EFFECT OF INCLUSION LEVELS OF PALM KERNEL CAKE ON THE GROWTH PERFORMANCE OF WEANED BUNAJI CALVES

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ABSTRACT
An experiment was conducted using thirty (30) weaned Bunaji calves with a live weight range of 85-94kg and age range of 7.5-9 months. The calves were balanced for weight and allotted to five (5) dietary treatments in a 2x5 factorial arrangement laid in Completely Randomized Design. They were individually penned and fed diets containing graded levels of palm kernel cake (PKC) and *Digitaria smutsii* (Wolly finger grass) hay at 2% of their body weight each. Feeding was conducted for 90 days. The CP contents of the diets vary between 13.88 and 18.00% while the ME ranged from 11.79 to 11.81MJ/kg DM. The crude fibre varied from 28.00 to 33.50%. When the level of inclusion was considered, the result of the feeding trial showed significant ($P<0.05$) difference in most of the parameters measured except the initial weight. Animals on diets containing 30% PKC (0.58Kg) inclusion had the highest weight gain. The economic analyses showed that cost per kg gain was highest at 0% PKC inclusion and lowest at 40% PKC. Weight gain and value of gain (VWG) was highest at 30% PKC inclusion and lowest at 0% PKC inclusion. There was positive Net Benefit (NB) and Return to Investment on feed (RIF) when level of PKC inclusion was considered hence it was concluded from the result of the performance and economic analyses that PKC can be fed to weaner calves of at 30% PKC for optimum performance without any adverse effect.

Keywords: Palm Kernel Cake, Weight Gain, Weaned Bunaji calves.

INTRODUCTION
Weaning is a critical component of beef cattle management. The important factors includes the breeding efficiency and fertility of the cow herd, feed utilisation, animal behaviour, future carcass merits and breeding efficiency of heifer weaners (Walmsley et al. 2016). With productivity and profitability as primary goals, weaning should be as stress-free as possible for animal managers (Shelby, 2011). This can be achieved with adequate and cost effective nutrition, hence the need for non conventional feed ingredient that can be used in feed formulation. The objective of the study was to evaluate the inclusion of Palm Kernel Cake which is cheap and readily available in the diets of weaned Bunaji calves.

MATERIALS AND METHODS
Experimental Site
The Experiments was conducted at the Experimental Unit of Beef Research Programme of the National Animal Production Research Institute, Shika, Zaria, Nigeria.

Experimental Design and Animal Management
A total of thirty (30) weaned Bunaji calves (15 bulls and 15 heifer) aged between 7.5 to 9 months and weighing between 85 to 94 kg were balanced for weight and allotted to five (5) dietary treatments in a 2x5 factorial arrangement laid in a Completely Randomized Design (CRD). They were individually penned and

fed diets containing graded levels of Palm Kernel Cake (PKC) and *Digitaria smutsii* (Wolly finger grass) hay at 4% of their body weight, 2% for concentrate and 2% for hay, respectively. The diets were formulated to be isonitrogenous and isocaloric (Table 1). The animals were weighed fortnightly and the ration was adjusted in line with the changes in their body weight. Water intake was also measured and evaporative loss was determined. The feeding trial lasted for a period of 90 days.

Table 1: Percent Gross Feed Composition of Concentrate Diets

	Inclusion Levels of PKC (%)				
Ingredient %	**0**	**10**	**20**	**30**	**40**
Palm kernel cake	0.00	10.00	20.00	30.00	40.00
Cotton seed cake	30.00	27.00	24.00	20.50	17.50
Poultry litter	20.00	18.00	16.00	14.00	12.00
Rice offal	12.00	12.00	12.00	12.00	12.00
Maize offal	37.00	32.00	27.00	22.50	17.50
Salt	1.00	1.00	1.00	1.00	1.00
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analyses					
Crude protein (%)	16.00	16.02	16.05	16.00	16.02
Crude fiber (%)	16.97	16.80	16.64	16.38	16.22
ME(MJ/Kg DM)	11.80	11.81	11.79	11.81	11.81
TDN (%)	65.88	63.35	60.84	58.32	55.79
Cost /kg (₦)	40.21	35.82	31.43	26.96	22.58

