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## **Goat Milk a Possible Alternative Source of Protein and Minerals to the Rural Poor Populace in Nigeria: A Case Study of Mubi Area of Adamawa State, Nigeria**

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### **ABSTRACT**

This study was conducted in Mubi area of Adamawa State, aimed at evaluating the use of goat milk by the rural populace as supplement to other animal protein and mineral sources. Majority of goats in Nigeria are kept under traditional system of management. In this study milk samples were collected from lactating animals (Red Sokoto goats) during the wet season (June-September, 2008), a period coinciding with forage availability and dry season (January-April, 2008) a period of feed scarcity. Analysis for fat, solid non fat, total solid, cholesterol, calcium, magnesium and phosphorus was determined according to the standard procedures described by Association of Official Analytical Chemists and Pearson's chemical analysis of food. The results obtained indicated that the goat milk has fat 5.01%, total solid 16.58%, solid non fat 11.79%, cholesterol 0.18%, calcium 0.29%, magnesium 0.15% and phosphorus 0.14%. It was concluded that milk from goats is of high nutritional values and can be used to supplement the nutritional status of the rural communities.

**Key words:** Mubi, goat, milk potentials, rural population

### **INTRODUCTION**

The demand for energy and animal protein among rural communities in Nigeria is increasing on a daily basis. The stricken poverty and low income of the households made it difficult to afford a balanced diet. Attempts by government to support the susceptible masses by implementing programs like poverty alleviation etc., has almost proved abortive. However, the majority of households in these rural communities keep goats mainly for meat production, the milk is not substantially consumed (Midau *et al.*, 2010).

Various nutrition surveys have demonstrated the existence of hunger and malnutrition in Nigerian children (FGN/UNICEF, 1994). Under nutrition and micronutrient deficiency are the major forms of malnutrition in the Nigerian children. Nutritional deficiencies contribute to the high rates of morbidity, mortality and disability in Nigeria (Ahmadu Bello University Consultancy Service, 1990).

Malnutrition in the early years of life while the brain is in its period of rapid growth can have a serious effect on intellectual development either directly by damaging the central nervous system or indirectly through its deleterious effects on responsiveness to stimuli and interference with learning (Akinmokun, 1989). In particular stunting which is widespread among children in Nigeria is known to be associated with diminished cognitive development. Height for age has been found to be a good predictor of mental performance, stunted children performing poorly on various scholastic aptitude tests. Wasting was also correlated with poor scores although less so, than in the case of stunting (Akinmokun, 1989).

Milk and other dairy foods are nutrient dense foods providing abundant amounts of protein, vitamins and minerals necessary for children's growth and development. Milk and other dairy foods are nutrient dense foods; their intake improves the overall nutritional quality of children's diet (Johnson *et al.*, 1998). As estimated in the year, 1997 dairy foods provided 72% of the calcium, 32% of the phosphorus, 26% of the riboflavin, 22% of the vitamin B12, 19% of the protein, 16% of the magnesium, 15% of the vitamin A, 9% of the vitamin B6 and 5% of the thiamin, in addition to appreciable amounts of vitamin D and niacin equivalents available in the U.S food supply (Gerrior and Benke, 2001). Despite the demonstration of this benefit, dairy product consumption has remained low in Nigeria (Addo, 2005). This low intake of milk and other dairy foods is a major factor contributing to growing children's calcium shortage (Johnson *et al.*, 1998). There is evidence that on live weight basis, goat is more efficient milk producer than the other species (Malau-Aduli *et al.*, 2001). It is well known that goat milk is more nutritious than cow milk, hence can provide the much needed nutrients for children and people living with HIV/AIDS especially from poor rural communities (Beck, 1989).

It was established that the consumption of goat milk reduces total cholesterol level because of the higher presence of Medium Chain Triglycerides (MCT) 36% in goat milk versus 21% in cow milk which decreases the synthesis of endogenous cholesterol (Alferez *et al.*, 2001). Goat milk production and some factors affecting its qualities (El-Hassan *et al.*, 2009; Haenlein, 2001) were considered in this study.

## **MATERIALS AND METHODS**

**Study area:** Mubi area (Mubi north and Mubi south local government areas) lie within Northern Guinea Savannah zone of Nigeria and located at latitude 10°00 north, longitude 13°30 east and about 305 meters above sea level with an area of 961.39 km<sup>2</sup>. The dry season in this area commences early October and last up to April. The wet season begins from May and attains its peak between July and August and declines in September; the mean annual rainfall is 1050 mm. The relative humidity is extremely low 20-30% between January and March and start increasing as from April and reaches a peak of about 80% in August and September; the relative humidity starts to decline from October following the cessation of rains. The maximum temperature can reach 40°C particularly in April while minimum temperature is about 18°C between December and January.

