NUTRITIVE EVALUATION OF PALM-KERNEL CAKE AS REPLACEMENT FOR CONVENTIONAL CONCENTRATE IN SUPPLEMENTARY FEEDING OF THE GOAT

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ABSTRACT
A total of 25 WAD growing male goats with live weight ranging from 7 to 8.2kg were used in a completely randomized experiment to access the efficiency of palm kernel cake (PKC) replacing the conventional concentrate as supplements in a diet based on grass silage. Five levels of PKC (0%, 25%, 50%, 75% and 100%) were incorporated in conventional concentrate. There were 5 goats per treatment. The experiment lasted 12 weeks. Parameters of evaluation were the chemical composition of the supplements, weight change and feed efficiency. The result indicated that chemical composition of the supplements varied as the PKC replaced conventional concentrate ($P<0.05$). The weight gain increased ($P<0.05$) with inclusion of PKC while the feed conversion were similar ($P>0.05$) between the groups of animals fed sole PKC and sole conventional concentrate supplement. It was concluded that PKC from point of its characteristics and nutrient content is considered suitable to improve the performance of goats when fed as supplement.
Key words: Goat, Palm Kernel Cake, Weight gain, Feed efficiency.

INTRODUCTION
Livestock and poultry production have to be increased to enhance animal protein supply (Francesca *et. al.,* 2013). It has been reported (Alokan, 2004) that nutrition is the major constraint facing livestock owners in long dry season. Some data have been compiled on the chemical composition and nutrient value of some forages (Ademosun, 1992). For forage or any diet to be economically useful, it must be capable of supporting livestock performance. To compensate for the increase goat production by small scale farmers, there is need for adequate plan to utilize the available forages in both fresh and preserved form through supplementation with agro by-product like PKC. A legume, like groundnut which is rich protein source for livestock is also an important human food. Presently feed cost alone represents 70-80% of the total cost of poultry production (Esonu, 2000). Consequently, research effort are now focused on the use of agro industrial by-products such as PKC and farm residues as alternative source of livestock feeds because it is cheap and less competitive. However, the variation in nutrient content of agro by-product is important because of the effect it can have in meeting nutritional requirement of the animal. Palm kernel cake is an oil by-product which is available in the tropics (Rhule, 1996) and considered to have moderate content of crude protein (Carvalho *et al*, 2005). View forage crops as basal diet for goat, this paper aimed evaluating the nutritive composition of palm kernel cake as supplement.

MATERIALS AND METHODS
Five levels of PKC (0%, 25%, 50%, 75% and 100%) were incorporated in conventional concentrate. These were used as supplement to Napier grass silage for feeding 25 growing WAD male goats in a complete randomized design experiment of 5 animals per group for 12 weeks. The goats were dewormed prior to the experiment, housed in individual pens equipped with feeding, watering troughsand mineral blocks offered liberally. The supplements were offered to animals along with silage in one meal throughout the feeding period. Daily record of feed intake was maintained throughout the experiment. Goats were weighed individually every week before feeding in the morning. Daily weight and feed efficiency were calculated. The proximate analysis of palm kernel cake and

conventional concentrate were carried out following the procedure of AOAC (2005). The soluble carbohydrate (NFE) was obtained by the difference of 100 - %CP+ %CF + %EE+ %Ash + % moisture. The gross energy (kcal/g) was determined by Carpenter (1956) formula, CP * 5.8/100 + E.E * 9.3/100 + CF + 4.2/100 + NFE * 4.2/100 and Total digestible energy (TDN) as %DCP + %NFE + %CF + 25.

