EFFECTS OF FEEDING DIETS CONTAINING GRADED LEVELS OF PALM KERNEL CAKE ON NUTRIENT DIGESTIBILITY AND NITROGEN BALANCE OF WEANED BUNAJI CALVES

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ABSTRACT

A study was conducted using thirty (30) Bunaji weaned calves with an average live weight range of 89.5kg and age range of 7.5-9 months to determine the Nutrient digestibility and nitrogen balance of Bunaji weaner calves fed diets containing 0, 10, 20, 30 and 40% levels of Palm Kernel Cake (PKC) inclusion in a 2x5factorial arrangement laid in Completely Randomized Design. At the end of 90 days feeding trial, weaner calves (3 bulls and 3 heifers) wereselected from each treatment and moved to metabolic crates for metabolism trial. The calves were allowed 14days adjustment period and 7 days for faecal collection. Concentrate and basal diets of *Digitaria smutsii* were offered at 2% body weight each. There were significant ($P<0.05$) differences in all the digestibility parameters obtained. Animals on 30% PKC inclusion had the highest digestibility values for all the parameters measured. It was observed that there was significant ($P<0.05$) difference in nitrogen balance across treatments. Nitrogen Intake was highest at 30%PKC inclusion (97.07g/day) but similar to the value of 95.56g/day for animals on 10%PKC. The supplied nutrients were well tolerated and properly utilized with positive nitrogen balance. Hence, it was concluded that inclusion of Palm Kernel Cake at 30% in the diets of weaned Bunaji Calves as no known negative effects on nutrient digestibility and nitrogen balance hence it can be adopted by farmers in Nigeria for increased productivity.

Key words: Weaned Bunaji calves, Palm Kernel Cake, Nutrient digestibility, Nitrogen Balance

INTRODUCTION

A thorough understanding of key digestion elements and unique ways to assess digestibility within the cow increases the probability of achieving optimum animal performance and business results (Bargo *et al*., 2002). High digestibility expresses the high amount of certain nutrient absorbed by cattle. Low digestibility indicates that the feedstuffs have less ability to supply nutrient for primary needs or production purposes (Mayulu, 2014). The ability to digest the feed is determined by several factors such as feed chemical composition and feed preparation. Measuring the digestibility of feedstuff is an effort to determine the nutrient amount contained in a feedstuff which will be degraded and digested in gastrointestinal tract (Coleman & Moore, 2003; Nurhaita *et al*., 2010).Present study is carried out to determine nutrient digestibility and nitrogen balance in weaned Bunaji calves fed diets containing graded levels of palm kernel cake.

MATERIALS AND METHODS

The Experiment was conducted at Experimental Pens of the Beef Research Programme of the National Animal Production Research Institute, Shika, Zaria, Nigeria.

Digestibility Study

At the end of 90 days feeding trial, weaned calves (3 bulls and 3 heifers) were selected from each treatment and housed in metabolic crates for total faecal and urine collection. The animals were allowed 14 days for adjusting to the condition of the metabolic crates before the commencement of the collection period, which lasted for another 7 days.

The experimental diets were formulated to be isonitrogenous and isocaloric, they comprised of Palm Kernel Cake (PKC) at 0, 10, 20, 30 and 40% inclusion levels. The animals were fed daily with concentrate and hay (*Digitaria smutsii*) at 2% of their body weight each. Daily faecal output was weighed and 10% of each day's collection was sub-sampled and oven dried at 60^{o}C for DM

determination. This was later bulked for laboratory analysis. Daily urine output was collected in a plastic container containing 100mls 0.1N H_2SO_4 placed under metabolic crates, 10% of daily urine output was taken from each bull and store in the refrigerator. At the end of the 7 days collection period, 10% of the urine taken from each bull was sub sampled and stored in the refrigerator pending Nitrogen determination (Osuji *et a*l., 1993)

