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RESEARCH ARTICLE

THE EFFECT OF REPLACING CASSAVA PEEL MEAL WITH DISCARDED TIGER NUT (*Cyperusesculentus)* MEAL ON YIELD AND COMPOSITION OF MILK OF RED SOKOTO GOATS

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ABSTRACT

Twelve lactating Red Sokoto Goats in their first parity were used to determine the effect of replacing cassava peel meal with discarded Tiger nut meal (DTNM) on milk yield and composition. The experimental design was CRD. Cassava peel meal was replaced at the levels of 0, 30 and 60%. Each treatment was replicated four times. Parameters measured were DM intake and milk yield. The results shows that DM intake was significantly ($P<0.05$) higher for goats on treatment 2 (30% DTNM). The mean daily milk yield of goats in treatment 1 and 2 were not significantly ($P>0.05$) different. The butter concentration increased significantly ($P<0.05$) with the inclusion of DTNM. It was concluded that discarded tiger nut meal may have great potential for the dairy goat industry.

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INTRODUCTION

Dairy goat keeping is new in Nigeria and is at the preliminary stage of research. Few are kept in research institutes and institutions to ascertain the true dairy potentials of the indigenous goat breeds in the country. There are estimated 24.5 million goats in Nigeria and 145 million in African; goat population is on the increase at a faster rate than those of other ruminants (Aliyu, 1990). There are two major goat breeds in Nigeria namely the Red Sokoto (Maradi) and West African Dwarf goat with many intermediate transitional breeds occurring as one moves from the North east, Southward to the South east (Devendra and Burn, 1970, Aliyu, 1990). Winrock (1976) observed that in addition to high reproductive rates due to short generation lengths, the energetic efficiency of milk production may be higher in dairy goats than for other dairy animals. Wilson (1991) reported that though goats produce lower absolute quantities of milk than cattle, when their body weight is taken into account, their milk yield is higher than those of other species with the possible exception of camels.

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One of the major problems militating against ruminant production in the tropics is the scarcity of year round provision of fodder (Adegbola *et al.,* 1988) especially during the long dry season. At this time, the available forages are dry, the protein content is very low and there is marked decrease in voluntary intake and digestibility (Obioha and Ndukwe, 1976). Feeding goats well is of fundamental importance for the success of the whole goat enterprise. Good nutrition is a pre-requisite for good health, good reproduction, high milk yield, fast growth rate and a successful goat system (Peacock, 1996). However, provision of good nutrition is limited by food procurement problems (Chidebelu and Ngondjou, 1997). The practical strategies for improving milk production of dairy animals on these diets depend on supplementation to optimize both fermentative digestion in the rumen and the efficiency of metabolism of absorbed nutrient (Leng, 2004).

Discarded tiger nuts, in the contextof feed resource classification, can be regarded as non-conventional feed resource (Devendra 1991). They are the rhizome of *Cyperusesculentus* used in some countries for human consumption (Bosch and Farre, 2005). It is cultivated in Northern Nigeria where it is made into a sweet meat. According to Daisy (1987) tiger nut can be used for animal

feed and are grown as pig feed in parts of the southern United States of America. The tubers are rich in both starch and oil with a protein content of 7 percent (Zimmermann, 1987).

MATERIALS AND METHODS

Description of Study Site

The study was conducted in the Livestock Teaching and Research Farm of the University of Agriculture, Makurdi located in the Southern Guinea Savannah Belt of Nigeria (Latitude $7^0 43^1$ North and Longitude $8^0 32^1$ East and an altitude of 97 meters above sea level). The temperature range is 21.6-42.8^{0}C and the relative humidity ranges from 69.1% in the morning to 52.2% in the afternoon.

Experimental Diets

Discarded Tiger nuts are mostly diseased nuts which remain afloat on water and are usually considered not good enough for consumption or used. They were obtained from the local sorting point in Wadata area in Makurdi, dried and crushed coarsely to enhance proper mixing with other ingredients. Three experimental diets designated 1, 2 and 3 were formulated. Diet 1 which is the control contain 0% Tiger nut, while diets 2 and 3 contain 30% and 60% discarded Tiger nut meal respectively. The compositions of the experimental diets are given in Table 1.