Economic and Data Analysis

The market price of the various feed ingredients was used to compute the total cost of feed consumed and feed cost per kilogram weight gain. General Linear Model procedure of SAS (2002) was used to analyze data from the fattening trial and the means were compared with Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The average feed intake reported in this study at graded levels of PKC inclusion ranges between 3.99-4.33 Kg/day (Table 2) which is lower than 6.04-6.47Kg/day reported by Yusuf (2016). Average Concentrate Intake (ACI) of 1.99 -2.17 Kg/day is lower than 2.55-2.76Kg/day and 2.54 - 2.78Kg/day reported by Yusuf (2016) and Adesote (2013). The Average Weight Gain (AWG) ranged from 0.50 - 0.58Kg/day which is higher than 0.22-0.35Kg/day by Adesote (2013) and gonzalez *et al.* (2002) lower than 0.70 kg/day reported by Abdulrazak *et al.* (1996) but within the range of 0.45 - 0.61Kg/day reported by Yusuf (2016).

Table 2: Effect of Levels of Inclusion of Palm Kernel Cake on Performance of Weaned Bunaji Calves

	Inclusion Levels of PKC (%)					
Parameters	**0**	**10**	**20**	**30**	**40**	**SEM**
Initial weight(Kg)	92.67	93.00	93.50	92.50	94.00	1.87
Final weight(Kg)	137.50 ^{c}	142.83 ^{ab}	140.83 ^{ab}	144.67 ^{a}	139.50 ^{bc}	2.37
ACI (kg/day)	1.99 ^{c}	2.17 ^{a}	2.13 ^{ab}	2.16 ^{a}	2.07 ^{bc}	0.04
AHI (kg/day)	2.04 ^{b}	2.18 ^{a}	2.13 ^{a}	2.16 ^{a}	2.11 ^{ab}	0.04
ATFI (kg/day)	3.99 ^{c}	4.33 ^{a}	4.24 ^{ab}	4.29 ^{ab}	4.15 ^{bc}	0.08
ADMI(kg/day)	3.89 ^{b}	4.21 ^{a}	4.12 ^{a}	4.20 ^{a}	4.05 ^{ab}	0.08
AWI(L/day)	12.25 ^{b}	12.77 ^{a}	11.99 ^{b}	12.83 ^{a}	12.17 ^{b}	0.24
AWG(kg/day)	0.50 ^{c}	0.55 ^{ab}	0.53 ^{b}	0.58 ^{a}	0.51 ^{bc}	0.02
FCR	8.38^{b}	7.65^{a}	8.04^{b}	7.36^{a}	8.25^{b}	0.19

^{abcd} means within the same row with different superscripts are significantly different (P<0.05)
where ACI=average concentrate intake, AHI=average hay intake, AFI=average feed intake, ADMI=average dry matter intake,AWI=average water intake, AWG=average weight gain, FCR=feed conversion ratio,SEM=Standard Error of mean, l=litre

Animals on 30% PKC has the highest weight gain but there is no significantly difference at (P>0.05) for calves on 10% inclusion level of PKC while the lowest weight gain was obtained for animals on the control diet. The differences in average weight gain reported in this study and that reported by other authors could be due to differences in the season the experiment was carried out, concentrate diet fed, temperature , age and sex of the animals. . The feed conversion ratio (FCR) of 7.36-8.38 obtained in this study is superior to 9.04-9.55, 13.71-22.4, 9.03-12.05,14.58%-21.81 and 10.6-13.71 reported by Madziga *et al.* (2013), Idowu (2011), Lamidi (2005), Adesote (2013) and Yusuf (2016) respectively. It is less superior when compared with FE based on rice type -raw and parboiled (6.26-6.67), inclusion level (6.26-6.72) and interaction between raw/parboiled rice type and inclusion level (6.26-6.93) reported by Sani (2014) for fattened Bulls. This could probably be due to differences in age, experimental diets and efficiency of feed utilization which implies that PKC can be efficiently utilized to improve feed conversion to body tissue

