Seasonal Variations of some Hematological and Biochemical Parameters of the Carpathian Romanian Buffaloes. I. The Winter Period

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Abstract
Aim of this study was to investigate the blood parameters in Carpathian Romanian Buffaloes in order to establish their physiological ranges. Eight buffaloes from Şercaia-Braşov area were screened for hematological and biochemical profile during the winter period. Animals were fed on hay and beet pulp. Hematological parameters (hemoglobin, red blood cells, white blood cells, hematocrit, lymphocytes, monocytes, neutrophils) and biochemical parameters (including total proteins, urea, cholesterol, alkaline phosphatase, aspartate transaminase, alanine transaminase, total calcium, inorganic phosphorus and magnesium) were assessed. Preliminary results obtained after hematological examination were included within the following limits: 12,6-16,9 g/dL for hemoglobin; 6,48-9,51 $x10^6$/µL for red blood cells; 35,23-45,65% for hematocrit; 4,04-9,57 $x10^3$/µL for white blood cells; 45,3-76,8% for lymphocytes; 0,7-9,2% for monocytes; 22,5-45,9% for neutrophils. Results obtained after biochemical examination were included within the following limits: 4,0-9,2 g/dL for total proteins; 12-30 mg/dL for urea; 47-86 mg/dL for cholesterol; 92-171 U/L for alkaline phosphatase; 23-48 U/L for aspartate transaminase; 22-46 U/L for alanine transaminase; 5,0-9,3 mg/dL for total calcium; 1,3-3,9 mg/dL for inorganic phosphorus; 1,27-3.17 mg/dL for magnesium. Study will be continued during the grazing season in order to determine the seasonal variation of metabolic profile parameters.

Keywords: biochemical, Carpathian Romanian Buffaloes, hematological, winter

1. Introduction

Buffaloes of Romania have their origin in the Indian buffalo (Bubalus arni), more exactly in the common domestic buffalo (Bubalus microceros or Bubalus bubalis) of South-East Asia. Under the genetic and environmental report, buffalos from Romania belong to Indian River buffaloes. In particular, the nucleus of buffaloes herd in the Şercaia – Braşov Research Station was formed through acquisition of local buffaloes from the surrounding areas. A short time infusion using Murrah bulls, 40 years ago was applied. Subsequently, they were bred in closed reproduction. Their biochemical, physiological, and production characteristics were obtained in response to specific climatic conditions in the area evolves: excess moisture, low pH, poor natural vegetation of low nutritional value [1].

For more knowledge concerning biological particularities of Carpathian Romanian Buffalo is necessary, first, evaluating nutritional and metabolic parameters, respectively blood and biochemical serum constants.

The metabolic profile test in dairy animals is being used to assess the nutritional status, to predict occurrence of metabolic diseases and to diagnose the diseases, and to appreciate the fertility status of animals [2]. But the success of metabolic profile test in Romanian Buffaloes is limited because there are no references concerning

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the normal values of blood metabolites, available. There is little information in the literature on Romanian Buffaloes. The present study was undertaken to study the profile of blood metabolites and their seasonal variation in Romanian Buffaloes.

2. Materials and methods

Eight buffaloes (four lactating and four pregnant) from Şercaia-Braşov area were screened for hematological and biochemical profile in the winter period. The animals are on the tie stall system. Their health status is assessed as good. The animals were fed on hay and beet pulp and had free access to drinking water and common salt.

Blood samples were collected aseptically from the jugular vein of each animal, in vacutainer tubes with and without anticoagulant wising disodium ethylene diamine tetra acetic acid (EDTA). Serum was separated by centrifugation at 3000 g for 15 min and stored in aliquots at –20 °C until analyzed for biochemical parameters.

Hematological parameters - hemoglobin, red blood cells (RBC), hematocrit, white blood cells (WBC), lymphocytes, monocytes, neutrophils - were determined using automated hematology analyzer Abacus Junior Vet (Diatron, Hungary). Serum samples were collected in a sterile vial for biochemical analysis. All the blood biochemical parameters were estimated using a semi-automated biochemical analyzer StarDust MC 15 (DiaSys Diagnostics Systems Gmbh, Germany) and DiaSys reagents in dedicated kits.

The values of the researched parameters have been statistically processed for analysis of the variance.

3. Results and discussion

Results of hematological parameters studied in this experiment are presented in Table 1.