Experimental Animal and Their Management

Twelve (12) Lactating Red Soktoto does in their first parity were used for the lactation study. The does were obtained from the University of Agriculture livestock teaching and research farm Makurdi, Benue State. The animals were quarantined for a period of fourteen days and were dewormed and vaccinated against pest de petits ruminant (PPR). In addition they were given a complete course of antibiotic to produce a common health status among the animals. The animals were managed under semi-intensive system, where they were allowed to graze the native forage and supplemented with concentrate. A buck was allowed to run with the does. On parturition, the 12 does were randomly allotted to the three experimental diets in a completely randomized design. Basal diet of Rice straw was given to the animal at 100g/head/day. The diets were offered to the animals at 4% of their body weight with clean water provided freely. Dry matter intake was recorded daily, for the feeding period of 60 days.

Measurement of Live Weightand MilkYield

The Goat's initial body weights were taken and there-after measured on weekly intervals using a hanging scale. On parturition, does and their kid(s) were individually housed for three (3) days before initiation of milk production measurements. Does were hand-milked once daily (8.00h) after separation from the kids(s) over night. The milk yields were weighed using a sensitive electronic weighing balance.

Chemical analysis

Dried samples were milled with hammer mill. Dry matter, crude protein, crude fiber, ether extract and ash were determined according to the Official Methods of Analysis (A.O.A.C 1990). Sample were analysed in duplicate. Nitrogen free extract was obtained by calculation. Samples were analysed for nitrogen by micro-kjeldahl method. Milk samples were analyzed for chemical composition. Total solids were determined by drying a known gramme of milk sample to a constant weight at 105^{0}C for 48hours. Solids-not-fat was determined as difference between total solids and butter fat. Butter fat was determined by Micro Roese-Gottlieb method (AOAC, 1990). Milk protein (N x 6.38) was determined by semi micro distillation method. Gross Energy (ME) was calculated using Peuzenga (1985) equation.

STATISTICAL ANALYSIS

Data obtained were subjected to analysis of variance applicable to completely randomized design (CRD). Significant means were separated by Duncan (1955) multiple range test.

RESULTS AND DICUSSION

The Tiger nut meal fed in this work has a crude protein (CP) value of 7.4% and Gross Energy value of 1.92MJ/Kg (Table 2). The CP valueis similar to the CP value of 7% obtained by Zimmermann (1987). However, Babadusi (2006) reported crude protein value of 9.9% which is higher than the value for the discarded Tiger nut meal used in this work. Navarro *et al.* (1984) observed that the origin, variety and harvesting period seem to affect the protein contents of Tiger nuts and therefore also the nutritional value of tiger nuts. Chemical Analysis of the experimental diets indicates that the crude proteins of the diets which range from 13.32-13.71% are within the recommended levels of 8-18% for ruminant in the tropics (ARC, 1980). Data on dry matter intake (DMI) and response of lactating Red Sokoto Goats to the different treatments are presented in Table 3. The DMI values increased for goats on treatment 2 which had 30% discarded Tiger nut meal (DTNM) inclusion but decreased in treatment 3 with the level of 60% DTNM inclusion. It could be that the inclusion of 30% DTNM and 30% Cassava peel meal (CPM) probably increased the palatability of treatment 2 diet whereas up to 60% inclusion of DTNM reduces palatability. Goats on treatment 2 diet had a significantly ($P<0.05$) higher dry matter intake. The intake 60.62g/kgw$^{0.75}$ per day fell within the range 59-68g/kgw$^{0.75}$ reported by Tuah *et al.* (1992) when they fed Djallonke sheep with cassava peels supplemented with varying levels of palm kernel cake. Goats on Treatment 1 and 3 lost an average of 1.63kg and 1.88kg respectively. This is consistent with the findings of AFRC (1998) which reported that the live weight of goats has been observed to fall by up to about 6kg during the first 6-12 weeks after parturition. The loss in live weight could be attributed to the mobilization of body reserves of fat and protein which occurs in the early stages of lactation in goats (AFRC, 1998), and low DMI. The DMI as percent of live weight for goats on Treatment 1 and 3 were 2.0 and 1.7 per cent respectively which are far below the 4-5 percent recommended by Steele (1996). Does on treatment 2 had a marginal weight gain of 0.63kg. This is in agreement with Dunshea *et al.* (1990) who reported that between days 38 and 76 of lactation, goats made small gain in weight: 0.8kg live weight.

