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

[1]Gin,N.S.,[2] Buteh,D.S.,[1]Daniel,S. [3]Muhammad, M.[3]Miri,S.H.
[1]Department of Science Laboratory Technology
Abubakar Tatari Ali Polytechnic,Bauchi, P.M.B.0094,Bauchi,Nigeria.
[2] Department of Integrated Science / Mathematics Adamu Tafawa Balewa College of Education Kangere Bauchi, Nigeria
[3]Abubakar Tafawa Balewa University Bauchi.
***Corresponding Author: ngsambo@yahoo.com; +2348036179773, +2348025712379**

ABSTRACT

Several milk samples were collected from three different animals cattle, goats and sheep for their mineral contents determination in September 2015. The milk sampling was carried out at Abubakar Tafawa Balewa University (ATBU) Teaching and Research farms Bauchi, Nigeria. The mineral contents of the milk samples were determined with Atomic Absorption Spectrophotometer (AAS Model 210/211). The samples obtained from the three animals under investigation showed variations in mineral contents. Sheep had 621.45 ± 2.52 mg/kg, cattle 534.14 ± 6.98mg/kg and goat 488.33 ± 40.34mg/kg for calcium as the highest mineral contents at ATBU teaching farm While from ATBU research farm, sheep had 619.67± 4.17 mg/kg, cattle 539.56 ± 6.98 mglkg and goat 633.51 ± 32.50 mg/kg respectively. It was observed from the prevailing results that ATBU research farm had the highest mineral contents in the milk samples analyzed.

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

INTRODUCTION

Milk a natural secretion of Mammalian glands plays fundamental role in nutrition, growth, development and immunity in recent time has become a food of particular interest both in terms of its nutritional value and its effect on health (Ajai et al 2012, Hozyasz and Slowik 2013, Monika et al 2013, Woo et al, 1995). It is considered a source of macro- and micronutrients. It also contains mineral elements and a number of active compounds. In cattle, goat and sheep milk, it plays a significant role in both nutrition and health protection (Michlova et al 2016, Gajewska et al 1997, Park et al 2007).

Milk products are important component in human food, since milk is one of the primary sources

of nutrients in diet for growth of children (Keiran *et al*, 2004). Milk is an excellent source of Calcium, Vitamin D, Rivo flavin, phosphorus and good source of protein, Potassium, Vitamin A, Vitamin B-12 and niacin. Milk products also supply three essential elements like,Mg, Ca and K that are identified as those needed in children's diet (Dietary guide lines for Americans).
According to Monika *et al* 2013, in Poland milk is mostly obtained from Cattle, but small quantities come from goats. Barlowska et, al, 2013 demonstrated that goat milk is a more valuable source of Calcium, Potassium, Iron, Copper, and Manganese than cow milk (Monika et al 2013). Studies by other authors confirmed this observation. 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).
In recent decades, the significance of milk eg goats as an important nutritional factor for human health has been noticed, since goat milk has been found to possess excellent properties that distinguish it from cattle milk and makes it a crucial alternative (Turker, 2013). 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 at Abubakar Tafawa Balewa University Teaching and Research farms in Yelwa and Gubi. Yelwa farm lies between latitude N10^{o}20′38.6″ and longitude E09^{o}53′9″ while Gubi farm is situated between latitude N10^{o}21′42.1″ and longitude E9^{o}54′31.2″. The permanent site of the University shares a common boundary with Firo district of Ganjuwa Local Government Area of Bauchi State.

Milk samples were collected from three (3) different animals (Cattle, goats and Sheep) at different sampling sites. A total of nine samples were obtained for their mineral contents determination in accordance with the method described by Vidovic et al, (2005) with modifications. 10 ml of milk sample was used for the analysis. 5ml of concentrated nitric acid was added to the milk sample and evaporated to dryness. The dish containing the sample was transferred to muffle furnace and heated to white ash at 450^{o}C for 12hours. After mineralization, 5 ml of 10 % HCl was added to the mixture. The mixture was heated and the solution was filtered to 25 ml volumetric flask and made up to volume using demonized water. Analysis of the mineral composition of the samples was carried out with Atomic Absorption Spectrophotometer (A.A.S. model 210/211 VGP Buck Scientifics).

RESULTS AND DISCUSSION

Table 1: Mean and standard deviation of concentration of milk in cattle, goats and sheep at Abubakar Tafawa Balewa University Teaching Farm in September 2015.