Table 1. Hematological indices in controlled buffaloes*

Hematological parameters	Pregnant group (n=4)	Lactating group (n=4)
Hemoglobin (g/dL)	13.93±2.0 12.6; 13.1; 16.9; 13.1	13.80±0.95 13.2; 12.9; 14.1; 15.0
RBC (10^6/μL)	7.34±1.45 6.58; 6.48; 9.51; 6.77	7.36±0.30 7.64; 7.57; 7.21; 7.01
Hematocrit (%)	39.04±4.44 36.37; 37.62; 45.65; 36.51	38.89±2.74 38.81; 35.23; 39.74; 41.79
WBC (10^3/μL)	6.11±1.49 4.04; 7.39; 6.96; 6.06	7.15±1.72 6.99; 6.44; 5.58; 9.57
Differential count of WBC (%): Lymphocyte	60.50±14.01 53.2; 45.3; 76.8; 66.7	58.85±5.12 55.9; 57.0; 66.5; 56.0
Monocot	6.83±4.09 8.6; 8.8; 0.7; 9.2	6.95±3.57 8.6; 8.7; 1.6; 8.9
Neutrophils	32.68±11.29 38.2; 45.9; 22.5; 24.1	34.20±1.61 35.5; 34.3; 31.9; 35.1

*Data are presented as mean ± standard deviation and individual values

There were non-significant differences in all these hematological parameters among group of pregnant and lactating buffaloes. Similar hematological values were reported for lactating Indian Murrah Buffaloes by Feldman et al [3] and Jain et al [4], except hemoglobin, hematocrit and lymphocyte whose values were higher in Romanian Buffaloes. Results of biochemical parameters screened are presented in Table 2. Among the biochemical parameters were determined serum total protein and urea as indicators of protein metabolism. The total protein concentration was 7.30 ± 0.95 and 5.53 ± 2.53 g/dL respectively in pregnant and lactating buffaloes. Note that the values obtained in pregnant buffalos are higher than in lactating buffalos but differences are non-significant (NS) ($p>0.05$) (Figure 1).

Table 2. Concentration values of some serum metabolites in controlled buffaloes*

Hematological parameters	Pregnant group (n=4)	Lactating group (n=4)
Protein metabolism		
Total protein (g/dL)	7.30±0.95 6.0; 8.0; 7.2; 8.0	5.53±2.53 4.0; 3.7; 5.2; 9.2
Urea (mg/dL)	23.0±4.76 22; 30; 20; 20	16.50±7.72 12; 14; 12; 28
Energetic metabolism		
Total cholesterol (mg/dL)	79.0±9.56 81; 84; 65; 86	59.25±10.14 55; 47; 66; 69
Hepatic functionality		
Aspartate transaminase (U/L)	44.25±3.77 41; 41; 47; 48	30.75±8.38 24; 23; 38; 38
Alanine transaminase (U/L)	42.50±2.38 41; 41; 42; 46	27.0±4.69 25; 28; 22; 33
Alkaline phosphatase (U/L)	147.0±24.71 171; 121; 131; 165	103.50±11.36 92; 96; 110; 116
Mineral metabolism		
Total calcium (mg/dL)	8.48±0.43 8.1; 9.1; 8.3; 8.4	6.48±1.92 5.0; 5.8; 5.8; 9.3
Phosphorus (mg/dL)	2.68±1.26 1.8; 3.9; 3.6; 1.4	2.28±0.92 1.7; 1.3; 2.9; 3.2
Magnesium (mg/dL)	2.92±0.20 3.17; 3.0; 2.78; 2.74	2.03±0.66 1.79; 1.27; 2.26; 2.81

*Data are presented mean ± standard deviation and individual values

Total protein contents was usually used as an indicator of the animals' nutritive status reflecting food intake and metabolism. Regarding serum urea, it was higher in pregnant buffaloes (23.00±4.76 mg/dL) compared with lactating buffaloes (16.50±7.72 mg/dL) (NS). Serum urea is influenced by the days in milk [5, 6] by the diet [5] and by the season [7]. The values of serum blood urea are considered to be an indicator of total protein intake. The highest values of blood urea over the gestation period were reported by El-Sherif and Assad [8] in Barki ewes in which plasma urea level started rising during week 10 of pregnancy and reached a peak at parturition, and by Durak

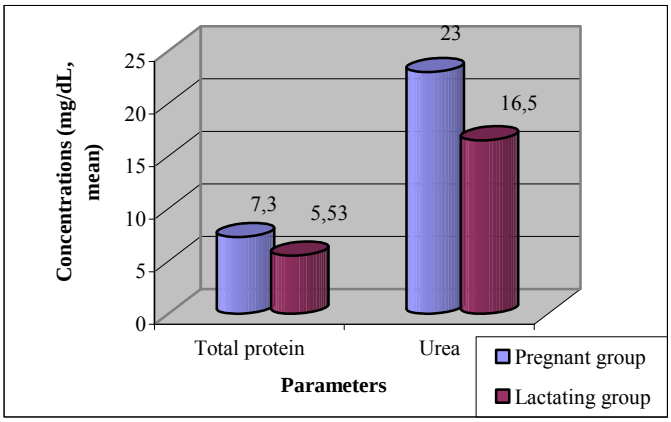

Figure 1. Some protein metabolism parameters in the blood serum of Romanian Buffaloes

and Altinek [9] in Chios ewes. Also, our results are in according with those reported by Karaphelivan et al. [10] on Tuj ewes and Yokus et al. [11] on Sakiz-Awassi crossbreds. These reports support the hypothesis that changes in blood urea content during lactation could depend on milk synthesis [8]. It is probably associated with the use of urea for protein synthesis on the rumeno - hepatic pathway due to compensation of the low protein uptake during the dry period [11].

