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SERUM TRACE ELEMENTS CONCENTRATION IN INDOOR COMPARED TO OUTDOOR NUBIAN NANNY GOATS

تركيز العناصر النادرة في مصل الدم في الماعز النوبي المنزلي بالمقارنة مع الماعز النوبي المتجول

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المستخلص

تم تحليل 40 عينة من مصل ماعز نوبي بالغ سليم ظاهرياً (20 عينة من ماعز محفوظة داخل المنازل و20 عينة من ماعز تتجول في الخارج) جمعت من منطقة عطبرة ولاية نهر النيل لمقارنة تركيز العناصر النادرة وهي الكوبالت , الكروم , النحاس , الحديد والمنجنيز بواسطة جهاز مقياس الطيف الضوئي الامتصاصي الذري ((Atomic Absorption Spectrophotometer (AAS). اظهرت النتائج زيادة احصائية معنوية ($P>0.05$) في تركيز الكروم والحديد في مصل الماعز المحفوظة في المنازل وزيادة احصائية معنوية ($P>0.05$) في تركيز النحاس والمنجنيز في مصل الماعز التي تتجول في الخارج مع عدم وجود اختلاف احصائي معنوي ($P<0.05$) في تركيز الكوبالت بين المجموعتين .

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Abstract

In a preliminary study, forty adult apparently healthy Nubian nanny goats (20 kept indoor and 20 roaming outdoor) sera samples collected from Atbara area, River Nile State were analyzed to compare the serum concentration of the fallowing trace elements: Co, Cr, Cu, Fe and Mn using Atomic Absorption Spectrophotometer (AAS). The results showed a significantly ($P < 0.05$) higher values of serum Cr and Fe concentrations in goats kept indoor and a significantly ($P < 0.05$) higher serum Cu and Mn concentrations in goats roaming outdoor. There was no significant difference ($P > 0.05$) in serum Co concentration between the two groups.

Key words: Serum trace elements, Nubian goats, Atomic Absorption Spectrophotometer (AAS), Sudan.

Introduction

Trace elements are needed for energy production, enzyme activity, hormone production, collagen formation, vitamins and tissue synthesis, oxygen transport, and other physiological processes related to health, growth and reproduction (Gurdocan *et al*., 2006). Trace elements deficiencies, excesses or malabsorption could cause ailments such as cardiac conditions, immunological and hormonal dysfunctions, in addition to a range of other maladies. Trace elements deficiencies have negative impacts on the reproductive efficiency of farm animals (Apgar, 1987). Appropriate trace elements supplementation is essential for maintaining optimum level of health, growth and performance of all animals. Assessment of trace elements status indicates whether elements supplementation of the animals' feed is adequate and whether productivity is likely to be improved with supplementation of trace elements (Solaiman *et al*., 2006).

The Nubian goat is a common breed throughout the Middle East and extending as far east as India. Sub-types (breed groups) include Mzabite

(Algeria), Zaraibi (Egypt) as well as the Nubian proper and in particular the "Shukria" eco-type of the Sudan (Wilson, 1990). In Sudan, goat population has been estimated at 44.000.000 million head, with the Nubian goat outnumbering other eco-types (Anon, 2010). It is found in the riverian and urban areas of Northern Sudan with a bodyweight of 50-70 kg for males and 40-60 kg for females. The daily milk yield is 1.5-2.0, 150-200 kg per lactation (Ahmed *et al*., 2001). Dwellers of urban and peri-urban areas own a small number of Nubian goats with a flock size ranging from 2 to 10, they are let out to graze during the day and are kept in shelters and may receive concentrates at night. They have no access to salt licks. Data concerning normal levels of feed requirements of trace elements during different physiological states of the Nubian goats in Atbara area, River Nile State are lacking.

The present study was carried out to compare the serum concentration of the trace elements: Cobalt (Co), Chromium (Cr), Copper (Cu), Iron (Fe) and Manganese (Mn) of Nubian nanny goats kept indoor and those roaming outdoor in Atbara area, River Nile State, in May, 2009.

Materials and Methods

Five ml of blood sample from each of forty adult, apparently healthy, Nubian nanny goats (20 kept indoor and 20 roaming outdoor) was collected using jugular veinopuncture into plain tubes in Atbara area, River Nile State, in May, 2009. The separated serum samples were stored at -20^{o}C until further analysis for the fallowing trace elements: Co, Cr, Cu, Fe and Mn according to Elmer (1982), using Atomic Absorption Spectrophotometer (AAS) (model A Analyst 700, Perkin-Elmer Cooperation, USA). Data collected were subjected to statistical analysis using SPSS version 13 and were expressed as mean ± S.D.