Table 1. Composition of Experimental Diets (DM basis)

INGREDIENTS Constituents %	DIETS (Treatment)		
	1	2	3
*Tiger nut meal	0	30	60
Cassava peel meal	60	30	0
Palm kernel cake	15	15	15
Brewers dried grains	19	20	21
Blood meal	3	2	1
Bone meal	2	2	2
Common salt	1	1	1
Total	**100**	**100**	**100**

* Discarded material

Table 2. Proximate Composition of Experimental Diets (%) and Discarded Tiger nut meal (DTNM)

Parameter	Treatment				
	1	2	3	CPM	DTNM
Dry Matter Crude Protein	90.05 13.3	89.8513.5	90.10 13.7	85.70 3.28	88.65 7.4
Crude fibre	11.66	13.82	16.38	17.18	17.4
Ash	5.87	7.21	8.82	4.89	11.9
Ether extract	5.67	7.81	10.05	1.72	13.1
Nitrogen Free Extract	63.05	57.66	51.05	72.93	50.2
Gross Energy (MJ/kg)	1.87	1.91	1.94	1. 73	1.92

DTNM:Discarded Tiger nut Meal
CPM:Cassava Peel Meal
TI = 0 % DTNM, T2 = 30 % DTNM and T3 =60 % DTNM

Table 3. Dry matter intake and Response of Lactating Red Sokoto Goats fedgraded levels of Discarded Tiger nut meal in supplementary feed

	Treatments			
Parameter	**1**	**2**	**3**	**SEM**
	0%	**30%**	**60%**	
Initial mean Live wt (kg)	18.00	17.00	17.75	0.95
Final mean Live wt (kg)	16.38	17.63	15.86	0.85
Total wt. gain/Loss (kg)	-1.63	0.63	-1.88	0.18
Ave. daily wt gain/loss (g)	-27.08	10.25	-31.25	2.97
Dry matter Intake (g/day)				
Rice straw	80.76	89.25	84.75	1.31
Concentrate	262.40^{b}	425.08^{a}	202.73^{b}	13.62
Total	343.16^{b}	514.33^{a}	287.48^{b}	14.06
Dry matter intake (as % BW)	2.0^{b}	3.0^{a}	1.7^{b}	0.09
Dry matter intake (g/day/Wkg$^{0.75}$)	40.18^{b}	60.62^{a}	34.87^{b}	1.82

^{abc}Means with the same superscript are not significantly different (P>0.05)
TI = 0 % DTNM, T2 = 30 % DTNM and T3 =60 % DTNM

Table 4. Milk yield and proximate composition of milk from Goat fed graded levels of Discarded tiger nut meal in supplementary feeds

Parameter	**T_1**	**T_2**	**T_3**	**SEM**
Mean daily milk yield (g)	138.58^{a}	159.1^{a}	98.9^{b}	533
Total solids (TS) %	16.80	15.95	14.75	6.19
Solids-not-fat (SNF) %	12.09^{a}	7.38^{bc}	5.95^{c}	3.39
Butter Fat (%)	4.71^{b}	8.57^{a}	8.80^{a}	3.02
Protein(%)	5.47	5.03	5.91	2.13
Ash (%)	0.82	0.80	0.77	0.31

^{abc}Means with the same superscription are not significantly (P>0.05) different
TI = 0 % DTNM, T2 = 30 % DTNM and T3 =60 % DTNM

