

SELECTIVE EVALUATION OF CERTAIN BLOOD AND BIOCHEMICAL PARAMETERS OF LOCAL CATTLE DURING WINTER AND SUMMER SEASONS

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ABSTRACT

This study was done to find out the effect of seasonal variations on the hematological and blood biochemical parameters of local cattle raised in Maysan Governorate. A number of 40 healthy cows were selected for the study during winter and summer seasons, blood samples were collected in each of the two seasons and were analyzed for some hematological and biochemical parameters. The results in the winter season showed significantly higher values of Mean Corpuscular Volume, glucose, total protein, albumin, globulin, bilirubin and creatinine but lower values of total white blood cells count, differential leukocyte count, hemoglobin concentration, Mean Corpuscular Hemoglobin, Mean Corpuscular Hemoglobin Concentration, AST and ALT than that of the same animals during the summer season. However, no significant differences in the erythrocyte count, haematocrite between the two seasons were observed in the local cattle.

INTRODUCTION

One of the greatest challenge facing dairy breeder production in southern Iraq is seasonal variations between summer and winter climatic conditions. In southern Iraq the summer season is relatively long and there is generally the presence of high relative humidity whereas winter is short season and relatively cold [22]. Lactating dairy cows may be exposed to different types of unfavorable environmental stresses such as extreme cold or heat. These stresses exert pronounced effects on the animal blood components.[23] .

MATERIALS AND METHODS

This study was conducted in Missan governorate "southern of Iraq" between December 2006 and August 2007 with mean temperature in winter (Max. (16.1-12.1) and Mini. (12.0-8.0)) and humidity (Max.82-68) and (Mini.67-53) in summer, temperature (Max. 39.0-35.9) and Mini. (35.8-32.7) and humidity (Max.35-25) and (Mini.24-14) in Missan City[22].A total of 40 local dairy cows at the age of 4.5-5 years old were provided from commercial herd that sheltered in half open barns in the province. They were milking twice a day and were under similar conditions of care and nutrition. They were fed concentrate ration and alfalfa[4].

According to the climatic data which were obtained from the reports of Metrological service in Misan city, two seasons were established, winter (December, January and February) 2006, summer (May, Jun, July and August) 2007.

Blood was taken in morning from all animals from jugular vein into a test tube containing ethylene diamine tetraacetic acid (EDTA) (2mg /1ml of blood). After drawing, blood was cooled to the temperature of approx. 4°C up to 6°C and transported to the laboratory during the period

between December 2006 to August 2007. The blood samples analyzed in Veterinary College laboratories of Basrah University. All animals had the same age relatively.

- Hematological parameters: hematocrite (Hct) was determined using the microhaematocrite method, hemoglobin (Hb) concentration was measured by acid haematin method, red and white blood cells were counted with a haemocytometer and erythrocyte parameters, i.e. mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were calculated; [7].
- Biochemical parameters of blood plasma: total protein and its fractions with biuret method, glucose with enzymatic method using Analco reagents, creatinine and bilirubin; [8]
- Activity of blood plasma enzymes: aspartate amino transferase (AST) and alanine aminotransferase (ALT) by kinetic method with NADH and tris buffer. The activity of enzymes was determined at 37°C using bioMerieux reagents; [9]

Statistical Analysis :

All values were calculated as means \pm S.D.


and p values <0.05 and 0.01 were considered significant using analysis of variants and were analyzed statistically using SPSS program.

RESULTS

Table 1 shows the mean values of RBC, total WBC, Hct, Hb, MCV, MCH and MCHC of the cattle blood during the winter and summer seasons. The cattle had significantly higher Hb concentration ($p < 0.01$), MCHC ($p < 0.01$), MCH ($p < 0.05$) and total WBC count ($p < 0.05$) but lower ($p < 0.01$) MCV in the winter than in the summer season. The values of RBC and Hct were similar in both seasons.

The level of glucose, total protein, albumin, globulin, creatinine and bilirubin (Table 2) were significantly higher ($p < 0.01$) in the winter season but blood plasma enzymes (AST and ALT) showed a significant variations ($p < 0.05$) in the summer season.

Table1: Hematological parameters of adult cattle during the winter and summer seasons (mean \pm SD).

|  Parameters | Winter season (N=40) | Summer season N=40) |
|--|-------------------------|------------------------|
| RBC ($\times 10^6/\mu$) | 5.66 \pm 1.48 | 6.90 \pm 1.58 |
| Hct (%) | 50.55 \pm 6.04 | 47.60 \pm 5.01 |
| Hb(g/dl) | 11.85 \pm 1.08 | 15.68 \pm 2.56* |
| MCV(fl) | 95.43 \pm 23.67* | 81.62 \pm 13.47 |
| MCH(pg) | 23.57 \pm 7.87 | 27.35 \pm 5.43** |

| | | |
|-------------------------------|-------------------|--------------------|
| MCHC(g/dl) | 21.27±2.10 | 32.41±5.22* |
| WBC(×10³/μ) | 5.9±0.30 | 4.8±1.32** |
| Neutrophiles % | 45.5±3.7 | 52.7±1.9* |
| Basophiles % | 5.8±0.5 | 7.9±1.5 * |
| Eosinophiles % | 1.6±0.3 | 7.7±0.2 * |
| Lymphocyte % | 30.4±2.9 | 35.2±0.3 |
| Monocyte % | 17.9±2.6 | 17.8±0.9 |

