Biochemical and Mineral Profile of South Eastern Algerian Desert Goats (*Capra hircus*)

**Research Article**

N. Hafid, T. Meziane, B. Maamache and M. Belkhiri

*Institute of Veterinary Science and Agricultural Science, Batna University, Algeria*

Received on: 1 Mar 2012  
Revised on: 5 Apr 2012  
Accepted on: 1 May 2012  
Online Published on: Sep 2013

**ABSTRACT**

An experiment was conducted in Algerian desert goats to study the effect of age and season on blood biochemical and mineral profile during different physiological stages of the goats. Serum Ca, Mg and Na levels were significantly high at birth and decreases as the age advanced. The season had a significant effect on the decreased levels of Ca, Mg and K and inversely on the increased levels of Na during dry season. The Ca (80.02±4.84 mg/L), Mg (22.14±1.61 mg/L), Na (142±1.73 mEq/L) and K (6.43±0.40 mEq/L) in pregnant goats were significantly higher than in non-pregnant and lactating goats.

**KEY WORDS** cholesterol, desert, goat, mineral metabolite, triglycerides.

**INTRODUCTION**

After the second phase of agrarian revolution (1972), the national goat population has progressively increased to reach more than 3.3 million heads. More than 80% of this population is raised in the arid areas, reared in extensive mixed farming systems, together with sheep, in small herds (Moustari, 2008). Goat production is recognized as an important source of the rural economy in Algeria, mainly for the meat and milk production.

The livestock is mostly represented by local breed (Arab or Arbia breed). It is long haired (12-15 cm) and the prevailing color is black or brown, it is small-sized, and both sexes are without horned (Fantazi, 2004).

As this local breed showed a high morphological variability and productive, according to the location area (mountain, stepp or oasis), with the ability to adapt to particular environmental conditions unfavorable natural, our objective was to explore the physiological and health statue, which are poorly studied in Algeria, by the determination of some biochemical metabolite influenced by season, age and reproductive stage in the south eastern Algerian goats as example of the indigenous goats in Algeria.

**MATERIALS AND METHODS**

**Experimental design**

This study was conducted in the experimental station of the national institute of agronomical research Sidi-Mehdi-Touggourt, in the south eastern Algerian desert. There are generally two seasons, dry season (from may to October, an average $T^{\text{max}}=35.98 \degree C$) and humid season (from November to April, an average $T^{\text{max}}=21.48 \degree C$) (Fantazi, 2004). The study period was one year, encompassed the late humid season and late dry season.

Fifty healthy goats were used in this study and were selected by age (young, adult and old) and reproductive status of females (pregnant, non-pregnant and lactating). The animals were grazed on natural pastures. The berseem,
hay, sorghum and concentrate of barley were also given to these goats. The quantity of the fodder and concentrate were changed according to the animal stage and the water was provided twice a day.

The blood samples were collected from jugular vein of fasting animals (24 hours), during the two seasons. The serum was separated by centrifugation at 3000 rpm for 10 min and it was stored at +4 °C until usage. All the samples were analysed in the central laboratory in Constantine, Algeria.

**Determination of biochemical parameters**

Cholesterol and triglycerides levels were determined by enzymatic colorimetric test (CHOD-PAD and GPO-POD, respectively) (Meziane, 2001) using commercially available diagnostic kits. Sodium (Na) and potassium (K) were determined by flame photometry (Daramola et al. 2005) using a Jen way PFP 7 from England.

Magnesium (Mg), calcium (Ca) and phosphorus (P) were determined by the colorimetric method, without deproteinization, using calmagite, arsenaazo and vanadate molybdate reagents, respectively (Djaalab, 2011).

**Statistical analysis**

All data were expressed by means ± SE and analysed were carried by using Student’s t-test (STATITCF software) for differences between means.

**RESULTS AND DISCUSSION**

**Energy metabolism**

**Cholesterol**

The values of cholesterol (Table 1) concentration reported by Zubcic (2001) and Mollereau et al. (1995) were 0.46-0.90 g/L and 0.53-2.11 g/L respectively.

<table>
<thead>
<tr>
<th>Cholesterol (g/L)</th>
<th>Humid season X ± SE</th>
<th>Dry season X ± SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>0.59±0.15</td>
<td>0.51±0.10**</td>
</tr>
<tr>
<td>Adult</td>
<td>0.58±0.04</td>
<td>0.56±0.16</td>
</tr>
<tr>
<td>Old</td>
<td>0.56±0.10</td>
<td>0.62±0.09</td>
</tr>
<tr>
<td>Reproductive status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-pregnant</td>
<td>0.50±0.06</td>
<td>0.58±0.11</td>
</tr>
<tr>
<td>Pregnant</td>
<td>0.58±0.06</td>
<td>0.65±0.19</td>
</tr>
<tr>
<td>Lactating</td>
<td>0.52±0.09</td>
<td>0.60±0.05</td>
</tr>
</tbody>
</table>

(\textit{P}<0.05).

Cholesterol concentration, during dry season, was lower in young animals compared with old ones (0.51±0.10 vs. 0.62±0.09). This decrease may be due to high environmental temperature which inturn reduced the feed consumption by 40-60%. Non significant increase in the substance, during both seasons, was observed in the pregnant goats in comparison with the non-pregnant and lactating goats. This result was similar to those obtained by Sandabe et al. (2004) and Waziri et al. (2010) in Sahel goats and in Merinolandschaf ewes (Antunovic et al. 2004). Antunovic et al. (2002) reported that cholesterol level in ewe was not be affected by season.

