EVALUATION OF PALM KERNEL MEAL AS A MAJOR SOURCE OF ENERGY AND PROTEIN FOR FATTENING YANKASA RAMS.

I.M. YAKUBU, N.N. UMUNNA¹ AND P.C. NJOKU²

Animal Production Programme, Abubakar Tafawa Balewa University, Bauchi, Nigeria.

1. International Livestock Research Institute Addis-Ababa, Ethiopia.

2. Federal University of Agriculture Umudike Umuahia, Nigeria

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ABSTRACT

A 61-day experiment was conducted to assess the effect of feeding Palm Kernel Meal (PKM) as a substitute for maize and cottonseed cake (CSC) in the concentrate for fattening Yankasa rams. PKM replaced CSC wholly and maize at 0,33,66 and 100% levels to give treatments 1,2,3 and 4 respectively in a completely randomized design. The concentrates contained 0,51,52,73.26 and 95.25% PKM respectively. Average daily gains (119-136g/day), dry matter intake (855-897g/day), feed efficiency (6.59-7.19) dry matter digestibility (70.56-77.23%) were not significantly affected by the treatments. However, crude protein digestibility (69.39-76.32%) was significantly ($P < 0.01$) affected by the treatment, with treatment 4 giving the highest value and treatment 1 the lowest. It was also observed that feed cost per gain (N30.59-N72.91/kg) declined significantly ($P < 0.01$) with increase in the levels of PKM. Based on the performance of the animals, it can be concluded that PKM can be used as both protein and energy sources for fattening Yankasa rams.

Key words: Palm Kernel Meal, performance, fattening Yankasa rams

INTRODUCTION

The high cost of conventional feedstuff for ruminants has necessitated the search for cheaper and available sources of feed ingredients. Attention has been directed towards the search for agro-industrial by-products that have low inclusion rate in monogastric feed formulations. These categories of feedstuffs include brewers' dried grain (BDG) rice bran (RB) and Palm Kernel

Meal (PKM). There have been substantial amount of work on BDG (Adeyanju and Ilori (1976) Umoh *et al.* (1983) and Joshi and Khan (1983), but very little on PKM. PKM is a by-product of palm kernel oil extraction either by solvent or expeller method (Oyenuga, 1968; Onwudike 1986 a and b; Anonymous, 1987). PKM has been reported to be gritty, unpalatable and high in crude fibre (Nehbring *et al.* 1965; Nwokolo *et al.* 1977). Its use in monogastric diets has been limited to 34% for pigs (Fetuga *et al.* 1977).

Feeding studies with ruminants have shown satisfactory results. Umunna *et al.*, (1980) observed non significant difference in terms of average daily gain, feed intake, feed efficiency, dry matter and nitrogen digestibility when PKM was included at 0, 30, 45 and 60 percent of calves' supplement. Anonymous, (1987) reported that PKM can be given at 100 percent level of feeding for growing cattle. In a trial with fattening Yankasa rams, Kwatu, (1983) observed no significant difference in dry matter intake and digestibility, feed utilisation and average gain when PKM replaced 20 and 40 percent of the dietary corn. Since PKM is produced in large quantities (Scarr, 1986) and is relatively cheaper than other oil seed cakes, there is the need to further determine its utilisation by ruminants. This study was aimed at evaluating PKM as the major energy and protein source for fattening Yankasa rams.

MATERIALS AND METHODS

Experimental Treatments:-

Four concentrates were formulated in which PKM replaced whole cotton seed cake and 0,33,66 and 100 percent maize in the concentrates. Thus the concentrates contained

0,5152,73.26 and 95.25 percent levels of PKM for treatments 1,2,3 and 4 respectively. The PKM used in this formulation was solvent extracted and pelleted. The composition of concentrate is shown in Table 1.

Experimental animals and their Management.