Value significantly different from seasons at *p<0.01 and **p<0.05

N=number of animals

Table 2:Biochemical parameters of adult cattle during the winter and summer season (mean ±SD) .

| Parameters | Winter season (N=40) | Summer season (N=40) |
|----------------------------|---------------------------------|---------------------------------|
| Glucose(mg/100ml) | 70.68±15* | 55.09±10 |
| Total protein(g/dl) | 7.50± 0.43** | 5.63± 0.27 |
| Albumin(g/dl) | 4.25±0.12* | 2.63±0.20 |
| Globulin (g/dl) | 3.25±0.31* | 3.0± 0.7 |
| Creatinine(mg/dl) | 2.10±0.70* | 0.50±0.4 |
| Bilirubin(mg/dl) | 3.11±0.5* | 1.3±0.22 |
| AST (U/l) | 61.9± 16.6 | 70.9±17.07** |
| ALT (U/l) | 25.1± 10.43 | 30.8±9.25** |

Value significantly different from seasons at *p<0.01 and **p<0.05

N=number of animals

DISCUSSION

In summer season the environmental effects on the cattle is more than that of the winter because the summer is longer than winter [22] and environmental heat exposures were made to evaluate metabolic changes associated with hormonal changes in warm climatic environments [10].Local cattle were used in this study. The influence of the environment on the cattle was

studied in each season and this was also studied in same species of dairy cattle [10] and white Fulani cattle [11]. The Hb concentration, MCH and MCHC were significantly higher in the local cattle in summer than in the winter season (Table 1). This is in agreement with the observation of [11] in which white Fulani cattle were also reported to have higher Hb, MCH and MCHC values during summer season and in the current study these results appeared due to the release of the red blood cells from spleen or the increase in oxygen consumption due to tissue demand causing ESF (erythrocyte-stimulating factor) release because relationship between the oxygen demand of tissue and the amount of oxygen carried by blood some finding for cows and buffalo. This relieves the animal of greater internal heat load under climatic stress [24]. Water intake is dependent on water loss, which in turn is correlated to ambient temperature, which is as a result of lower ambient temperature and higher relative humidity of 26°C and 82% respectively during the winter season compared with higher ambient temperature of 28°C and a lower relative humidity of 78% in the summer season. This may have resulted in changes in water content of the blood and blood viscosity as the total body water decreased with increase water loss.

The total WBC count was significantly lower in the local cattle during the winter season (Table 1). Similarly, [11] reported a higher total WBC values in White Fulani Cattle during summer season. Also, during the winter season [12] reported a total WBC count of $12.18 \times 10^3/\mu\text{l}$ in the West African dwarf goat, which was lower than the values of $16.14 \times 10^3/\mu\text{l}$ reported by [13] for this breed during the summer season. The observation in the local cattle of the present study may be due to higher levels of sub clinical parasitic infection during the summer season [2,14]. In the present study, the glucose, total protein, albumin and globulin concentrations were higher in the local cattle during winter than during the summer season, this could be due to that the local cattle were dehydrated during the winter season which may have elevated the concentration of the plasma protein [8,9]. The level of glucose increase during winter season than summer season due to consumption of fodder in winter season higher than summer season.

The total protein content in blood plasma is one of the indications of nitrogen metabolism in the organism, and depends on protein content in fodder [1,3], season of the year [15]. The total protein level in blood plasma may serve as indirect exponent of the animal's feeding state [16], however, it shows a considerable individual variation [15].

No observations concerning seasonal variations in the total plasma protein, albumin in the White Fulani Cattle during the summer season recorded [5,11]. The higher mean of glucose in cattle blood plasma in the winter season indicated the energy level in the feeding as well as the relation between glucose and energy influence [17,18]. The mean activity of indicative enzymes, AST and ALT, in cattle blood plasma, showed upward tendencies during the summer season. The increase of AST and ALT activity related to the physiologic state, and their increase also accompanies disorder of energetic metabolism [6,17,18]. Increase of this enzyme activity in cattle indicated a cellular structure damage of hepatocytes according to [19]. In case of cows with acidosis the enzyme activity increases [20], which might be the evidence of adipose hepatic degeneration [20, 21]. The level of creatinin which must be derived from creatine whereas the creatine level remained unaltered during summer season. Similar results have also been reported [25]. The endogenous purines (derived from body tissues such as creatinine) which suggests the possibility of an alteration is some of enzymatic systems necessary to convert purines to uric acid.

التقييم الانتقائي لبعض المعايير الدمية والكيموحيوية لدم الأبقار المحلية خلال فصلي الشتاء والصيف

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الخلاصة

اجري هذا البحث لدراسة تأثير تغيرات الظروف البيئية خلال فصلي الشتاء والصيف في المعايير الدمية والكيموحيوية لدم الأبقار المحلية، ولوحظ خلال فصل الشتاء ارتفاع قيم البروتين الكلي و الألبومين والكلوبولين ونسبة السكر ومعدل حجم الكرية الحمراء والكرياتنين والبلروبين و لوحظ ايضا انخفاض قيم كلا من تركيز خضاب الدم وخضاب الكرية ومعدل تركيز خضاب الكرية والعد الكلي والعد التفريقي لكريات الدم البيضاء وأنزيمات الكبد في نفس الحيوانات خلال فصل الشتاء مقارنة مع فصل الصيف ولم يلاحظ أي اختلاف معنوي للعد الكلي لكريات الدم الحمراء وحجم الكريات المضغوطة لدم الأبقار المحلية خلال فصلي الشتاء والصيف

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