Bemji *et al.* (2006) also reported that does weight decreased from parturition up to the 4th week and increased thereafter till the 12th week of lactation. The milk yield and proximate composition of milk from does in the different treatment are shown in Table 4.The mean daily milk yield for goats on Diets 1 and 2 were not significantly (P>0.05) different. However, goats on Diet 2 produced more milk although not statistically different from diet 1. The total solids were not significantly (P>0.05) different among the treatments. The solids-not-fat (SNF) of milk from goats on treatment 1 was significantly (P<0.05) different from SNF of milk from goats on treatment 2 and 3. The concentration of butter fat increased significantly (P<0.05) with the inclusion of DTNM in the diets. This could be as a result of the higher level of fat concentration in DTNM compared to CPM. The CP concentration in the milk from goats in all the treatments were not significantly (P>0.05) different. However, the concentration fell by 0.44% for goats on treatment 2 and increased by 0.44% in the milk of goatson treatment 3. This could be attributed to the increase in milk production from goats on treatment 2. Morand-Fehr *et al.* (1986) reported that the concentrations of both fat and protein were found to fall by about 10g/kg as milk production increased. The ash content of the milk were not significantly (P>0.05) different among the treatments.

Conclusion and Recommendation

Discarded tiger nuts, when used replace to cassava peels in a concentrate diet up to 30% improved the dry matter intake and milk production of goats. It also increased the fat content of milk by about 82%. The dairy industry will benefit enormously from the use of tiger nut in diets of dairy animals especially where high fat content is desirable for the production of butter and cheese. The DM intake was generally low across the treatments. DM intake could be increased with pelleting of the diets. It has been observed that goats do not thrive well when kept on a single type of feed for any length of time but prefers to select from many varieties of feeds, such as combinations of grasses and shrubs, plants or tree leaves (Morand-Fehr *et al*, 1991). It is recommended that for optimal performance goats should be allowed to graze native or cultivated pasture and supplemented with concentrates. Since the use of discarded tiger nut up to 30% inclusion level in a supplementary diet for goats in this study has no adverse effect it can be recommended that discarded tiger nut can constitute up to 30% of supplementary rations for goats during the long dry season.

Tiger nut is a hardy crop and will grow in a very wide range of climatic conditions. Its cultivation should be encouraged to exploit its enormous potential in livestock feeding. More studies need to be carried out to determine the correct status of discarded tiger nut as a source of unconventional feed stuff for goats.

REFERENCES

A. O. A. C. 1990. Association of official analytical chemists. Official methods of analysis Washington DC, USA.

Adegbola, A. A., Smith, O. B and Okeudo N. J. 1988. Response of West African Dwarf sheep fed cassava peel and poultry manure based diets: Proceedings of the first joint workshop held in Lilongwe, Malawi 5-9 Dec. 1988, Addis Ababa, Ethiopia, pp 357-366.

AFRC 1998. The Nutrition of Goats Wallingfor, UK: CAB International.

Akinfala, E. O. and O. O. Tewe 2002. Evaluation of energy and protein value of whole cassava plant meals in growing pig diets in the tropics. Bull. AnimHlth. Prod. Afr. 80:228-234.

Aliyu, S. U. 1990. Sheep and goat production Extension bulletin No. 46 Livestock series No. 8 pp 1- 22.

ARC 1980. Agricultural Research Council.The Nutrient Requirements of ruminant livestock. Technical Review by the Agricultural Research Council working party Common-wealth Agriculture Bureau, Faruham Royal, UK.

Babadusi, D. R. 2006. Effect of Tiger nut (*Cyperusesculentus*) Rejects based diet on the growth performance of weaner Rabbits. B. Agric project, Dept. of Animal Prod. University of Agriculture, Makurdi.

Bemji, M. N. Osinowo, O. A., Ozoje, M. O, Adebambo, O. A. and Aina, A.B.J. 2006. Live weight changes during lactation and its relationship with milk off-take and yield in West African Dwarf and Red Sokoto goats intensively managed within the humid zone of Nigeria. *Nig J. Anim Prod*., 33 (1): 145-150.

