www.roavs.com EISSN: 2223-0343
RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES

Trace minerals profile in wild pasture and in the blood serum of camel in Butana region

Ayman Balla Mustafa[1] Abdelrahim A. Sayied[2] and Khadiga A.A. Atti[3]

[1,2]University of Bahri, P.O. Box: 12327, code 11111 Khartoum, Sudan; [3]Departments of Animal Nutrition, Faculty of Animal Production, University of Khartoum, Postal Code 13314 Khartoum North, Sudan

Abstract

This study was performed to assess some important trace minerals concentrations in the wild grasses of Butana range. Determination the levels of trace minerals in the blood serum of the camel that grazed in same area was also performed. Samples of mixed grasses were collected from natural pasture and serum samples obtained from preslaughtered camels. Atomic Absorption Spectrophotometer was used for analyzing samples. Results showed that trace minerals levels were variable in mixed grasses; Iron level was found 770.7±299.7 mg/kg, copper level 8.62±1.2 mg/kg and zinc level was 19.73±1.7 mg/kg. Accordingly, mixed grasses contained considerable amount of iron. Furthermore, iron, copper and zinc level in serum was 169.3±209.9 µg/dl, 60.74±20.6 µg/dl and 24.5±15.8 µg/dl respectively. These results revealed that camel serum of Butana area was exhibited adequate level of iron, whereas, copper was present within normal level. These results indicated consequence and bioavailability of copper status in grasses of pasture. While camel serum contained low level of zinc, coincided with its level in grasses. Trace minerals of the camel serum in the present study were within the safety levels for camel health, as well as, within the appropriate limits in wild grasses.

Keywords: Butana; camel; pasture; trace minerals; serum

To cite this article: Mustafa AB, AA Sayied and KAA Atti, 2012. Trace minerals profile in wild pasture and in the blood serum of camel in Butana Region. Res. Opin. Anim. Vet. Sci., 2(5), 329-333.

Introduction

Camel (*Camelus dromedarius*) is a very important animal because it is providing nutrient resources (meat and milk) for humans in several arid and semiarid zones of subtropical and tropical regions where it represents often the only protein source. In hostile environment, where the availability of water is scarce and ambient temperature is very high, dairy camels can provide milk almost all the year in quantities greater than other domestic animals (Farah, 1996).

Camel, like other animals must receive all the essential dietary nutrients including water, protein, carbohydrates, fat and minerals in optimal amounts. Since requirements for trace minerals have not been formulated for camels, there is a little evidence to date of clinical trace elements deficiencies in camels (Faye and Bengoumi, 1994).

Camel research in the Sudan has been focused mainly on functional anatomy, diseases and reproduction. However, research on husbandry and management systems, feeding and nutrition and production performance are scanty (Majid, 2006). Camel nutrition is based on vegetable species; they can browse in pastural land. Because of the scarce availability of local raw materials and of the high cost of transportation, it is very difficult to provide camels any supplemental food, i.e. concentrates. However, it is possible to feed camels mineral supplements, because the amount that must be fed is limited, 100-200 g/d, so that transportation is not a great problem, (Vittorio, 2001).

The physiological variations of mineral concentration in camel plasma and sometimes liver show the peculiarities of mineral metabolism include increasing of the absorption capacity, tolerance for

Corresponding author Ayman Balla Mustafa, University of Bahri, P.O. Box: 12327, code 11111 Khartoum, Sudan

minerals in excess and maintenance of enzymatic activity in deficient period (Faye et al., 2006). Blood measures are frequently used in assessment because they are significantly correlated to nutritional status of some trace minerals (Claypool et al., 1975). Where trace minerals status of animal is best described by concentrations in plasma according to Kincaid (1999).

This practice is useful because it is known that camels can undergo some mineral deficiency due to lack of certain minerals, especially trace elements. Mineral requirements of camels are not well established (Faye & Bengoumi, 1994), so it is difficult to formulate a proper mineral supplement to satisfy requirements and to avoid possible deficiencies. Moreover, camels browse in lands, where it is impossible to know the dry matter intake and plant content and availability of trace elements can vary in consequence of salt mineral content, season and vegetation state. This means that it is very difficult to know the amount of minerals that are available for the animals daily. Several authors have studied the mineral status of camels, but the results are not easy to compare because of the different physiological conditions of camels (adult, young, lactating or dry animals), of the different diets and environmental conditions. Recently, Faye and Bengoumi (1997) have reported that mineral supplementation with twice the estimated requirements of copper, zinc, cobalt and manganese increased copper levels in the blood and liver of dromedaries but did not affect zinc levels.

The main objective of the present study is to assess the iron, copper and zinc level of natural (wild) pasture in Butana area and to determine trace elements status in the serum of local camel grazing in this area by measuring the concentration of the iron, copper and zinc.