As regards the energetic metabolism, the lactating group showed lower levels for total cholesterol (59.25±10.14 mg/dL) than the pregnant group (79.0±9.56 mg/dL) (Figure 2). The differences are non-significant. The decreasing of serum total cholesterol during lactation period was also reported in dairy cows. Marcos et al. [12] considered that the lowest values of these compounds were due to the cows' increased requirement for energy during lactation.

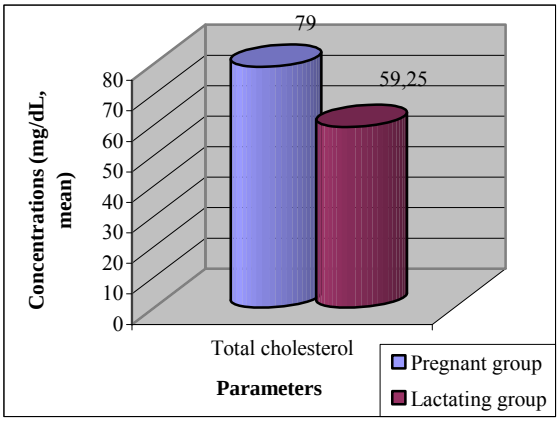

Figure 2. Some blood serum energetic and metabolic parameters in the controlled buffaloes

Serum enzymes (Aspartate transaminase – TGO, Alanine transaminase – TGP and Alkaline phosphatase - PAL) were significant lower in the lactating group ($p<0.01$ for TGO and TGP enzymes and $p<0.0r$ for PAL) (Figure 3). Enzymes are protein catalysts present mostly in

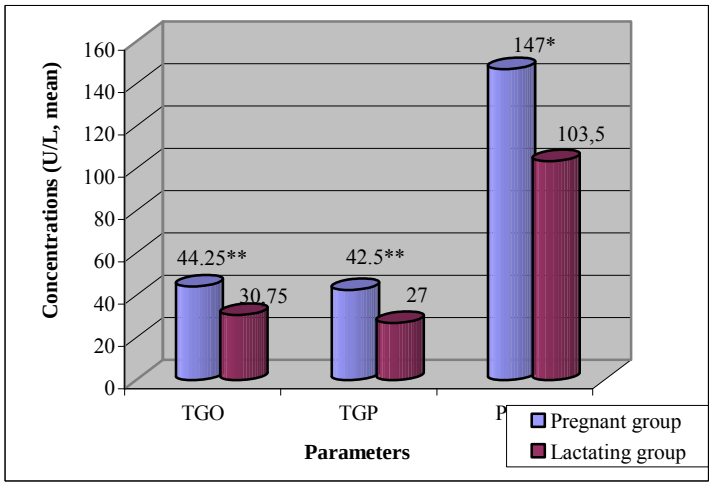

Figure 3. Serum enzymes in controlled buffaloes

living cells and are constantly and rapidly degraded although, renewed by new synthesis [13]. As a result of the different physiological processes in the body, normal enzyme level in serum is a reflection of a balance between synthesis and their release [14].

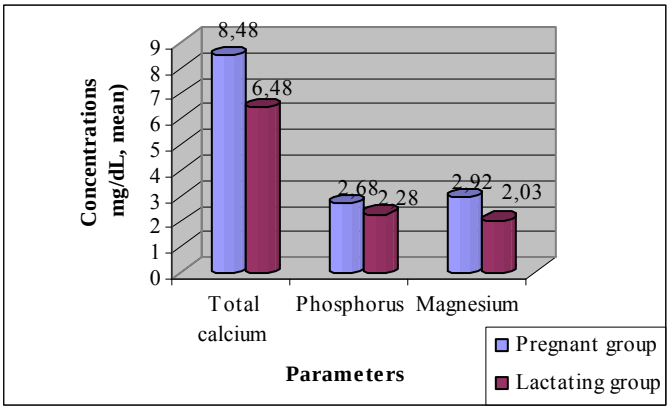

Figure 4. Some mineral metabolism parameters in the blood serum of Romanian Buffaloes

Among mineral metabolism parameters, the calcium, phosphorus and magnesium concentrations (Figure 4) in lactating group are lower in comparison with pregnant group. No significant differences between groups were observed for the blood levels of these macro minerals.

4. Conclusions

The results showed the changes of metabolic profile in the serum of Romanian Buffaloes during gestation and lactation period as a consequence of the metabolic adaptation. Thus, metabolic profiles, its appropriate interpretation and good understanding of physiological processes involved in the metabolic adaptation have an important role in monitoring the health status of buffaloes. Research will be extended during several years. Tests will be performed on groups of animals with different physiological states both in the stable maintenance season, and grazing season.

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