	55.80	22.60	23.00	15.00	18.00	21.40
D	60.13	28.30	34.00	16.00	20.00	2.0

Shown in Table 3 is the proximate composition of Guinea grass fed as basal diet to the calves. The CP, CF, EE and ash values were 7.35, 26.71, 2.20 and 7.12 % respectively. This composition was quite low in CP but high in CF, and may not sufficiently support growth/fattening of calves for meat production. [Devendra and McLeroy \[13\]](#) reported that a dietary CP of 11 % is ideal for normal weight gain in sheep and goats.

Table-3. Proximate composition (%) of Guinea grass fed as basal diet to Sokoto Gudali calves

Parameters	Percentage
Dry matter	30.71
Crude protein	7.35
Crude fibre	26.71
Ether extract	2.20
Ash	7.12
Nitrogen free extract	56.62

Presented in Table 4 is the performance characteristic of Sokoto Gudali calves fed PKC, BDG, WO and a combination of the three diets as supplement to Guinea grass. There were not significant differences ($p > 0.05$) among the four groups in the final weight, daily weight gain and feed efficiency ratio. It could be deduced that any of the three by-products or their combination can be interchangeably used.

However, feed intake for diet A was significantly higher ($p < 0.05$) than other diets. This could be due to the gritty nature of PKC and its proportion in the diet. In this sense, it may be uneconomical, if the animal will have to consume more and produce the same body weight as those cattle on other by-products that had lower intake. [Ogundola \[14\]](#) observed that there was not significant difference in intake and growth rate when brewer's dried grain and wheat offal were offered to calves.

Table-4. Performance characteristics of Sokoto Gudali calves fed PKC, BDG, WO and a combination of the three as supplement in form of concentrate

Parameters	Diets				SEM
	A	B	C	D	
Initial weight (Kg)	88.667	105.333	98.667	107.000	3.424
Final weight (Kg)	116.667 ^a	126.667 ^a	116.667 ^a	125.667 ^a	3.486
Weight gain (Kg)	28.00 ^a	21.33 ^a	24.00 ^a	18.67 ^a	4.466
Weight gain / day (g/d)	266.70 ^a	203.20 ^a	228.60 ^a	177.80 ^a	42.529
Feed intake (g / d)	5379.5 ^a	2700.3 ^b	2740.2 ^b	3008.3 ^b	89.919
Feed conversion ratio	23.59 ^a	32.51 ^a	21.49 ^a	21.08 ^a	7.069

4. CONCLUSION

The result showed that Brewer's dried grain and wheat offal had similar effects on the performance of calves in terms of feed intake, daily weight gain and feed conversion ratio. Calves fed with PKC had high feed intake but did not differ in weight gain and feed conversion ratio from those fed with wheat offal and brewer's dried grain. Brewer's dry grain can be interchangeably used for wheat offal when farmers face the problem of availability and affordability of feedstuffs for cattle production.

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