Bosch, L. A. andFarre, R. 2005. RP-HPLC determination of Tiger nut andorgeat amino acid content. *Food Sci. Tech. Int*., 11 (1): 033-038.

Chidebelu, S. D. and M. Ngondjou 1997. The economics of goat production in South Eastern Nigeria, implication for the future *Nig. J. Anim*. *Prod*, 25:93 99.

Daisy, E. K. 1987. Root Crops.Reviewed by E.G. B. Gooding. Tropical development and Research institute, 127 Clerknwell Road, London ECR 15 DB Overseas development Administration, Crop and Product digestion 2nd Ed. London XUS 380 p.

Devendra C. and Burns, M. 1970. Goat Production in the tropics. Fernham Royal Book Commonwealth Agric. Bureaux 7.

Devendra, C. 1991. Feed Resources in Goat Husbandry and Breedingin the Tropics.Paper presented in an international seminar carried out by German foundation for international development (DSF) at the Institute of Advanced Studies University of Malayam, Kwala Lumpur, pp 121-135.

Duncan, D. B. 1955. New Multiple Range Test. Biometrics 11.1:-42.

Dunshea F. R., Bell, A.W. and Trigg T. E. 1990. Body composition changes in goats during early lactation estimated using a two-pool model of tritiated water kinetics. *British J. of Nutrition*, 64:121-131.

Leng, R. 2004. Feed strategies for improving milk production forage utilization. Hot mail pp 1-2

Morand-Fehr, P., Blanchart G. Le, Mens, P., Remenf, F. Sanvant, D., Lenoir, J, Lamberet G; Le Taouen, J. C. and Bas P. 1986. Donneesrecentessur la composition du lait de Cherre. *Journees de la Recherché Ovine etcaprime,* 11:253-298.

Morand-Fehr, P., Owen, E. and Giger-Reverdin, S. 1991. Feeding behaviour of goats at the twugh. In: goat nutrition Morand-Fehr, P. (Eds). Wagomingani Product 111 EAAP Pub. No. 4 pp 3-12.

Navarro, J.L., Schwartz, M., Gasque, F., Alberola, T., Perez, R. and Lafuente, B. 1984. Influencia de la época de

recoleccion de la chufa (Cyperusesculentus L.) Sobre lascaracteristicasanaliticas y sensoriales de la horchata. Revista de Agroquimica Tecnologia de Alimentos, 24, 199-208

Obioha, F. C. and Ndukwe, N. 1976. Changes in yield and chemical composition of standing and conserve forage during the dry season in East central Nigeria. *Nig. J. of Amin Prod*. 3: 105-116.

Peacock, C. 1996. Improving goat production in the tropics. A manual for development workers. An Oxfarm/FARM African publication (Uk and Ireland) pp1-20.

Peuzenga, U. 1985. Feeding Parent Stock.Zooteenical International December 19985 PP 22-24.

Steele, M. 1996. Energy requirement of goats. The tropical Agriculturist 1st ed. CTA Macmillan Education Ltd. Hongkong. Pp 23-36.

Tuah, A. K., Orskor, E. R, Obese, E. Y. Okai, D. B. and J. F. D. Greenlangh 1992. The effects of supplementation of cassava peels with graded levels of palm kernel cake on performance of growing Djallonke sheep Proceeding of the 2nd Biennial Conference of Africa Research Network, AICC, Arusha, Tanzania 7 – 11 December, 1992 PP 163 – 167.

Wilson, R. T. 1991. Small ruminant production and the small ruminant genetic research in tropical Africa. FAO Anim. Prod. and Health paper 88. FAO Rome Italy, 231 p.

Winrock Int. 1976. Proceeding of a workshop on the Role of sheep and goats in Agricultural development held in Winrock Int. Centre Morrilton, Arkansas USA 15-17 Nov. 1976. 43 p.

Zimmermann, W. 1987. Tiger nuts scientific analysis www.Tigernut.Com/intml

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