**Triglycerides**

The values of triglycerides (Table 2) were approximately equal to those (0.14-0.44 g/L and 0.14-1.40 g/L) reported by Mollereau et al. (1995) and Daramola et al. (2005), respectively. Taking into account the season, no changes were observed in the levels of triglycerides. A similar observation was presented by Krokavec et al. (1992). In contrast to our findings, Nazifi et al. (2002) reported a remarkable effect of age in triglycerides levels on Iranian goats.

<table>
<thead>
<tr>
<th>Triglycerides (g/L)</th>
<th>Humid season X ± SE</th>
<th>Dry season X ± SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>0.33±0.18</td>
<td>0.28±0.12</td>
</tr>
<tr>
<td>Adult</td>
<td>0.17±0.03</td>
<td>0.20±0.13</td>
</tr>
<tr>
<td>Old</td>
<td>0.18±0.06</td>
<td>0.23±0.08</td>
</tr>
<tr>
<td>Reproductive status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-pregnant</td>
<td>0.14±0.04</td>
<td>0.18±0.04</td>
</tr>
<tr>
<td>Pregnant</td>
<td>0.16±0.02</td>
<td>0.25±0.07</td>
</tr>
<tr>
<td>Lactating</td>
<td>0.19±0.05</td>
<td>0.29±0.15</td>
</tr>
</tbody>
</table>

**Mineral metabolism**

The means ± SE of the mineral concentration are presented in Tables 3 and 4.

**Calcium (Ca)**

The range of Ca reported by Daramola et al. (2005) was 46-96 mg/L, but the value was lower than those (88-120 and 98.4±4 mg/L) determined by Mollereau et al. (1995) and Nazifi et al. (1999), respectively. This difference might be due to the disorder of the protein metabolism (Mbu and Mbwaye, 2005) or to the water deprivation (Bengoumi and Faye, 2002).

However, the increase of Ca levels, during the dry season because of the solar-rays specifically (UV) ones which stimulates the synthesis of \textit{vit} \textsubscript{D}\textsubscript{3} in the skin.

The increased levels of Ca in the young animals, during the humid season, can be explained by the increased requirements to the skeletal mineralization during the growth period. Old animals showed decreased Ca levels as demonstrated by Ahmed et al. (2000) which might be explained by the decrease or the loss of Ca intestinal
homeostasis during lactation (Liesegang i

by the notable drain of Ca for milk production (Tschuor has a significant effect on m

sl

registered by Gromadzka Ostrowska (1977)

mg/L and 17.01-38.88 mg/L) reported by Castro 529

absorption and / or bone resorption (Gueguen and

Hafid et al.

Pointillart, 2000 ) . The presence of hypocalcaemia in the

to the reports of (Antunovic 2009).

The effect of season showed the similar results as

registered by Gromadzka Ostrowska et al. (1986). The slight increase in P during the dry season could be due to

direct solar radiation. Also, the P-values were increased

(P<0.05 and P<0.001) (Tables 2 and 3). The decrease during the humid season can be explained by the consumption of the green grass (Odette,

2005). A significant decrease of Mg levels in the young animals compared to the adult during the dry season (P<0.05) may be due to the thermal stress, specifically throughout nights. The slight decrease in the old animals can be explained by the decrease of intestinal absorption of Mg with the age, specifically after the age of five years (Marx, 2002) or to the decrease of bone stores. Non significant difference was observed in all reproductive stages of goats.

Phosphorus (P) The earlier report of P carried out by Mollereau et al. (1995) was 46.5-139.5 mg/L.
The effect of season showed the similar results as registered by Gromadzka Ostrowska et al. (1986). The slight increase in P during the dry season could be due to the direct solar radiation. Also, the P-values were increased with age according to Ahmed et al. (2000).

Magnesium (Mg) The values of Mg were in agreement with those (17-38.88 mg/L and 17.01-38.88 mg/L) reported by Castro et al. (1977) and Mollereau et al. (1995), respectively.
The effect of season on the Mg levels was remarkable, specifically in the dry season (P<0.05 and P<0.001) (Tables 3 and 4). The decrease during the humid season can be explained by the consumption of the green grass (Odette,
Na levels had seen a slight decrease in olds, as reported Opara et al. (2010), specifically in the dry season. It was due to the progressive reduction of Na extracellular concentration with ageing.

A significant difference (P<0.001) between the non-pregnant and pregnant goats was explained by higher requirements of electrolyte by the foetus. Also, this increase could be related to the changes in renal regulation of water and electrolytes during pregnancy (Elnageeb and Abdelatif, 2010).

Potassium (K)
The value of K reported by Daramola et al. (2005) was 3-6 mg/L. A significant decrease was observed in K levels in dry season (P<0.01 and P<0.001). This decrease was also explained by Meziane (2001). It can be due to the dehydratation.

A significant variation (P<0.05) between pregnant and lactating goats was observed. The increase of K levels with pregnancy in Baladi goats was explained by the anti-mineral corticoids activity of progesterone during the pregnancy (Azabe and Abedl Maksoud, 1999), where the quantities of excreted K are reduced, which it is usually convertible to the increase of this electrolyte in blood. Concerning the age, no change had occurred. Similar findings were observed by Das et al. (2010).

CONCLUSION
It can be concluded that the existence of some significant variations in biochemical indicators are related to reproductive status and age of goats. Season had a significant impact on these biological indicators. The concentration of Na was higher in high temperature conditions. Moreover, it was reported that cholesterol level rises in the humid season and declines in dry season. The findings of this study may serve as reference in which alteration due to nutrition deficiency or metabolic disorder could be found in goats.

ACKNOWLEDGEMENT
The authors are thanking the staff of INRAA-Sidi-Mehdi-Touggourt-Algeria.

REFERENCES