Results and Discussion

Blood serum concentration values of Co, Cr, Cu, Fe and Mn of indoor kept Nubian nanny goats and those roaming outdoor are shown in Table 1. No significant difference (P = 0.765) was detected in Cobalt (Co) serum concentration between goats kept indoor and those roaming outdoor. Unlike sheep, goats have been shown to be less sensitive to low levels of feed cobalt

concentration (Mburu *et al*., 1993). A significant increase (P = 0.0001) was evident in Cr serum concentration in indoor goats than in goats roaming outdoor. Generally, forages and agricultural products and by-products contain more Cr concentration (Bunting, 1999), forages are always provided to goats kept indoor. It is apparent that Cu concentration in goats roaming outdoor was significantly higher (P = 0.0001) than in goats kept indoor. Serum Cu concentration varies with age, stressors, infections and insufficient supplementing of feed of domesticated animals (Kincaid, 1999). Goats' owner always do not let out lactating goats to roam outdoor, so the majority are kept indoor. The serum Cu concentration decreases during the lactation period since it is stored in the liver before being excreted into milk (Adelstein and Vallee, 1962). On the other hand, serum Fe concentration was significantly higher (P = 0.0001) in goats kept indoor compared to those roaming outdoor. This may be due to a well balanced ration provided by owners to those goats. A significantly (P = 0.001) higher serum concentration of Mn in goats roaming outdoor compared to goats kept indoor was found. This may be attributed to a deficiency of Mn in the rations of goats kept indoor. It was noted that no salt licks were provided by the owners to the confined goats. On the other hand, goats that were allowed to roam outdoor could satisfy their needs of Mn by picking and licking materials containing the element.

It could be concluded that serum Cr and Fe concentrations were significantly higher in goats kept indoor, whereas serum Cu and Mn concentration were significantly higher in goats roaming outdoor. No significant difference in serum Co concentration between goats kept indoor and those roaming outdoor. Therefore, it is recommended that salt lick should be provided to goats kept indoor to satisfy their needs of trace elements and to prevent goats from picking and licking foreign bodies which may lead to problems in digestive system.

References

Adelstein, E. and Vallee, B.L., **1962.** Copper. In: Bronner, C. (Ed.), Mineral Metabolism, Part 2-B. Academic Press, New York; 623 p.

Ahmed, M.M., Hamed, T.F. and Barri, M.E., **2001.** Variation of zinc and copper concentrations in the plasma of Nubian goats according to physiological state. Small Rumi. Res., 39: 189-193.

Anon. **2010.** Annual Reports. The Federal Ministry of Animal Resources and Fisheries (DataCenter).

Apgar, J., **1987**. Effect on the guinea pig of low zinc intake during pregnancy. Fed. Proc., Fed.Am. Soc. Exp. Biol., 46: 747.

Bunting, L. D., **1999.** Chromium in Dairy Nutrition: What Do We Know? Proceedings, Mid-South Ruminant Nutrition Conference, Dallas, TX.

Elmer, P., **1982.** Biochemistry, BC5, BC7. Analytical Methods for Atomic Absorption Spectrophotometry. Perkin-Elmer Cooperation, Norwark, CT, 200 pp.

Gurdogan, F., Yildiz, A. and Balikci, E., **2006.** Investigation of serum Cu, Zn, Fe and Se concentrations during pregnancy (60, 100 and 150 days) and after Parturition (45 days) in single and twin pregnant sheep. Turk. J. Vet. Anim. Sci., 30: 61-64.

Kincaid, R.L., **1999.** Assessment of trace mineral status of ruminants: a review. Proc. Am. Soc.Anim. Sci.

Mburu, J.N., Kamau, J.M.Z. and Badamana, M.S., **1993.** Changes in serum levels of vitamin B12, feed, live weight and haematological parameters in cobalt deficient small East African goats. Int. J. Vitam. Nut. Res., 63: 135–139.

Solaiman, S. G., Shoemaker, C. E., and D' Andrea, G. H., **2006.** The effect of high dietary Cu on health, growth performance, and Cu status in young goats. Small Rumi. Res., 66: 85-91.

Underwood, E.J., **1971.** Trace Elements in Human and Animal Nutrition. 3rd ed., Academic Press, New York.

Wilson, R.T., **1990.** Small ruminant production and small ruminant genetic resources in tropical Africa. Animal Production and Health Paper. Food and Agricultural Organization (FAO), 231 p.

Table 1: The mean serum concentrations (± S.D) for Co, Cr, Cu, Fe and Mn (mg/l) in Nubian nanny goats kept indoor and those roaming outdoor in Atbara area, River Nile State, in May, 2009.

Trace element	Indoor goats Mean ± S.D (n=20)	Outdoor goats Mean ± S.D (n=20)
Co	0.397 ± 0.010	0.399 ± 0.001
Cr	0.474 ± 0.020*	0.077 ± 0.030
Cu	0.281 ± 0.001	0.490 ± 0.030*
Fe	4.536 ± 0.003*	3.428 ± 0.004
Mn	0.050 ± 0.006	0.176 ± 0.002*

* Indicates significant difference between goats kept indoor and those roaming outdoor ($P<0.05$)