Twenty (20) Yankasa Rams with an average weight of about 30kg were used. Prior to the experiment, the animals were dewormed with thiabendazole, dipped in acaricidal solution and given prophylactic treatment with terramycin L.A. The rams were housed individually in pens with floor space of about one square meter. Feeding trough and bucket for watering were provided in each pen. A concentrate to roughage ratio of 95:5 was used. This was adopted to test (with rams) the finding of Anonymous (1987) that 100 percent PKM has been used as a feedlot diet for cattle. The roughage source was hay made up predominantly of *Andropogon* and *Hyperthemia* spp.

The rams were randomly assigned to the four treatments at the rate of five animals per treatment. Both the concentrate and the hay were weighed out separately and offered to the rams in feeding troughs each morning at about 8.00a.m. The left over feeds were weighed and discarded before fresh ones were offered. This was used to determine feed intakes. Water was provided *ad libitum*. The experiment lasted for 61 days. Samples of the concentrates were taken immediately after mixing while that of the hay was taken during feeding. The samples were stored in polythene bags and later bulked and sampled for analysis of the proximate components. The rams were weighed at the beginning of the experiment and then bi-weekly.

Digestion Trial

Sixteen (16) rams (four from each treatment) were fitted with harness and faeces collection bags and allowed 2 days to get used to the harnesses and bags after which collection continued for 7 days. The faecal output from each ram was placed in labelled polythene bags, weighed and stored in a deep

freezer at - 15°C. The total faeces collected for each animal was bulked, mixed thoroughly and sampled for chemical analysis.

Carcass Yield

At the completion of the experiment, three rams were chosen from each treatment based on similarity in weight and slaughtered for carcass analysis. The rams were bled by cutting the carotid arteries and jugular veins (Adu and Brickman, 1981). After skinning the heads were removed at the Occipital - atlas articulation and the feet cut off between the cannon and the pastern bones. The warm carcasses were weighed immediately after dressing and then transferred to freezer and chilled overnight. The chilled carcasses were weighed to determine percent shrinkage and thereafter cut into whole - sale cuts. Each whole sale cut as well as kidney and mesenteric fat were weighed separately.

Data and Sample Analysis

The feeding trial was based on the completely randomized design and the data collected were analysed by the analysis of variance. The treatment means were compared using the Duncan's Multiple range test (Steel and Torrie, 1980).

The proximate composition of the feed and faecal samples were determined by standard method (A.O.A.C., 1980). Samples were ground through a 1mm sieve in Food science Laboratory Mill prior to chemical analysis.

RESULTS AND DISCUSSION

The proximate values of the PKM used are shown in Table 1. The values were similar to those reported by Nwokolo *et al.* (1977) and Onwudike, (1986), except for the ether extract which was low (2.00% as against 7.80 and 7.94 percent respectively as reported by them). The variation might be due to differences in the method of processing and the efficiency of oil removal by the different oil mills. The proximate value of the concentrates fed are shown in Table 1. The protein, ether extract, and crude fibre tended to increase with increasing levels of PKM in treatments 2 to 4. Other proximate values showed no significant

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TABLE 1: COMPOSITION AND PROXIMATE ANALYSES OF CONCENTRATES IN WHICH PALM KERNEL MEAL SUBSTITUTED THE MAJOR ENERGY AND PROTEIN SOURCES.

	TREATMENTS			
	1	2	3	4
% Maize replaced by PKM	0	33	66	100
INGREDIENTS				
Maize	65.00	43.38	31.74	0
Cottonseed Cake	29.75	-	-	-
Palm kernel Meal	-	51.52	73.20	95.25
Molasses	3.00	3.00	3.00	3.00
Bone Meal	1.50	1.35	1.25	1.00
Salt	0.50	0.50	0.50	0.50
Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00

CHEMICAL COMPOSITION (%)

					HAY	PKM
Dry Matter	90.89	89.15	91.46	91.26	94.96	92.35
Crude Protein	16.50	16.91	17.81	21.12	6.90	20.73
Ether Extract	2.10	1.51	1.60	2.05	0.74	2.00
N-Free Extractives	66.27	63.88	64.09	57.94	48.29	59.13
Crude Fibre	9.02	7.15	10.24	11.85	38.33	14.00
Gross Energy (Kcal/g)	4.03	4.00	4.07	4.07	4.04	4.24
Ash	4.46	4.61	4.62	5.02	5.74	4.19
Calcium	-	-	-	-	-	0.40
Phosphorus	-	-	-	-	-	1.30