Table 3: Partial Budget Analyses of Weaned Bunaji Calves Fed Diets Containing Graded Levels of Palm Kernel Cake

	Inclusion Levels of PKC inclusion (%)					
Parameters	**0**	**10**	**20**	**30**	**40**	**SEM**
Total weight gain (Kg)	44.83 ^{c}	49.83 ^{ab}	47.33 ^{bc}	52.17 ^{a}	45.50 ^{c}	1.49
Daily weight gain (Kg)	0.50 ^{c}	0.55 ^{abc}	0.53 ^{bc}	0.58 ^{a}	0.51 ^{c}	0.02
Value of gain (₦)	26900 ^{c}	29900 ^{ab}	28400 ^{bc}	31300 ^{a}	27300 ^{c}	891.07
Concentrate intake (Kg)	178.99 ^{c}	195.43 ^{a}	192.02 ^{ab}	194.05 ^{a}	186.02 ^{b}	3.45
Hay intake (Kg)	183.23 ^{b}	196.49 ^{a}	192.01 ^{a}	194.52 ^{a}	189.53 ^{a}	3.51
Total feed intake (Kg)	359.82 ^{c}	389.30 ^{a}	381.49 ^{ab}	385.96 ^{ab}	373.02 ^{bc}	6.88
Total water intake (Litres)	1102.11 ^{b}	1149.66 ^{a}	1079.40 ^{c}	1155.52 ^{a}	1095.08 ^{c}	21.45
TCCC (₦)	7197.00 ^{a}	7000.30 ^{a}	6033.30 ^{b}	5231.5 ^{c}	4200.2 ^{d}	112.66

Cost of hay consumed (₦)	6717.2 [b]	7203.3 [a]	7039.2 [a]	7131.1 [a]	6948.2 [ab]	128.50
Cost of feed consumed (₦)	13914.10 [a]	14203.60 [a]	13072.50 [b]	12362.60 [c]	11148.40 [d]	238.83
Cost of water consumed(₦)	881.69	919.73	863.52	924.41	876.07	171.16
TCFWC (₦)	14795.80 [a]	15123.30 [a]	13936.00 [b]	13287.00 [c]	12024.5 [d]	251.99
Cost of concentrate/Kg (₦)	40.21	35.82	31.43	26.96	22.58	
Cost/ Kg gain (₦/Kg gain)	353.68	305.40	301.96	258.80	272.09	
Net Benefit (₦)	12104.00 [c]	14777.00 [b]	14464.00 [b]	18013.00 [a]	15276 [b]	790.81
Return to investment on feed (RIF)	0.78 [d]	0.98 [c]	1.01 [bc]	1.36 [a]	1.26 [a]	0.06

[abcd] means within the same row with different superscripts are significantly different (P<0.05) TCCC = Total cost of concentrate consumed; TCFWC = Total Cost of feed and water; SEM=Standard Error of mean. , *Digitaria smutsii* hay=₦ 36.66/kg , price of water= ₦ 0.8/l, Price of weaned/live weight=N600/kg. value of gain= total weight gain×N600,Net benefit=value of gain - total cost of feed and water consumed, Return to investment on feed-= net benefit/cost of feed and water

The result of the study shows that feed cost (concentrate) in Naira per kg declined with increase in PKC levels from ₦40.21/kg to ₦22.58/kg. The feed cost to gain ratio was higher at 0% inclusion level (₦ 353.68/ Kg live weight gain) and lowest at 30% PKC inclusion level (₦ 258.80/Kg live weight gain) which implies that the 30% inclusion was economically better than the control. Net benefit was higher in the diets with 30% inclusion levels of PKC with lowest value were obtained for the control diets. The income over feed cost (net benefit) which is the most important economic factor for the farmers and rate of return to feed investment observed at the levels of inclusion were all positive.

CONCLUSION

Palm Kernel Cake can be incorporated at 30% in the diets of weaned Bunaji calves for optimum performance and improved economic advantage.

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