FEED INTAKE, MILK YIELD AND MILK TOTAL SOLIDS OF RED SOKOTO GOATS FED GRADED LEVELS OF DRIED TIGERNUT (*CYPERUS ESCULENTUS* L.)

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ABSTRACT
The influence of diets containing graded levels of tiger nut (*Cyperus esculentus L*) *on feed intake, yield and total solids content of milk of Red Sokoto goat were evaluated in this study using four does in their mid-lactation stage. The does were fed diets (A, B, C and D) containing 0, 10, 20 and 30% tiger nut (TGN) in a 4x4 Latin Square arrangement. Feed intake and milk yield were measured daily and the milk samples were also analyzed for total solids (%). The results showed that feed intake and milk yield of goats that were fed 10% and 20% tiger nut diets were higher (P<0.05) than those fed 0% and 30% tiger nut diets (P<0.05). Total solids (%) of milk was not influenced by inclusion of tiger nut in the diets (P>0.05). It was therefore concluded that up to 20% inclusion level tiger nut can be made in the diet of lactating does to improve milk production.*
Keywords: Feed intake**,** Milk yield, Total solids, Red Sokoto goats, Tigernut

INTRODUCTION

Milk provides proteins and other metabolites needed for growth, maintenance and repair of body tissues, reproduction, supply of energy and appetite satisfaction in human nutrition. It is normally obtained from ruminant animals which include cattle, horses, buffalo, camels, sheep and goats; the dairy cow being the major milk producer. In some parts of the world, the use of dairy goats for milk production is on the increase. For instance, it has been reported that countries such as Libya and Iraq obtain half their total milk requirements from goats (Butswat *et al*., 2002). Presently, importance of goats as a source of milk has attracted global interest. Campbell *et al.* (2003) postulated that goat milk industry will thrive and expand globally in the 21st century. In Nigeria, goats are rarely kept for milk production. The little data available on milk production from goats are largely from empirical research studies. However, since domestic milk supply obtained from indigenous cattle breeds kept primarily by pastoral and agro-pastoral Fulani cattle rearers and few organized dairy farms (Yahuza, 2001) is too low when compared to the demand for milk and milk products, using goats as alternative source of milk will reduce excessive importation of dairy products and help the poor masses obtain milk at a cheaper rate since the prices of dairy products have skyrocketed in recent times.

A major factor that can limit the dairy performance of animals is inadequate nutrition. In dairy goat feeding, high concentrate-low forage diets have been used to improve milk yield without adverse effect on the content of milk (Min *et al*., 2005). Dietary fat sources have also been incorporated in the diets of lactating goats to increase the energy density of feeds or improve milk quality (Pulina *et al*., 2008). Pigeon pea-cassava peel based diets have also been used in studies involving lactating goats (Ahamefula and Ibeawuchi, 2005). Tiger nut (*Cyperus esculentus*) is one of the two major species of the nutsedge found as weed in the tropics and subtropics and has been grown in Florida in the past as livestock feed (Mason, 2010). It belongs to the group of plants known as Magnoliophyta, class Liliopsida, Order – Cyperale and Family Cyperaceae (The Columbia Electronic Encyclopedia, 2004). *Cyperus esculentus* is a good source of dietary fiber, carbohydrate, fat and minerals especially phosphorus, potassium and vitamins C and E (Ekeanyanwu and Ononogbu, 2009). It has a high content of soluble glucose, about 21% (Mason, 2010). It can be eaten raw, used as hog feed or pressed for its juice to make a beverage (The Columbia Electronic Encyclopedia, 2004). Belewu *et al* (2007) reported higher weight gain and feed efficiency when tiger nut meal was used to substitute wheat offal at 0, 10 and 20 percent levels in the diets of West African Dwarf (WAD) goats. Also, better carcass yield was reported when it was used to replace 33.3% maize in the diets of cockerel (Bamigbose *et al*., 2003). There is paucity of information on its utilization in the diet of lactating animals hence this study.

MATERIALS AND METHODS

The study was carried out at the Livestock Unit of the Teaching and Research farm, Michael Okpara University of Agriculture Umudike (MOAU) as a collaborative work between the Department of Animal Science and Technology, FUTO and that of MOAU. Umudike is located at about eight kilometers from Umuahia, the Abia State capital and lies on latitudes 5°28[1] north, longitude 7° 32[1] east and at an altitude of 122m above sea level. It is situated in the tropical rain forest zone, which is characterized by an annual rainfall of about 2177mm**.**The relative humidity ranges from 50 to 95%. Average monthly ambient temperature is 26°C with maximum and minimum of 32°C and 22°C respectively (Ahamefule *et al*., 2004). Dry tiger nut tubers were purchased from vendors in Owerri main market. The tubers were sorted, milled and sundried for three days to improve the keeping quality. The basal feed was formulated with brewer's dried grains, palm kernel cake, molasses, bone meal and common salt. The tiger nut meal was used to replace cassava peel at 0, 10, 20 and 30% (w/w) in diets A, B, C and D. Diet A served as the control. The cassava peels were collected from garri processing sites and sundried for a period of 6-8 days before use. The ingredient composition of the experimental diets is shown in Table 1. The proximate compositions were determined according to AOAC (2000) procedure.