Statistical analysis

Data obtained by chemical analyses of the supplementary feeds, feed intake, live weight gain and feed efficiency were subjected to analysis of variance (Steel and Torrie,1980) and treatment means were separated by Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The chemical composition of the total diet varied as the PKC replaced the conventional concentrate (Table 2a and 2b). The crude protein obtained in all the treatments were different (P< 0.05) but the values (16.57 – 18.90%) are within the range established as the requirement for the growing goat (Chin, 2000). The changes in energy content as brought about by the oil in PKC is apparent at 75% and 100% PKC replacement of concentrate. Ether extract values (4,81% and 4.61%)were supportive to the report of Ruhule (1996) that referred to palm kernel cake as an oil palm by- product and source of energy by Chin (2002). Although EE value (4.81%) from 100% PKC sample was lower to the values of 9.1 -10.0% reported by Mustapha *et al.* (1987) and Chin (1991); the workers concluded that the values depend on the method and extent of oil extraction. The observed crude fibre values (8 –14.78%) from all the samples which contained PKC in this study fall within 14.60 - 16.0% and compared well with the reports of Mustapha *et al.* (1987) and Chin (1991) for the analysed mechanically expelled PKC but lower than 16 – 23.0% reported by Tipu (2014). The NDF, ADF, ADL values reported in this study seem to support rumination, fermentation and optimal functioning of the goat metabolic activities. The NFE, TDN and energy values for PKC alone were lower than similar estimates for all other samples studied. The NFE value was lower than 59.90% (Mustapha *et al.*, 1987) and TDN higher than 72.0% reported by Chin (1991). The growth performance of goats (Table 3) indicated similarity (P>0.05) in the final live weights of the goats between the groups. The feed efficiency values in animals fed only concentrate (30.28) and animals fed only PKC did not differ significantly (P>0.05). Goats in all groups showed daily weight gain that range between 12.96 and 21.11g/day which fall within 10.2 – 52.5g/day reported for goat fed PKC based concentrate in previous study (Rahman *et al.*, 2012). The similarity in performance of the goats fed only conventional concentrate and goats fed PKC supplements may suggest the efficacy of PKC in its nutrient content and palatability to replace the conventional concentrate in the goat's diet (Chanjula *et al.*, 2011).

CONCLUSION

The overall indications is that PKC was well utilized by the goats and the values of feed efficiency in all treatments indicate that PKC can effectively replace the conventional concentrate as supplement in the diet of the goat.

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Table 1: Supplementary diet composition

	% Inclusion				
Conventional Conc.	100	75	50	25	0
PKC	0	25	50	75	100
Total	100	100	100	100	100

Table 2a: Analyzed Nutrient Content of Supplemental diets

Conc:PKC	Moisture	DM	CP	EE	CF	NDF
100:0	11.03	88.97	18.90[a]	3.71[c]	5.20[d]	18.57
75:25	10.95	89.05	18.12[b]	3.83[c]	8.00[c]	24.98
50:50	11.26	88.74	17.64[b]	4.11[b]	10.70[b]	29.63
25:75	11.46	88.54	16.84[c]	4.61[a]	14.78[a]	37.37
0:100	11.96	88.08	16.57[c]	4.81[a]	14.78[a]	45.14
SEM		0.69	0.35	0.20	0.23	
LOS	NS	*	*	*	*	*

Table 2b: Analyzed Nutrient Content of Supplemental diets

Conc:PKC	ADF	ADL	ASH	NFE	TDN	GEKCAL/g
100:0	6.03	2.09	3.26^{d}	57.90^{a}	87.96^{a}	138.9572^{a}
75:25	11.73	4.36	4.28^{c}	54.82^{b}	87.02^{b}	13.5042^{b}
50:50	16.37	5.79	4.83^{b}	51.46^{c}	86.16^{c}	13.2242^{c}
25:75	22.64	7.17	5.01^{b}	47.30^{d}	85.78^{d}	12.8033^{d}
0:100	27.37	8.40	5.77^{a}	41.64^{e}	84.52^{e}	12.6153^{e}
SEM			0.20	0.45	0.30	0.12
LOS	*	*	*	*	*	*

PKC= Palm kernel cake;Conc.=Concentrate;SEM-standard error means, LOS-level of significance. Means along the same column with common superscripts are not statistically different (P>0.05).

Table 3: Growth performance of goats fed basal diet of elephant grass silage with Conventional Concentrate and Palm Kernel Cake supplementation.

Conc:PKC	100:0	75:25	50:50	25:75	0:100	SE±
Initial weight (g)	7166.67^{a}	6033.33^{a}	8200.00^{a}	7066.67^{a}	7766.67^{a}	1271.48
Final weight (g)	8333.33^{a}	7213.33^{a}	9400.00^{a}	8166.67^{a}	9200.00^{a}	1296.92
Ave. wt gain (g)	1166.67^{c}	1180.00^{a}	1200.00^{bc}	1100.00^{c}	1433.33^{b}	131.66
Daily wt gain (g)	13.89^{c}	14.01^{a}	14.29^{bc}	13.10^{c}	17.06^{b}	1.57
DMet.Wt($g/W^{0.75}$)	7.19^{c}	7.2^{a}	7.34^{bc}	6.88^{c}	8.40^{b}	0.60
Feed Efficiency	30.28^{ab}	28.72^{c}	29.28^{ab}	32.08^{a}	24.19^{bc}	3.54

* Means in the same row with common superscripts are not statistically different (P>0.05);Ave. wt gain (g)=Average weight gain; Daily wt gain (g)=Daily weight gain(g); DMet.Wt($g/W^{0.75}$)=Daily metabolic weight.