

# Concentration of Minerals in Milk of Cattle, Goat, and Sheep at Nasarawa, Ganjuwa Local Government, Bauchi Nigeria.

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## ABSTRACT

*Milk samples were obtained from sheep, cattle and goats in Nasarawa District of Ganjuwa Local Government Area, Bauchi State, Nigeria for analysis of their mineral contents. Atomic Absorption spectrometer (AAS) Model (210/211VGP Buck scientific) was used to determine the concentration of various mineral contents of the milk. These parameters were considered Zn, Mn, Cu, Fe, Ca, Na and K were calculated in mg/kg. The following concentrations were obtained for the three animals (Sheep, Cattle and Goats). Zn ( $2.83 \pm 0.024$ ,  $1.74 \pm 0.034$  and  $1.87 \pm 0.039$ ), Mn ( $0.83 \pm 0.011$ ,  $1.02 \pm 0.044$  and  $0.93 \pm 0.082$ ), Cu ( $0.55 \pm 0.012$ ,  $1.45 \pm 0.053$  and  $0.45 \pm 0.029$ ), Fe ( $4.20 \pm 0.27$ ,  $3.54 \pm 0.068$  and  $4.11 \pm 0.037$ ), Ca ( $619.65 \pm 2.23$ ,  $535.63 \pm 6.77$ , and  $625.64 \pm 40.74$ ), Na ( $83.69 \pm 0.79$ ,  $80.69 \pm 0.49$  and  $92.7 \pm 2.51$ ) and K ( $89.62 \pm 1.12$ ,  $85.92 \pm 0.46$ , and  $88.15 \pm 2.07$ ) respectively. From the study carried out at two the different farms it showed that sheep had highest content of Zn,  $2.83 \pm 0.024$  mgkg<sup>-1</sup> followed by goats with  $1.87 \pm 0.039$  mgkg<sup>-1</sup> while cattle had the least contents of  $1.74 \pm 0.034$  mgkg<sup>-1</sup>. Sheep had the highest concentrations of most of the minerals investigated, followed by goats while cattle had the least of some minerals. While Mn and Cu were higher in Cattle and goats had the highest concentrations of Na.*

**KEYWORDS:** Milk Minerals, AAS, Sheep, Cattle, goat, Nasarawa.

## Introduction

Milk is a natural secretion of Mammary glands which plays a fundamental role in nutrition, growth, development and immunity (Woo et al,

1995). The milk of mammalian species is a unique in composition and nutritional value (Kaloaka et al, 1991). Milk and milk products are important component in human food, since milk is one of the primary sources of nutrient in diet for growth of children (Keiran et al, 2004 ). Milks are excellent sources of Calcium, Vitamin D, Ribo flavin, and phosphorus and good source of protein, Potassium, Vitamin A, Vitamin B-12 and niacin,. Milk and milk products supply some minerals like Mg, Ca, K. that were identified as the most needed in children's diet (Dietary guide lines for Americans). In Poland, most available milk is obtained from Cows, but some small quantities originate from goats (Barlowska et al, 2013) showed that goat milk is more valuable source of Calcium, Potassium, Iron, Copper, and Manganese than cow milk. Studies by other authors confirmed this observation having detected more Magnesium and Zinc in goat milk than Cow milk (Belewu, Aiyegbusi, (2002), Soliman, (2005), Park et al, (2007), Ceballos et al, (2009), Zamberlin et al, (2012)) . Thus goat milk can be alternative source of calcium as well as other elements.

Nevertheless, the chemical composition of milk, including the content of macro- and micro elements is not constant, it depends on a variety of environmental, genetic and physiological factors (Dankwo, Pikul, 2011). The mineral content of milk of animals raised under dry and parched conditions, such as Bauchi is haphazardly documented in Archive. In this study the mineral contents obtained from cattle, goat, and sheep raised in two farms are studied.

## Material and Method

This study was carried out in August 2016 at Nasarawa District of Ganjuwa Local government Area of Bauchi State, Nigeria. It lies between longitude N10°27.632S and latitude E009 94.979W.