Table 1: Ingredients composition of experimental diets containing tigernut meal

Ingredients (%)	A	B	C	D
Tigernut meal	0.00	10.00	20.00	30.00
Dried cassava peel meal	30.00	20.00	10.00	0.00
Brewers' Dried grains	34.00	34.00	34.00	34.00
Palm kernel cake	30.00	30.00	30.00	30.00
Molasses	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00
Common salt	1.00	1.00	1.00	1.00
Total	**100.00**	**100.00**	**100.00**	**100.00**

Four Red Sokoto does in mid-lactation with mean body weights averaging 20 ± 0.5 kg were selected from among the flock reared in the MOAU Farm and used for the experiment. The animals were managed intensively in separate pens. The does were assigned to four dietary treatments in a 4 x 4 Latin Square arrangement. An average of 800g of the treatment diets were offered to each doe. Each animal received one of the diets for 14 days. The first 7 days was allowed for adjustment to the feed, whilst data collected from 8th – 14th days. Thereafter the next ration in the sequence was introduced. Water was provided liberally. Feed intake was determined as the difference between daily feed offered and refusal.

Milk Sampling, Measurement and Analysis

Each animal was hand-milked once daily in the morning hours between 6.30 and 7.30am. The volume of milk harvested was measured using a graduated 100 mL capacity glass cylinder and then weighed to the nearest gram on an electronic laboratory scale (Citizen Electronic Weighing Balance). Prior to each day's milking, kids were separated from their dams on the evening preceding the day of milking and returned after milking. Samples from the daily milk yield for each doe was analyzed three times per week for lactose content before being bulked and stored in a refrigerator (-5□) until required for analysis. The milk samples were analyzed for total solids (TS). The TS content was calculated and expressed as percentage of fresh milk. The data obtained were subjected to analysis of variance (ANOVA) and differences between means were established using Duncan's Multiple Range Test. SPSS statistical software (SPSS, 2008) was used.

RESULTS AND DISCUSSION

The proximate composition of the experimental diets is shown in Table 2. Increase in tiger nut meal level increased the crude protein and crude fibre contents of the experiment diets. This is similar to the report of Belewu *et al* (2007) which showed increase in crude protein and crude fibre contents of diets as the level of tiger nut increased in the diets. Also, there was an increase in the ether extracts of the diets as tigernut level increased. This, however, not in line with the report of the same authors which

showed a decrease in ether extract of diets as the level of tigernut increased.ze

Table 2: Proximate composition of experimental diets containing tigernut meal

Parameters	A	B	C	D
Dry matter	88.14	86.31	88.26	87.29
Crude protein	11.20	11.54	12.01	12.17
Crude fibre	21.20	24.10	27.50	29.25
Ether extract	3.01	4.47	6.63	7.79
Ash	10.87	8.02	8.75	8.55
NFE	41.86	38.18	33.37	29.53
Energy (ME, kcal/kg)	2290	2300	2330	2300

NFE = nitrogen free extract. Energy calculated as in MAFF (1977)

The feed intake, milk yield and milk total solids of the experimental goats are summarized in Table 3. Both the average daily feed intake (g/d) and feed intake on metabolic weight basis (Wkg $^{0.75}$) were significantly higher (P<0.05) for diets B and C than in diets A and D. Average milk yield (g/day) increased in tigernut-containing diets. However, the average milk yield (g/d) obtained from goats fed the 30% tigernut diet was similar to that of goats fed the control diet; but lower than those fed diets with 10% and 20% tigernut diets (P<0.05). Results indicate that diets B and C which were consumed more than the other diets promoted higher milk yields. The low milk yield, ranging from 48.74-67.05 (g/d) obtained in this study may be due to once a-day milking practiced. Earlier observation (Winters, 1997) revealed that milk yields are higher when animals are milked twice or thrice a day. Also the present results were obtained with does in their mid-lactation. Studies with Red Sokoto goats showed that high milk yields were obtained in early lactation (Butswat *et al.,* 2002). The total solids of milk ranged from 14.89% in diet B to 16.38% in diet D. The values obtained for diets A, C and D are comparable to the values of 15.85% recorded by Mba *et al.* (1975) but higher than the value of 15.37% recorded by Malau-Aduli and Anlade (2002). Although the total solids value of the 10% tigernut diet was numerically lower than the other diets, differences in total solids were not significant (P>0.05) across the dietary treatments.

Table 3: Intake, milk yield and composition of goats fed graded levels of tigernut meal

Parameter	A	B	C	D	SEM
Feed intake (g/day)	497.68^{b}	609.64^{a}	593.93^{a}	456.43^{b}	31.78
Feed intake($Wkg^{0.75}$)	104.34^{b}	122.48^{a}	120.28^{a}	98.20^{b}	5.09
Milk yield (g/day)	48.74^{b}	66.51^{a}	67.05^{a}	51.10^{b}	5.04
Total solids (%)	15.70	14.89	15.77	16.38	0.61

^{ab} means on the same row with the same superscripts are not significantly different (P>0.05)

CONCLUSION

The results of this study have shown that up to 20% level of tigernut can be included in the diet of lactating does to improve milk production of lactating does. Further studies should be directed towards investigation of milk production of does fed diets containing tigernut in late lactation. Also, there is need for extensive laboratory analysis to acquire more information on fatty acid profile, mineral and vitamin contents of milk of lactating animals fed tigernut diets.

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