**Research animals:** Forty lactating Red Sokoto does were used for this study. The milk samples were collected in two seasons, wet (June-September, 2008) and dry (January-April, 2008) seasons. Animals were managed under extensive system of management; no concentrates were given. Goats are allowed to range freely in the dry season but confined as soon as the crops are sown in the wet season and released as soon as the crops are harvested.

**Sampling techniques:** Purposeful, multistage, random sampling techniques were used. Forty lactating Red Sokoto does, 20 in the dry season (January-April, 2008) and 20 in the wet season (June-September, 2008), were selected within Mubi area to determine the milk yield and composition.

**Milk collection samples and analysis:** Goat milk samples were collected in the dry season and the wet seasons, during the year 2008. The does were milked twice a day (morning 6:00 a.m. and evening 6:00 p.m.). The milk samples were then evaluated for fat, total solid, solid-not-fat,

cholesterol, calcium, phosphorus and magnesium levels, these were determined according to the standard procedures described by Association of Official Analytical Chemists, AOAC (1990) and Pearson's chemical analysis of food (Egan *et al.*, 1981). The minerals (Phosphorus, Calcium and Magnesium) were determined by Atomic Absorption Spectrophotometer (Perkin-Elmer, 1976).

**Statistical analysis:** The data obtained from the study were subjected to analysis of variance using GenStat (2007) Release 7.2.

## RESULTS AND DISCUSSION

Milk yield and composition during the two seasons (wet and dry) are presented in Table 1.

There was significant effect of season on calcium ( $p < 0.01$ ) which shows that the result obtained for calcium was lower in the dry season. Milk yield, there was significant difference at ( $p < 0.001$ ) as affected by season.

**Milk yield:** It was observed that the milk yield is higher in the wet season, there was a significant difference ( $p < 0.001$ ) this may be due to the availability of forages in the wet season, it may be a better time for milking, since this is also a season when there is food scarcity in rural areas.

**Milk fat:** Fat showed significant difference ( $p < 0.001$ ) between the two seasons. The values obtained were similar to the values 5.04 and 4.94 (Zahraddeen *et al.*, 2007), 5.7 (Alawa and Oji, 2008), 5.32 (Mba *et al.*, 1975), 4.30 (Sankey, 1991) 4.60 (Akinsoyinu *et al.*, 1982) and 4.75 (Ehoche and Buvanendran, 1983) reported for the Red sokoto goat. The study in (Table 1) has shown that the mean value of fat was lower in the dry season and higher in the wet season. Based on these findings the wet season is more favorable milk fat content.

**Total solid and solid non fat (SNF):** The values of solids-non-fat and total solids in this study were 11.79 and 16.58% in wet season, 13.42 and 17.86% for the dry season, respectively. These values are similar to the values, 11.4 and 17.1%, respectively obtained by Alawa and Oji (2008) but higher than the values of 10.53 and 15.83% (Mba *et al.*, 1975), 13.63 and 17.73% (Sankey, 1991). The values were higher in the dry season.

**The mineral content:** The values of calcium found in this study were 0.22 and 0.29% in dry and wet seasons, respectively. There was a significant difference in calcium caused by seasonal effects and this might relate to the better nutritional status of forage in the wet season. These values are

Table 1: Milk yield/wk  $\text{kg}^{-1}$  and milk composition (%) in wet and dry season

Parameters	Wet season (n = 20)	Dry season (n = 20)
Milk yield	3.38	2.08
Fat	5.01	4.84
Total solid	16.58	17.86
Solid non fat	11.79	13.42
Cholesterol	0.18	0.17
Calcium	0.29	0.22
Magnesium	0.15	0.14
Phosphorus	0.14	0.13

comparable to the value of 0.20% obtained by Alawa and Oji (2008). Magnesium values were 0.14 and 0.15% in dry and wet seasons, respectively and these are comparable to 0.14% obtained by Alawa and Oji (2008). The values for phosphorus were 0.13 and 0.14% in the dry and wet seasons; the influence of season was not significant.

**Cholesterol level:** Cholesterol values obtained in this study were 0.17 and 0.18% in the dry and wet seasons, respectively; research on Red Sokoto goat milk cholesterol level seems unavailable but an average of 0.14% was obtained for European goats breed (Chicama, 2009). However, in comparison with cow milk the cholesterol level in Red Sokoto goat milk obtained in this study was slightly higher than the average value 0.15% for European breeds of cattle (Chicama, 2009). An average cholesterol level in human milk (0.20%) is higher than the values for both goat and cow milk. "Low-cholesterol" means the food contains 20 mg cholesterol or less per 100 g. The AHA (2009) recommends that, average daily cholesterol intake of less than 300 mg, if you have heart disease and up to 400 mg for healthy persons.

## CONCLUSION AND RECOMMENDATION

The milk can be used to complement the fat, calcium, phosphorus, magnesium requirement of the growing children and the sick in this area. Because the composition is of good quality containing minerals and essential nutrients that are needed by the growing population. There is also a need to create awareness on nutritional value of goat milk and its consumption.

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