Concentration of Minerals in Milk of Cattle, Goat, and Sheep At Abubakar Tafawa Balewa University Teaching and Research Farms Bauchi, Nigeria

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ABSTRACT

Milk samples were obtained from two different farms, from sheep, cattle and goats 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. The mean and standard deviation of the concentrations of Zn, Mn, Cu, Fe, Ca, Na and K were calculated in mg/kg. At Abubakar Tafawa Balewa University (ATBU) Research farms, the following ranges of concentrations were obtained for three animals (Sheep, Cattle and Goats). Zn (2.61± 0.03, 1.37± 0.03 and 1.62± 0.04), Mn (2.11± 0.70, 0.83± 0.01 and 0.62± 0.00), Cu (0.47±0.03, 1.10±0.03 and 0.35±0.01), Fe (3.83±0.07, 2.85±0.03 and 3.49±0.02), Ca (501.63±37.90, 427.10±5.01 and 488.33±5.13), Na (74.47±0.22, 71.57±0.05 and 80.45±0.90) and K (85.71±0.21, 80.85±0.61 and 83.61±1.00) while ATBU Teaching farms recorded Zn (2.58±0.04, 1.39±.03 and 1.64±0.04), Mn (0.70±0.05, 0.82±0.00 and 0.64±0.00), Cu (0.52±0.01, 1.08±0.00 and 0.35±0.05), Fe (3.82±0.01, 2.82±0.03 and 3.48±0.02), Ca (539.61±1.50, 431.77±3.16, and 486.47±6.86), Na (74.83±0.46, 71.60±0.21 and 81.16±0.13) and K (86.26±0.12, 80.74±0.05, and 83.41±0.70) respectively. Adequate care was taken to ensure that the milk samples were free from contamination.

KEYWORDS: - *Milk Minerals, AAS, Sheep, Cattle, goat, ATBU Teaching farms and ATBU Research farms.*

INTRODUCTION

Milk is a natural secretion of Mammalian glands which plays fundamental role in nutrition, growth, development and immunity (Woo et al, 1995). The milk of mammalian species is unique in composition and nutritional value (Kaloaka et al, 1991). Milk and milk products are important components of human food, since milk is one of the primary sources of nutrient in diets for growth of children (Keiran et al, 2004). Milks are excellent sources of Calcium, Vitamin D, Rivo flavin,

and phosphorus and good source of protein, Potassium, Vitamin A, Vitamin B-12 and niacin. Milk and milk products supply three numerous minerals (Mg, Ca and K) that were identified as those most needed in children's diet (Dietry guide lines for Americans). In Poland, most available milk is obtained from Cows, but some small quantities originate from goats (Barlowska et, al, 2013), demonstrated that goat milk is more valuable source of Calcium, Potassium, Iron, Copper, and Manganese than cow milk. Studies by other authors confirm this observation having detected more Magnesium and Zinc 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 hapharzly 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 2014 at Abubakar Tafawa Balewa University Teaching and Research farms in Yelwa and Gubi towns respectively. The permanent site lies between latitude N10^{o}20′38.6″ and longitude E09^{o}53′9″ while the temporary site of the University lies between latitude N10^{o}21′42.1″ and longitude E9^{o}54′31.2″. The permanent site of University shares a common boundary with Firo district of Ganjuwa Local Government Area of Bauchi State, Nigeria.

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 their mineral contents in accordance with the method described by Vidovic et al, (2005) with minor modifications. 10 ML of the sample was used for the analysis. 5 ML of concentrated nitric acid was added and the suspension was evaporated to dryness. The dish was then transferred to muffle furnace and heated to white ash at 450^{o}C for 12hours. After mineralization, 5 ml of 10 % HCl was added. The mixture was heated and the solution filtered to 25 ml volumetric flask and made up to volume using deionized water. Analysis of trace elements in the samples was carried out with Atomic Absorption Spectrophotometer (A.A.S. model 210/211 VGP Buck scientific).

RESULTS AND DISCUSSION

From the study carried out at two different farms, table 1 showed that sheep had highest content of Zn, 2.61±0.03mgkg^{-1} followed by goats with 1.62±0.04mgkg^{-1} while cattle had the least contents of 1.37±0.03 mgkg^{-1}. From the general observation made in table 1, sheep had the highest concentrations of most of the minerals or elements investigated followed by goats while cattle had the least. The findings of this research agreed with Barlowska et, al. (2003) which demonstrated goat milk is a more valuable source of Calcium, potassium, Iron, Copper and Manganese than Cow milk (Al-wabel, 2008). From table 2 the concentrations of Zn, Fe, Ca and K in mgkg^{-1} for sheep were highest. While Mn and Cu were higher in cattle and goats had the most concentrations of Na. This again agreed with the arguments of Belewu, Aiyegbusi, (2002) and Soliman, (2005).

Based on the investigation carried out in these farms on minerals composition of milk cattle, goat and sheep, it was observed that there were no significance difference between the milk sampled from Abubakar Tafawa Balewa University Teaching farms and that of Research farm respectively at 95% confidence limit p – value of 0.05.

The availability of minerals in milk is important to its nutritional quality for the

development of newborn babies. Phosphorus and Calcium are the major constituent of milk required by the growing neonate for bone 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. It is imperative for transport of oxygen by heamoglobin. 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 elements in milk were closely dependent upon animal types and feeding time of the year, sample collection and environmental conditions and 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 were significantly higher in milk of cow. Toxic minerals like Cadmium and Lead in milk are as a result of 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 Abubakar Tafawa Balewa University Teaching Farm from August – September 2014.

Parameters (mg/kg)	Sheep	Cattle	Goats
Zn	2.61±0.03	1.37±0.03	1.62±0.04
Mn	2.11±0.70	0.83±0.01	0.62±0.00
Cu	0.47±0.03	1.10±0.03	0.35±0.01
Fe	3.83±0.07	2.85±0.03	3.49±0.02
Ca	501.63±37.70	427.10±5.01	488.33±5.13
Na	74.47±0.22	71.57±0.05	80.45±0.90
K	85.71±0.21	80.85±0.61	83.61±1.00

Table 2: Mean and standard deviation of concentration of milk in cattle, goats and sheep at Abubakar Tafawa Balewa University Research Farm from August – September 2014.

Parameters (mg/kg)	Sheep	Cattle	Goats
Zn	2.58±0.04	1.39±0.03	1.64±0.04
Mn	0.70±0.05	0.82±0.00	0.64±0.00
Cu	0.52±0.01	1.08±0.00	0.35±0.05
Fe	3.82±0.01	2.82±0.03	3.48±0.02
Ca	539.61±1.50	431.77±3.16	486.47±6.68
Na	74.83±0.46	71.60±0.21	81.16±0.13
K	86.26±0.12	80.74±0.05	83.41±0.70

CONCLUSSION

The study carried out on the Concentration of Minerals in Milk of Cattle, Goat, and Sheep at Abubakar Tafawa Balewa University Teaching and Research Farms, Bauchi, Nigeria showed that all the indices analysed were found to be within permissible limits and in agreement with previous work. From table 1, sheep had the highest concentrations of most of the minerals investigated followed by goats while cattle had the least of these minerals agreeing with Barlowska et, al. (2003) and Al-Wabel, (2008). In table 2, sheep had the highest concentrations of

most of the minerals or elements investigated followed by goats while cattle had the least of same minerals agreeing with the arguments of Belewu, Aiyegbusi, (2002) and Soliman, (2005).

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