Chemical analysis

Analysis of experimental diet and faecal samples were carried out by AOAC (2000) procedure. Also, Acid Detergent Fiber (ADF) and Neutral Detergent Fiber (NDF) were determined in all the feed ingredients according to (Van Soest, 1991)at the Central Laboratory of National Animal Production Research Institute (NAPRI), Shika, Zaria. Metabolizable energy (ME) was determined by equation of Alderman & Cottrill (1985). ME (MJ/Kg DM) = 11.78 + 0.0064 CP + $(0.000665EE)^2$ - CF (0.00414EE) - 0.0118A. Where ME = DM = Dry matter, CP = Crude protein, EE = Ether Extract, CF = Crude fiber and A = Ash.

Data analysis

The data from the digestibility trial was analyzed using the General Linear Model Procedure of SAS, (2002). Data from the feeding trials were analyzed to investigate the response of the animals to measured parameters. Significant differences among treatment means were determined and compared using Dunnett's test (Dunnett, 1955)

RESULTS AND DISCUSSION

Effect of levels of inclusion of palm kernel cake on the apparent digestibility of weaned Bunaji calves is shown in Table 2. There was no significant (P>0.05) difference in Crude Protein (CP) digestibility at 10, 30 and 40% levels of inclusion of PKC. Crude Fibre digestibility (CF) was also similar for animals on diets containing 0, 10 and 40%. EE of 66.16, 60.44 and 59.02% for 0,10 and 20% levels of inclusion of PKC respectively. Hemicellulose at 10, 20 and 30% levels of inclusion of PKC are similar (P>0.05) but different from 0 and 40% PKC inclusion. Table 2 shows the effect of levels of inclusion of palm kernel cake on Nitrogen balance of weaner Bunaji calves, it was observed that there was significant (P<0.05) difference in nitrogen balance across treatments. Nitrogen Intake was highest at 30%PKC inclusion (97.07g/day) but similar to the value of 95.56g/day for animals on 10%PKC. Urinary nitrogen loss was lowest for animals on 40%PKC inclusion and highest for those on 30%PKC levels but similar for animals on 0, 10 and 20%PKC inclusions. Faecal nitrogen loss was similar for animals on 0, 20 and 30% PKC levels but differ from those on 10 and 40% PKC inclusions. Animals on 30% PKC inclusions had the highest digestibility values for all the parameter measured, this might have resulted to the higher weight gain obtained at 30% inclusion of PKC when compared to other PKC inclusion levels (0, 10, 20 and 40%). The digestibility values obtained in this trial for most of the parameter was higher than those obtained by Yusuf (2016) and Sani (2014) . The digestible crude fibre range obtained in this study is within the range of 54.06-73.22 obtained by Goska *et al*.(2016) when he fed diets cottonseed cake and groundnut haulm to Bunaji bulls. this is an indication that palm Kernel cake can be fed up to 40% in the diets of Bunaji weaners without any negative effect on nutrient utilization. The digestibility of feed was reported to be influenced by the composition, available energy and retention time in the gastrointestinal tract (Abdu *et al.*, 2012). The nitrogen intake is lower than the value of 130-180 and 146.67-206.6g/day reported by Lamidi (2005) when Bunaji bulls were fed sundried layer and broiler litters respectively. This could be as a result of differences in the age of the animal and feed composition.

Conclusion

It was concluded that inclusion of Palm Kernel Cake at 30% in the diets of weaned Bunaji Calves as no known negative effects on nutrient digestibility and nitrogen balance hence it can be adopted by farmers in Nigeria for increased productivity.