Materials and Methods

The study was carried out on herd composed of 20 matured camels held in slaughter house of Tambol town. The camels grazed in limited pasture without any supplementary feeding. Blood samples were collected in August 2006 and natural grasses were collected from the same area in the same season.

The area of study

Butana area is considered as study area, whereas, this study was conducted in most areas of Tambol town. It is located about 25 km east Rufaa city the capital of Butana region. Butana area consists of the whole region between the main Nile, the Blue Nile and the river Atbara. The climate of the area gradually changes from desert type in the north to semi-desert and savannah in the southern part. The rainfall in Butana area ranges between 100-200 mm in the northern side and increases to above 500 mm in the southern side (Ali, 2002). The geographical zone which lies approximately between latitude 14º-16º N and longitude 33º-36º E the area is surrounded by the River Atbara to east, River Nile to the west and Blue Nile to south and south west. The cracking clay soil covers most area, alternating with grass to south (Abusin, 1990).

Samples collection

Camels grazed in the natural pasture of Butana. Five samples of mixed grasses, each sample containing more than 8 varieties of annual grasses, the samples were collected from the grazing area on the basis preference of the feeding behaviour, species of animal and most frequency grasses or dominant in the pasture such as (Hantout) *Ipoboea blepharosepala*, (Tabar) *Ipomoea cardofana,* (Sharia) *Indigofera hochstetteri,* (Um assabi) *Dactyloctenium aegyptiacum*, (Taffa) *Urochloa trichopus*, (Gubbein) *Solanum dubium*, (Um Galagil) *Aristolochia bracteolate* and (Rihana) *Ocimum basilicum.* Randomly twenty samples of blood were collected from different camels and maintained in thermos flask up for laboratory analysis.

Ash was determined by Gravimetric Method (Marshal, 1993). The principle of the method is to burn away all organic matter at a temperature of 500-550 C°, dry weight of samples were weighed accurately into dry clean pre-weighed crucible. The sample was burnt in a Muffle furans set at 500–550C° for three hours and cooled. The crucible were removed and placed in a dissector to cool and then weighed.

$$Ash\% = \frac{W_r}{W_s} \times 100$$

Where, W_r is weight of ash and W_s is the weight of sample.

Mixed grasses samples were collected from natural pasture of Butana area, washed then dried completely by indirect sunlight under natural condition for two weeks, mechanically crashed and moved to burnt organic matter, determine ash content and prepare solution sample.

Serum analysis

A total of twenty serum samples were collected from mature and apparent healthy camels aged over four years at slaughter house, where these samples were obtained from camels before slaughtering and kept in test tube under frozen condition for later use. The serum sample was placed in centrifuge under 1500 rotations for 10 minutes for more accurate separation from plasma. Pure sera were carefully shifted to special sterile tube. To determine the level of trace element in blood serum special procedure was used.

In polyethylene tube, a minimum of 0.5 ml sera sample was diluted with an equal volume of 20% TCA

(Tricholoroacetic acid) solution. The tube was caped loosely, mixed and heated in water path at 90C° for 15 minutes. The solution was cooled and centrifuged at 3000 rotation for 10 minutes and pure treated sera was obtained from mixed solution and used to determinate iron level in serum, in mg/litre (ppm).

The sample of copper was diluted with an equal volume of deionised water at 1:1 ratio respectively to assess copper in ppm. The zinc sample was diluted with equal volume by deionised water to reading in ppm. After using all previous procedures concerned, contents of minerals was to be determined must be looked to divert a value. Atomic absorption apparatus in solution state was used to reveal actual value. The following equation was used:

$$Gm/100gm = \frac{r(mg/lit)\times v}{10^6 wt}\times 100$$

Where:
r: A value determined by atomic absorption in solution condition by ppm.
v: prepared volume of tested sample (100ml).
wt: weight of sample per gram.

Statistical Analysis

Because of unequal sampling and different ages of camels, it was not possible to detect means differences of trace elements between blood serum samples and mixed grass. Therefore the goal of assessment may be to estimate the mean and standard deviation of some trace minerals concentration in blood sera.

Results and Discussion

Trace minerals of pasture grasses

The dry matter content of mixed grasses in the present study is shown in Table 1 and the mean value of dry matter was 90.5±0.7, which is higher than that value reported by Nabag (2004) from the same region but the difference may be in maturity stage.

The average percent of ash content of mixed grasses in the present study is shown in Table 1. The mean value was 12.85±0.458, this result is higher than 10.49±0.76 finding by Nabag (2004), and it has been similar to the range (8-12%) of ash content of dry matter of tropical pasture reported by Bogdan (1977).