Parameters (mg/kg)	Sheep	Cattle	Goats
Zn	2.84±0.02	1.74±0.04	1.87±0.04
Mn	0.84±0.08	1.03±0.05	0.93±0.07
Cu	0.56±0.04	1.45±0.04	0.45±0.03
Fe	4.25±0.22	3.53±0.06	4.14±0.34
Ca	621.45±2.52	534.14±6.98	488.33±40.34

Na	83.41±0.93	81.04±0.57	89.47±3.07
K	90.40±0.38	85.93±0.69	88.65±1.72

Table 2: Mean and standard deviation of concentration of milk in cattle, goats and sheep at Abubakar Tafawa Balewa University Research Farm in September 2015.

Parameters (mg/kg)	**Sheep**	**Cattle**	**Goats**
Zn	2.86±0.03	1.75±0.03	1.89±0.04
Mn	0.83±0.02	1.02±0.04	0.98±0.06
Cu	0.56±0.03	1.46±0.05	0.46±0.04
Fe	4.30±0.06	3.56±0.06	3.83±0.32
Ca	619.67±4.17	539.56±6.98	633.51±32.50
Na	83.62±0.96	80.71±0.50	91.38±2.22
K	90.09±1.13	85.93±0.54	89.74±0.84

From the study carried out at the two different farms, table 1 above showed that sheep had the highest contents of Zn, 2.84±0.02mgkg^{-1} followed by goats with 1.87±0.04mgkg^{-1} while cattle had the least contents of 1.37±0.03 mgkg^{-1}. For Mn, cattle had the highest content, 1.03±0.05 mgkg^{-1} followed by goats with 0.93±0.07mgkg^{-1} while sheep had the least contents of 0.84±0.08 mgkg^{-1}. For Cu cattle had the highest content, 1.45±0.04 mgkg^{-1} followed by sheep with 0.56±0.04mgkg^{-1} while goats had the least contents of 0.45±0.03 mgkg^{-1}. For Fe, sheep had the highest content, 4.25±0.22 mgkg^{-1} followed by goats with 4.14±0.34 mgkg^{-1} while cattle had the least contents of 3.53±0.06 mgkg^{-1}. For Ca, sheep had the highest content, 621.45±2.25 mgkg^{-1} followed by cattle with 534.14±6.98mgkg^{-1} while goats had the least contents of 488.33±40.35 mgkg^{-1}. For Na, goats had the highest content, 89.47±3.07 mgkg^{-1} followed by sheep with 83.41±0.93mgkg^{-1} while cattle had the least contents of 81.04±0.57 mgkg^{-1} and for K; sheep had the highest content, 90.40±0.38 mgkg^{-1} followed by goats with 88.65±1.72mgkg^{-1} while cattle had the least contents of 85.93±0.69 mgkg^{-1}.

Table 2 above showed that sheep had highest content of Zn, 2.86±0.03mgkg^{-1} followed by goats with 1.89±0.04mgkg^{-1} while cattle had the least contents of 1.75±0.03 mgkg^{-1}. For Mn, cattle had the highest content, 1.02±0.04 mgkg^{-1} followed by goats with 0.98±0.06mgkg^{-1} while sheep had the least contents of 0.83±0.02 mgkg^{-1}. For Cu cattle had the highest content, 1.46±0.05 mgkg^{-1} followed by sheep with 0.56±0.03mgkg^{-1} while goats had the least contents of 0.46±0.04 mgkg^{-1}. For Fe, sheep had the highest content, 4.30±0.06 mgkg^{-1} followed by goats with 3.83±0.03 mgkg^{-1} while cattle had the least contents of 3.56±0.06 mgkg^{-1}. For Ca, goats had the highest content, 633.51±32.50 mgkg^{-1} followed by sheep with 619.67±4.17 mgkg^{-1} while cattle had the least contents of 539.56±6.98 mgkg^{-1}. For Na, goats had the highest content, 91.38±2.22 mgkg^{-1} followed by sheep with 83.62±0.96mgkg^{-1} while cattle had the least contents of 80.71±0.50 mgkg^{-1} and for K, sheep had the highest content, 90.09±1.13 mgkg^{-1} followed by goats with 89.74±0.84mgkg^{-1} while cattle had the least contents of 85.93±0.54 mgkg^{-1}.