Vitamin-Mineral Premix (Zoo dry VM 702 Roche) added to provide the following per Kilogramme of concentrate.
 Vit. A. (Stabilized) 25,000 I.U. Vit D(Stabilized) 2,500 I.U., Vit E. (Stabilized) 25mg, Mg 250mg, Mn 125mg,
 Fe 200mg, Zn 11mg, Cu 15mg, I 6.25mg, and Co 2mg.

TABLE 2: DRY MATTER, NUTRIENT INTAKE AND DIGESTIBILITY OF YANKASA RAMS FED CONCENTRATE CONTAINING VARYING LEVELS OF PALM KERNEL MEAL.

Parameters	TREATMENT				Sem ±
	1	2	3	4	
Dry matter Intake(g/d)	855	897	860	896	0.06
DM intake per kg mw	64.58	67.44	64.66	67.52	0.83
DM digestibility (%)	72.75	77.23	73.76	70.56	1.20
Crude Protein Intake (g/d)	137.20	147.42	148.70	183.10	2.10
Crude Protein Deg. (%)	69.39 ^b	75.73 ^a	73.11 ^{ab}	76.32 ^a	1.36
Energy intake (Kcal/d)	3445.65	3588.00	3500.20	3646.72	4.40
Energy digested (Kcal/d)	2606.71	2771.01	2581.75	2573.00	4.48
Energy digestibility %	75.65	77.23	73.76	70.55	1.24

Sem = Standard Error of the mean

a,b,c Row means with different superscripts are significantly different (P < 0.01).

variation among the treatments.

The dry matter and nutrient intake and digestibility (Table 2) show that dry matter intake (DMI), Crude protein intake (CPI) energy intake (EI), dry matter digestibility (DMD) and energy digested were not significantly ($P > 0.05$) affected by the levels of PKM in the concentrates. The treatment mean values for DMI were closely similar and there were no definite response patterns in relation to increasing levels of PKM. The reported decreased feed intake with high PKM diets by Umunna *et al.* (1980) and Kwatu (1982) was not observed in this study. The type of PKM (solvent extracted and pelleted) and the addition of 3% molasses could have contributed to the improved DMI within the PKM concentrates. Although the mean values of DMD were not significant, it was observed that within the PKM concentrates DMD tended to decline with increasing levels of PKM. However, the values for DMD were higher than those reported by Umunna *et al.* (1980) for 60 percent PKM supplementation and Kwatu (1982) for 20 and 40 percent PKM supplementation. The low level of dietary crude fibre (5% hay) and the readily available fermentable carbohydrate (3% molasses) might have contributed to the high DMD.

There were significant differences in crude protein digestibility (CPD) among the treatments. Rams on treatments 2 and 4 digested crude protein ($P < 0.01$) better than those on the control (treatment 1) but not significantly better than those on treatment 3. The high CPD of the PKM concentrates might have been due to the high crude protein content of the concentrates as shown by proximate analysis (Table 1). Similar observations have been reported by Adegbola *et al.* (1977) and Ikhatua and Adu (1981) where increased nitrogen digestibility was recorded with increasing level of crude protein in the test diets.

Table 3 contains the performance of the rams in terms of average daily gains (ADG), feed efficiency (FE) and cost of feed per unit weight gain. The results indicated that ADG and FE were not significantly affected by the

treatment. The fairly high animal performance on the PKM concentrates though insignificant, shows that PKM is as good as conventional CSC - maize concentrates. The result is in agreement with the finding of Anonymous (1987) Kwatu (1982) and Umunna *et al.* (1980) where better animal performance was obtained on PKM diets used either as sources of protein, energy or both. The non-significant difference among the treatment means with respect to FE might have been caused by the similarity in DMI, DMB as well as ADG.