Some trace minerals levels of mixed grasses in this study have been shown in Table 1. The iron concentration mean is 770.7±299.7 mg/kg and the range between (287-1283 mg/kg) on dry matter basis (DM). Hence, this result is high compared to 283±258.1 mg/kg, 370.2±272.8 mg/kg and 569.7±271.5 mg/kg reported by Gartenbbery et al. (1990). Therefore, iron level of mixed grasses is adequate for ruminants' requirements in tropical and it is above the low critical level established by Viets and Lindsay (1973) and NRC (1984).

Copper concentration of mixed grasses in this result is 8.62±1.2 mg/kg ranged between 6.6 and 10.4 mg/kg, which is less than low critical level (10 mg/kg) reported by NRC (1984). However, the copper level determined in present study may be insufficient to satisfy animal needs unless other source of compensation is utilized. Nevertheless, the copper content of mixed grasses in present study is similar to findings demonstrated by Gartenbberg et al. (1990) of some grasses in difference regions. Copper level observed in current study has indicated deficiency of the same in pasture grasses.

Zinc concentration of grasses in this study was 19.73±1.7 mg/kg ranged between 17.97 and 22.7 mg/kg. Here all grasses zinc contents are less than low critical level of forage which should be 30 mg/kg as shown by Viets and Lindsay (1973). But the grasses zinc content values is similar to the result reported by Gartenbberg et al. (1990). Therefore, zinc level of grasses in the current study is less than camel maintenance requirements that estimated by Faye et al. (2006).

Table 1: Dry matter contents, ash contents and trace minerals (iron, copper and zinc) levels in mixed grasses

Parameter	Minimum value	Maximum value	Mean ± SD
Dry matter content (%)	90	91.8	90.5 ± 0.7
Ash content (%)	12.14	13.37	12.85 ± 0.458
Iron (mg/kg)	287.9	1283.6	770.7 ± 299.7
Copper (mg/kg)	6.6	10.40	8.62 ± 1.2
Zinc (mg/kg)	17.97	22.7	19.73 ± 1.7

Values are means of five samples of mixed grasses

Table 2: Concentration of iron, copper and zinc in blood serum of camel (µg/100ml)

parameter	Minimum value	Maximum value	Mean ± SD
Iron	16.7	432.5	169.3 ± 209.9
Copper	37.2	131.4	60.74 ± 20.63
Zinc	7.2	75.3	24.5 ± 15.8

Values are means of 20 samples of camel blood sera

Trace minerals of serum

In this study, Table 2 shows the results of iron, copper and zinc concentrations of blood serum. The mean content of iron is 169±209.9 µg/100ml (ranged between 16.7 and 432.5 µg/100 ml). The iron content of camel serum in the present study was highest than the findings of Kamal (1993).

Serum copper concentration in this study is 60.74±20.6 µg/100ml ranged between 37.2-131.4 µg/100ml. Copper concentration of serum in this study is lower than 92.6± 18 µg/100ml in adult camel in the same area (Abu Damir et al., 1983). The Serum copper

concentration observed in the current study is within the range obtained in camels raised under nomadic conditions at different locations which were 59±1.98 µg/100ml in Nuba Mountains, 70±1.14 µg/100ml in Darfur and 67±1.37 µg/100ml in Egyptian camels by Espinosa et al. (1982). Also it lies within the range (60-150µg/100ml) of camels in eastern Sudan (Abdel Rahim, 1983).

The level of serum zinc in the present study is 24.5±15.8 µg/100ml ranged between 7.2 and 75.3 µg/100ml, while the content of serum zinc was lower than the values reported by Abdel Moty et al. (1968), Abu Damir (1998) and Mona et al. (2003). Faye and Bengoumi (1994) reported that zinc level was low in serum of camels in north east areas of Africa. Camel serum appears to maintain zinc level at lower value than other ruminants due to low zinc content in natural grasses and soil. However, Mc Dwell et al. (1993) stated that tropical forages were frequently deficient in zinc and potential deficiencies in livestock were widespread. Zinc content of soil is reflected in plant, erosion of soil and desertification may affect the minerals content of soil.

Conclusion

Mixed grasses contained considerable amount of iron, which was comparable with the recommended level. At the time of collection, pasture grasses had a poor amount of copper and zinc. Therefore, both copper and zinc were less than camel maintenance requirements. The trace elements concentration differs in camel serum due to the effect of the surrounding environment (feeding plants, and grasses type) and animal absorption of these elements. The results revealed that camel serum from the Butana areas exhibited appropriate concentrations of iron. Whereas, these information are important to determine precisely the needs of this animal for minerals. Trace minerals supplementation through any way is suggested to maintain basal enzymatic activities and to avoid potential deficiencies of camels in range.