From table 1 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. And from

table 2 the concentration Zn, Fe and K in $mgkg^{-1}$ for sheep were highest. While Mn and Cu were higher in cattle and goats had higher concentrations of Ca and Na. The two tables agreed with the arguments of Belewu, Aiyegbusi, (2002) and Soliman, (2005). This result also agreed with Barlowska et. al. (2003) which indicated that goat milk is a more valuable source of Calcium, potassium, Iron, Copper and Manganese than Cow milk (Al-wabel, 2008).

The availability of minerals in milk is important to its nutritional quality in the development of newborn babies all over the world. The major constituent of milk required by the growing neonate for bone growth and development are Phosphorus and Calcium. 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 required 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, environmental conditions and manufacturing process. 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 cattle receiving diets high in both minerals. Toxic minerals in milk such as cadmium is also affected by polluted environment. These generate negative impact and accumulate in milk and other foods (Vidovic et al, 2005).

CONCLUSION

The study carried out on the minerals contents in Milk of Cattle, Goat, and Sheep at Abubakar Tafawa Balewa University Teaching and Research Farms, Bauchi Nigeria showed that all the minerals analysed were found to be within permissible limits and in agreement with previous works. From both table 1 and 2, sheep had the highest content of most of the minerals investigated followed by cattle while goats had the least of some of the minerals which agree with Barlowska et, al. (2003), Al-Wabel, (2008), Belewu, A. (2002) and Soliman, 2005.

REFERENCE

1. Ajai, A. I., Ochigbo, S. S., Ndamitso, M. M. and Olaoluwajuwon, J. Proximate and Mineral Compositions of Different Raw Cow's Milks in Minna. Scholars Research Library. European Journal of Applied Engineering and Scientific Research. 2012. 1(1) :23-29.
2. Woo, R.U., Daniel, K. R. and House, E. S. Annual Revision Nutrition 1995: 5:411-418.
3. Hozyasz, K. K. and Slowik, M. (2013). Alternatives to standard cow milk: pros and cons. Prz. Gastroenterol., 8(2): 98-107. (in Polish)
4. Karaoka, K., Nakae, T. and Imamura, T. Japan Journal of Dairying Science, 1991, 20:222-232.
5. Turker, G., Kizilkaya, B. and Cevik, N. The mineral composition of kefir produced from goat and cow milk. Journal of food. Agriculture and Environment Vol.11 (2): 62-65. 2013.
6. Park, T. W., Juarez, M., Ramos, M. and Haenlein, G. F. W. (2007). Physic-chemical characteristics of goat and sheep milk. Small Ruminant Res., 68(1-2): 88-113.

7. Michlova, T., Hejtmankova, A., Drogounava, H. and Hornickova, S. The content of minerals in milk of small ruminants. Agronomy Research 14(S2). 1407-1418. 2016.
8. Dietery guidelines for Americans U. S. Department of Agriculture. www.healthoerus.gooldiety guidelines.org 2005, 6th Edt.
9. Barlowska, J., Wolanciuk, A., Kedzierska-matysek, M., Litwinczuk, Z. 2013. Effect of production season on the basic chemical composition and constituent of macro-and micro elements in coward goat milk. Zywn.Nauk.Technol.Jakosc, 6(91):69-78(in Polish).
10. Belewu, M. A., Aiyegbusi, O. F., (2002). Comparison of the mineral content and apparent biological value of milk from human, cow and goat. Journal of food Tech.Af. 7(1):9-11.
11. Vidovic, M., Sadibasic, A., Cupic, S., and Lausevic, M. (2005). Cd and Zn in atmospheric deposit, soil, wheat and milk environment. Res., 97:26-31.
12. Underwood, E. J. 1981. The mineral Nutrition of livestock 2nd Ed common wealth Agricultural Bureaux, farnham Royal, Slough, England,ISBN:100851995578.
13. Toni, E., Bocca, B., and Carolis. 1999. Minor and trace element content of two typical Italian sheep dairy products. Journal of Dairy research 66:589-598.
14. Dell'Ortivo, V., Cattaneo, E., Berrata, A., and Savoini, E.G.2000. Effects of trace element supplementation on milk yield composition in camels. Int. Dairy Journal,10: 873-879.
15. Al-Wabel, N. A., (2008). Mineral contents of milk of cattle, camels, goat and sheep in central region of Saudi Arabia. Asian Journal of Biochemistry 3(6): 373-375, 2008. ISBN: 1815-99232068 Academic J.