Table 1: Chemical Compositions of Concentrate Diets Containing Varying Levels of Palm Kernel Cake Fed to Weaners Bunaji Calves

Parameters (%)	Treatments				
	0	10	20	30	40
Dry Matter	97.4	97.36	97.30	97.96	97.81
Crude Protein	16.75	18.00	13.88	16.31	16.06
Crude Fibre	28.00	29.00	33.50	31.00	32.50
Ether Extract	15.60	12.98	12.76	10.86	10.64
Ash	7.48	7.39	6.24	6.33	5.74
Neutral Detergent Fibre	49.29	53.14	58.02	52.65	54.2
Acid Detergent Fibre	35.11	37.30	33.97	35.21	27.27
Hemi Cellulose	14.18	15.84	24.05	17.44	19.18
GE(MJ/KgDM)	13.25	15.11	13.55	13.68	12.68
ME(MJ/KgDM)	11.80	11.81	11.79	11.81	11.81

Where ME = Metabolizable energy, GE= Gross energyDM = Dry matter, CP = Crude protein, EE = Ether Extract, CF = Crude fibre and A = Ash.,,NDF=neutral detergent fiber, ACF=Acid detergent fiber,HC=hemicellulose. ME=Metabolizable Energy. ME was determined by equation of Alderman and Cottrill, 1985. ME (MJ/Kg DM) = 11.78 + 0.0064 CP + $(0.000665EE)^2$ - CF (0.00414EE) - 0.0118A.

Table 2: Effect of Levels of Inclusion of Palm Kernel Cake on the Apparent Digestibility of Weaner Bunaji Calves

Apparent digestibility(%)	Level of inclusion(%)					
	0	10	20	30	40	SEM
Dry Matter	61.69^{c}	63.07^{bc}	64.70^{ab}	66.03^{a}	63.70^{bc}	1.13
Crude Protein	54.63^{b}	65.44^{a}	51.95^{b}	62.13^{a}	61.37^{a}	2.39
Crude Fibre	59.13^{c}	61.20^{c}	66.59^{b}	70.58^{a}	62.76^{c}	1.23
Ether Extract	66.16^{a}	60.44^{a}	59.02^{a}	58.15^{ab}	50.87^{b}	4.03
Ash	29.13^{ab}	30.38^{a}	22.15^{b}	31.81^{a}	24.77^{b}	2.52
Neutral Detergent Fibre	67.77^{c}	72.59^{ab}	73.53^{a}	74.84^{a}	70.49^{b}	1.14
Acid Detergent Fibre	66.84^{b}	71.67^{a}	67.85^{b}	73.60^{a}	67.35^{b}	1.57
Hemi Cellulose	48.43^{b}	58.23^{a}	57.20^{a}	57.50^{a}	52.36^{b}	2.31

^{abcd} means within the same row with different superscripts are significantly different (P<0.05) Where DM = Dry matter, CP = Crude protein, EE = Ether Extract, CF = Crude fibre and A = Ash. SEM=Standard Error of mean,

Table 3: Effect of Levels of Inclusion of Palm Kernel Cake on Nitrogen Balance of Weaner Bunaji Calves

Nitrogen balance	Level of inclusion(%)					
	0	10	20	30	40	SEM
Nitrogen intake (g/day)	84.74^{c}	95.56^{a}	80.24^{d}	97.07^{a}	88.96^{b}	1.95
Urinary Nitrogen (g/day)	1.12^{bc}	1.24^{b}	1.23^{b}	1.41^{a}	1.04^{c}	0.06
Faecal Nitrogen (g/day)	38.59^{a}	32.85^{b}	38.94^{a}	39.51^{a}	34.82^{b}	2.33
Total Nitrogen Output (g/day)	39.71^{a}	34.09^{b}	40.16^{a}	38.36^{ab}	35.86^{ab}	2.34
Nitrogen Retained (g/day)	45.03^{c}	61.47^{a}	40.08^{c}	58.70^{a}	53.10^{b}	2.34
Nitrogen Retained (%N-intake)	53.30^{b}	64.13^{a}	50.39^{b}	60.72^{a}	60.25^{a}	2.40

^{abc} means within the same row with different superscripts are significantly different (P<0.05) SEM=Standard Error of mean

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