The feed cost per kilogram weight gain showed significant ($P < 0.01$) difference among the treatment means. Treatments 1 and 2 were similar and significantly ($P < 0.01$) higher than treatment 4. The difference between treatments 2 and 3 was not significant. The feed cost was reduced as the level of PKM in the concentrates increased. The least expensive concentrate was at the highest level of PKM inclusion. With the inflationary trend and with the prices of conventional feedstuff on the increase always, fattening Yankasa rams on concentrate containing 95.25% PKM is highly beneficial and cost saving.

The carcass yield, wholesale cut, and kidney and mesenteric fats are shown in Table 4. The means of the treatments for these parameters were not affected by the level of PKM in the concentrate. Thus, the carcass parameters paralleled the weight of the rams at slaughter. The dressing percentage of the rams in this study are in agreement with the report of Ahmad and Davis (1986) where lambs on high concentrate diets were observed to have higher dressing percentage. The dressing percentages are comparable with the value reported by Adu and Brickman (1981) with Yankasa crosses, Orskov *et al.* (1973) with suffolk crossess, and slightly higher than those recorded by Taiwo *et al.* (1983) with Nigerian dwarf sheep and Uda crosses. Both the warm and chilled dressing percentages as well as percentage shrinkage were not significantly affected by the treatments. The high carcass fat obtained in this study confirms the finding of Ahmad and Davies (1986) and Adu and Brickman (1981) that lambs fed high energy

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TABLE 3. LIVEWEIGHT CHANGES AND FEED COST PER KG/GAIN OF YANKASA RAMS FED CONCENTRATE CONTAINING VARYING LEVELS OF PALM KERNEL MEAL.

Parameters	TREATMENTS				Sem ±
	1	2	3	4	
Initial weight(kg)	30.12	30.16	30.15	30.12	0.02
Final weight (kg)	37.40	37.76	37.76	38.41	0.21
Mean weight (kg)	33.76	33.96	33.96	34.27	0.09
Ave. weight gain (kg)	7.28	7.61	7.61	8.29	1.10
Ave. daily gains (g/d)	119.34	124.75	124.75	135.70	3.01
Feed : Gain	7.16	7.19	6.89	6.59	0.12
Feed Cost/kg gain (N/kg)	72.91 ^a	55.20 ^{ab}	42.55 ^{bc}	30.59 ^c	7.84

SEM = Standard Error of the mean

a,b,c. Row mean with different superscripts are significantly different (P < 0.01).

TABLE 4: CARCASS YIELD OF YANKASA RAMS FED CONCENTRATE CONTAINING VARYING LEVELS OF PALM KERNEL MEAL.

Parameters	TREATMENTS				SEM ±
	1	2	3	4	
% Maize replaced by Palm Kernel Meal	0	33	66	100	
Liveweight (kg)	37.47	37.65	37.92	38.50	0.19
Hot Dressed weight (kg)	47.44	49.50	48.77	47.84	1.17
Chilled Dressed Weight (kg)	17.63	18.42	18.35	18.20	0.16
Chilled Dressed %	47.03	49.23	48.39	47.34	1.70
Percent Shrinkage	0.84	1.20	0.76	1.04	0.25
Wt. of Shoulder + Neck (kg)	7.04	7.49	7.12	7.48	0.20
Weight of Neck (kg)	2.20	2.39	2.35	2.12	0.10
Weight of Loin (kg)	2.26	2.53	2.82	2.27	0.18
Weight of Long Leg (kg)	4.96	5.20	5.05	5.10	0.04
Weight of Messenteric Fat (kg)	1.32	1.88	1.18	1.18	0.20
Weight of Kidney Fat (kg)	0.63	0.97	0.79	0.58	0.14

S.E.M. = Standard Error of the mean

diets had greater amount of fat. However, Kwatu (1982) obtained lower values of both kidney and messenteric fat from Yankasa rams fed diets containing 20 and 40 percent PKM. The result of this study has greatly elucidated the potential of PKM as a ruminant feed. The inclusion of 95 percent PKM in the concentrate of fattening Yankasa rams resulted in good animal performance and carcass yield as well as low cost of production.

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