References

Abdel Moty, I.M., Mulla A. and Zafer, S.A. 1968**.** Copper, iron and zinc in serum of Egyptian farm animals. *Sudan Agriculture Journal*, 3:146-151.

Abdel Rahim, A.G. 1983**.** The relationship between the concentrations of serum copper and zinc and the activities of serum enzymes copper oxidase and alkaline phosphates of dromedary camel. *Journal of Animal Environment*, 6:265-268.

Abu Damir, H.,Tartour G.,and Adam, S.E.I. 1983. Minerals contents in livestock in eastern Sudan. *Tropical Animal Health and Production*, 15: 15-16.

Abu Damir, H. 1998. A review of mineral deficiencies, toxicities and imbalances in camel. *Soba veterinary Research*, 68(10): 1109.

Abusin, M.E. 1990. Literature survey of Baseline information and Profile of central. areas, Khartoum. UNDP, Annual Report.

Ahmed Mona, M.M., Awad, M.E. and Barri, M.E.S. 2003. Some micro minerals, J profile in the serum of female camels as affected by the physiological status. *Pakistan Journal of Biological Science*, 6(21): 1853-1855.

Ali, M.S. 2002. Some husbandry aspects of camels in the Butana Area in Eastern Sudan. M. Sc. Thesis, University of Khartoum.

Bogdan, A.V. 1977. Tropical pastures and fodder plant. Longman, London. Pp 14-16 (cited by Humphreys, LR 1991).tropical pastures utilization st. lucia, Australia. Cambridge University Press.

Claypool, D.W., Adams, F.W., Pendell, H.W, Hartman, N.A and Bone, J.F. 1975. Relation between copper level in blood plasma and liver of cattle. *Journal of Animal Science*, 41:911-914.

Espinosa, J.E., Mc Dowell, L.R., Juan, R., Loosli, J.K., Conard, J. M. and Frank, K.G. 1982. Mineral status of Llamas and sheep in the Bolivian Allipano. *Nutrition*, 122:2286-2292.

Farah, Z. 1996. Camel milk.Properties and products. St. Gallen, Switzerland: SKAT.

Faye B. and Bengoumi M. 1994. Trace element status in camel: A review. *Biological Trace element Research*, 41:1-11.

Faye, B. and Bengoumi, M. 1997. DonneHes nouvelles sur le meHtabolisme des principaux eHleHments-traces chez le dromadaire. *Revue d+ Elevage et de Me& decine Ve& terinaire des Pays Tropicaux*, 50: 47-53.

Faye, B., Bengoumi M. and Seboussi, R. 2006. Metablism of some minerals in camels: A face of the adaptation to harsh condition: in international scientific conference for camel, Gassiem, KSA. 4:1593-1615.

Gartenbberg, D.K., Mc Dowell, L.R., Rodriquer, D., Wilkinson, N., Conrad, J.H. and Martin, F.G. 1990. Evaluation of trace minerals status of ruminants in northeast Mexico. *Livestock Research for Rural Development*, Volume 2, number 1. http://lrrd.c ipav. org.co/ lrrd2/1/cont21.htm

Gihad, E.A. 1995. Arabian camel, production and culture (Textbook in Arabic). Arab Publishing and Distribution Company. Egypt.

Kamal, A.A. 1993. Some biochemical studies on camel blood relation to seasonal variations, M.V.Sc thesis. Ismailia University, Egypt in: camel newsletter, 1996, CARDN.

Kincaid, R.L. 1999. Assessment of trace mineral status of ruminants: A review. In: proceeding of American society of animal science, Pullman. Pp: 9164-6351.

Marshall, R.T. 1993. Standard Methods for Examination of Dairy Products. American Public Health Association Report, Washington, USA.

Mc Dwell, L.R., Cornal, J.H. and Hemby, F.G. 1993. Mineral for grazing ruminants in tropical regions, Anim. Sci. Dept., University of Florida, CBAG.

Nabag, M.G. 2004. Milk composition of camel and goat grazing in Butana area. M.Sc. dissertation, University of Khartoum.

NRC 1984. Nutrient Requirements of Domestic animals, No. 4. Nutrient requirements of Beef Cattle. 6th edition. National Research Council, Washington DC.

Viets, F.G. and Lindsay, W.L. 1973. Testing soil for zinc, copper, manganese and iron. In: soil testing and plant analysis. Editors: (LN Walsh and Beaton) Soil Sci. Soci. of American Inc. Madison, Wisconsin Pp: 153-172.

Vittorio D., Cattaneo, D., Beretta, E. Baldi, A., Savoini, E. G. 2001. Effects of trace element supplementation on milk yield and composition in camels. *International Dairy Journal,* 10: 873-879.