Concentration of Minerals in Milk of Cattle, Goat, and Sheep At Yelwa and Gangu Farms Bauchi Nigeria

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Abstract

Milk samples were obtained from different farms, from Sheep, Cattle and Goats for analysis of their mineral contents. Atomic Absorption Spectrophotometer (AAS) model (210/211VGP Buck Scientific) was used to determine the concentration of various mineral contents of the milk. The mean and standard deviation concentrations of Zn, Mn, Cu, Fe, Ca, Na and K were obtained in mg/kg. At Gangu farms, the following mineral concentrations were obtained from three (3) Animals (Sheep, Cattle and Goats). Zn (2.68±0.04, 1.744±0.041, 1.85±0.14), Mn (0.80±0.43, 1.011±0.045, 0.92±0.06), Cu (0.53±0.03, 1.472±0.033, 0.76±1.32), Fe (3.64±0.12, 3.586±0.063, 3.87±0.35), Ca (615.2±7.69, 540.36±5.733, 609.88±51.90), Na (81.74±2.17, 80.72±0.543, 90.33±2.60), K (88.2±0.84, 86.03±0.555, 89.45±1.64) While Yelwa farms recorded Zn (2.69±0.34, 1.81±0.07, 1.92±0.02), Mn (0.85±0.085, 1.03±0.019, 0.98±0.001), Cu (0.54±0.047, 1.48±0.041, 0.48±0.042) Fe (4.19±0.27, 3.57±0.0719, 3.80±0.43), Ca (624.58±12.58, 543.73±8.91, 649.87±4.78), K (84.73±2.66, 81.23±0.38, 91.70±1.63), Na (89.98±0.72, 85.32±0.44, 107.23±40.85) respectively. From the concentrations of these elements, it was found statistically that milk contained high amount of Calcium, potassium and sodium. Adequate care was taken to ensure that the milk samples were free from contamination.

KEYWORDS: Milk, Minerals, Concentration, Atomic Absorption Spectrophotometer, Standard Deviation, sheep, Cattle, Goats, Gangu, Yelwa.

Introduction

Milk is an opaque white fluid rich in fat and protein, secreted by female mammals for the nourishment of their young [1]. The milk and milk products of different ruminant species

comprise a food of outstanding importance for human nutrition throughout their lives. Milk can be considered a source of macro and micronutrients including the mineral elements and also contains a number of active compounds that play a significant role in both nutrition and health protection [2]. The concentration of minerals in milk varies in different countries and is affected mainly by factors such as the growing conditions of feed, soil, type of fertilizer and irrigation water as well as the type of processing used which affects the pH and the use of metal containers [3]. Minerals at nutritional standard concentrations in foodstuffs are necessary for human health; however when these nutritional values are low or exceed the permissible limit they are likely to cause diseases [3]. The dietary guidelines for Americans showed that milk is an excellent source of calcium, Vitamin D, B-12. Milk and milk products supply three numerous minerals (Mg, Ca, K) which are the most needed in children diet. Though the aim of this work is to determine the concentrations of some macro and micro elements that play a fundamental role in nutrition, growth development and immunity to human life, however some of these elements if present in high amount can be toxic to human life. Trace metals in cattle milk are of interest because of their essential importance. For instance, Chromium and Manganese are essential but may become toxic at higher levels while lead and cadmium are toxic and can be cumulative [5]. In this study the mineral contents of milk obtained from sheep, cattle and goats raised under hot and dry condition from two farms in Bauchi, Nigeria is reported.

2.0 Materials and Method

2.1 Sample Collection

The method of Vidoric *et'al* (2005) was adopted in sampling for this study. Milk samples were collected from Sheep, Cattle and Goats in a sterilized closed cap bottle respectively.

2.2 Method

Milk samples were collected in July – August 2016 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 was used. 5 ML of concentrated nitric acid were added and 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 were added. The mixture was heated and the solution was filtered to 25 ml in volumetric flask and made up to volume using deionized water. Analysis of trace elements in the samples were carried out with Atomic Absorption Spectrophotometer (A.A.S. model 210/211 VGP Buck scientific).

Result and Discussion

From the study carried out at Gangu and Yelwa farms, tables 1 and 2 shows that Sheep had the highest concentration of Zn; 2.68±0.04mgkg^{-1} and 6.69±0.34mgkg^{-1} while goats had 1.85±0.14mgkg^{-1} and 1.92±0.02mgkg$^{-1,}$ Cattle had the least contents with 1.744±0.041mgkg^{-1} and 1.81±0.07mgkg^{-1} respectively. From the general observation made from tables 1 and 2, goats had the highest contents of most of the elements investigated, followed by Sheep and Cattle. This assertion agrees with Barlowska *et'al* (2003) which indicated that goat milk is a more valuable source of Ca, K, Fe, Cu and Mn than Cow milk [1]. Mn and Cu were higher in Cattle, Goats had the most concentration of Na; this again agreed the work of (Belewu *etal.*, 2002).

The availability of minerals in milk is important in the diets of both man and animals. Phosphorus and Calcium are the major constituents of milk and are 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. It is imperative for transport of oxygen by heamoglobin. Zinc, Manganese and Copper are major component in many tissue enzymes needed by the body [10].

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 are closely dependent upon animal types and feeding time of year sample collection, environmental conditions and manufacturing process. Of importance is the quantity of the minerals in the feed, Calcium and Zinc were specially affected by diet [7] showed that the concentration of calcium and Zinc were significantly higher in milk of cow receiving diets high in these minerals. Toxic minerals in milk such as cadmium are as well affected by polluted environment. These generate negative impact and accumulate in milk and other foods [8].

Table 1: Mean and Standard deviation of concentration of milk in Cattle, Goats and Sheep at Gangu Ganjuwa in July – August 2016.

Parameters (mg/kg)	Sheep	Cattle	Goats
Zn	2.68± 0.04	1.744± 0.041	1.85±0.14
Mn	0.8 0±0.43	1.011± 0.045	0.92±0.06
Cu	0.53± 0.03	1.472± 0.033	0.76±1.32
Fe	3.64± 0.12	3.587± 0.063	3.87±0.35
Ca	615.2± 7.69	540.36± 5.733	609.88±51.90
Na	81.74± 2.17	80.72± 0.543	90.33±2.60
K	88.2± 0.84	86.031± 0.555	89.45±1.64

Table 2: Mean and Standard deviation of concentration of milk in Cattle, Goats and Sheep at Yelwa in July – August 2016.

Parameters(mg/kg)	Sheep	Cattle	Goats
Zn	2.69±034	1.81±0.07	1.92±0.02
Mn	0.85±0.085	1.03±0.019	0.98±0.001
Cu	0.54±0.047	1.48±0.041	0.48±0.042
Fe	4.19±0.27	3.57±0.0719	3.80±0.43
Ca	624.58±12.58	543.73±8.91	649.87±4.78
K	84.73±2.66	81.23± 0.38	91.70±1.63
Na	89.98±0.72	85.32±2.044	107.23±40.85

Conclusion

The study carried out on the Concentrations of Minerals in Milk of Cattle, Goat, and Sheep at Gangu and Yelwa farms, Bauchi State, Nigeria showed that all the indices analyzed were found to be within permissible limits and the samples were of higher nutritional quality and in agreement with previous work.

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