Milk samples were collected from three (3) different animals (Cattles, goats and Sheep) at different sampling sites. A total of nine samples were obtained for the determination of their mineral contents in accordance with the method described Vidovic et al, (2005) with minor modifications. 10 ML of the milk sample was mixed with 5 ML of concentrated nitric acid and allowed to sediment. After about 3 hours it was evaporated to dryness. The residue was transferred to muffle furnace and heated to white ash at 450°C for 12hours. After mineralization, 5 ml of 10 % HCl was mixed with the white ash residue, the mixture was heated and the solution was filtered into 25 ml volumetric flask and made up to volume using deionized water. The milk samples were screened for its mineral contents with Atomic Absorption Spectrophotometer (A.A.S. model 210/211 VGP Buck scientific)

## Results and Discussion

From the study carried out at the two different farms, table 1 showed that sheep had highest content of Zn,  $2.83 \pm 0.024 \text{ mgkg}^{-1}$  followed by goats with  $1.87 \pm 0.039 \text{ mgkg}^{-1}$  while cattle had the least contents of  $1.74 \pm 0.034 \text{ mgkg}^{-1}$ . From the general observation made in table 1, sheep had the highest concentrations of most of the elements investigated, followed by goats while cattle had the least of same minerals. This assertion agreed with Barlowska *et al.*, (2003) which demonstrated that goat milk is a more valuable source of Calcium, potassium, Iron, Copper and Manganese than Cow milk (Al-wabel, 2008). While Mn and Cu were higher in Cattle and goats had the most concentrations of Na. This again agreed with the arguments of Belew, Aiyegbusi, (2002) and Soliman, (2005).

The availability of minerals in milk is important to its nutritional quality and the development of newborn babies. Phosphorus and Calcium are the major constituent of milk and required by the growing neonate for bone growth and development. The concentration of Iron in milk is naturally, low and it is bound to lactoferrin, transferrin, Xanthine Oxidase and is essential in some other caseins. Fe is an important constituent for transport of hemoglobin. Zinc, Manganese and Copper are major component in many tissue enzymes needed by the body (Underwood, 1981).

There are numerous factors that account for the concentration of minerals in milk. Toni, *et al.*, (1999) reported that concentration ranges of certain health related element in milk were closely dependent upon animal types, feeding time of the year, sample collection, environmental conditions manufacturing processes. Of

importance is the quantity of the minerals in the feed, Calcium and Zinc were specially affected by diet, DellOrto, *et al*, (2000) showed that the concentration of calcium and Zinc are significantly higher in milk of cow receiving diets high in both minerals. Toxic metals in milk such as cadmium, is caused by polluted environment. These generate negative impact and accumulate in milk and other foods (Vidovic et al,2005).

**Table 1:** Mean and standard deviation of concentration of milk in cattle, goats and sheep at Nasarawa

Parameters (mg/kg)	Sheep	Cattle	Goats
Zn	2.83±0.024	1.74± 0.034	1.87± 0.039
Mn	0.83± 0.011	1.02± 0.044	0.93± 0.082
Cu	0.55± 0.012	1.45± 0.053	0.45± 0.029
Fe	4.20± 0.270	3.54± 0.068	4.11± 0.037
Ca	619.65 ± 2.23	535.63± 6.77	625.64± 40.74
K	89.62± 1.12	85.92± 0.46	88.15± 2.07
Na	83.69± 0.79	80.69 ± 0.49	92.7± 2.51

### Conclusion

From the study carried out at the two different farms it showed that sheep had highest content of Zn, 2.83±0.024 mgkg<sup>-1</sup> followed by goats with 1.87± 0.039 mgkg<sup>-1</sup> while cattle had the least contents of 1.74± 0.034 mgkg<sup>-1</sup>. From the general observation made sheep had the highest concentrations of most of the minerals investigated followed by goats while cattle had the least of some minerals. This assertion agreed with Barlowska *et al.*, (2003) which demonstrated that goat milk is a more valuable source of Calcium, potassium, Iron, Copper and Manganese than Cow milk (Al-wabel, 2008). While Mn and Cu were higher in Cattle and goats had the most concentrations of Na. This again agreed with the arguments of Belew, Aiyegbusi, (2002) and Soliman, (2005).

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