

## EFFECT OF ENVIRONMENTAL TEMPERATURE ON SOME BIOCHEMICAL VALUES IN FEMALE SAHEL GOATS

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### ABSTRACT

Ten adult female goats were used to study the effect of environmental temperature on some biochemical constituents. The results showed higher glucose level in rainy than dry and cold seasons and the difference across season was significant ( $P < 0.05$ ). The cholesterol level was low during cold than dry-hot or rainy seasons ( $P < 0.05$ ). Serum total protein increased during rainy season while it was lower during dry-hot season ( $P < 0.05$ ). Potassium, sodium and inorganic phosphorus levels showed difference across seasons ( $P < 0.05$ ) although it showed higher values during dry-hot season. It was concluded that high environmental temperature has effects on biochemical constituents in sahel goats and therefore good management should be provided to them during dry-hot season.

**Keywords:** Goats, serum, total protein, sodium, potassium, phosphorus, cholesterol, calcium

### INTRODUCTION

The sahel goats are distributed in all parts of the West African Arid regions. The goats are used for festivities and for meat. They are renowned for their hardiness, can survive in most environment, are resistance to most diseases and show remarkable ability to fluctuating environmental conditions (Webster and Wilson, 1980). They are generally raised by the herdsmen of the sahel region exclusively on roughages with rarely concentrates supplementation (Rwuaan *et al.* 1993). Since most of the goats receive no concentrate supplementation, some serum biochemical components needs to be known so as to form a baseline for intensive farming methods. Seasonal variations in the levels of some blood constituents have been attributed to changes in the environmental temperature which vary markedly between the winter and summer months (Olusanya, 1977). Since there are some changes in environmental temperature, which affects the rectal temperature, the aim of this study was to investigate seasonal variations in blood constituents of sahel goats in the tropics and with the increasing interest in goats as experimental animals and for production, there is an obvious need to determine these parameters.

### MATERIAL AND METHODS

Ten cycling does (non-pregnant) adults, aged 1 ½ years were used for this study, which was conducted during dry-hot, rainy and cold (harmattan) seasons of

the year. Climatological data were obtained from the Meteorological Department, Ministry of Aviation, Maiduguri Office, Borno State (Table 1).

**Table 1: Mean monthly atmospheric temperature and relative humidity in Maiduguri during the time to the experiment.**

Month	Temperature (°C)	Relative Humidity (%)
February- July (Dry-hot season)	40±1.30	12
July- October, (Rainy season)	31.0±2.20	52
November- January (Cold season, harmattan)	28.0±1.8	14

The goats were housed in pens throughout the day except during grazing in the mornings. They were fed standard goat ration (Table 2) according to Akusu (1994). Water was provided *ad libitum*.

**Table 2: Composition of standard goat ration.**

Ingredients	Percentage
Corn meal	20.00
Palm Kernel Cake	20.00
Wheat Offal	20.00
Brewers Grain	37.80
Groundnut Cake	1.85
Salt (NaCl)	0.25
Minovit Super	0.10
Total	100

Before the commencement of the experiment, the animals were screened for haemoprotzoan and gastrointestinal parasites using methods described by Schalm et al. (1975) and Coles (1980). They were treated against coccidiosis using amprolium in water for 7 days at dose rate of 7 mg/kg body weight.

These animal were bled four times a month at midday on each occasion. Two blood sample obtained through the external jugular vein from each animals. One sample collected into a universal bottle containing sodium fluoride as anticoagulant to prevent loss of glucose on standing while the other sample was allowed to clot and serum was extracted by centrifugation.

Serum sodium and potassium were determined by standard spectrophotometry by the methods of Schales and Schales (1941). Serum calcium and phosphorus levels were determined according to Trunder (1960) and Gomori (1942) respectively. The serum level of cholesterol was determined using the procedures described by Wybenga and Inkpen (1974). Glucose level was analyzed using glucose oxidase methods as modified by Gochman and Schmitz (1972). The data were presented as means  $\pm$  standard deviation and analyzed statistically by analysis of variance (ANOVA) and student-t-test (Mead and Curnow, 1983).

## RESULTS AND DISCUSSIONS

The serum glucose level was higher in rainy than dry-hot and cold seasons and the difference across seasons was significant ( $P < 0.05$ ). The cholesterol level was low during cold season than rainy and dry-hot seasons and their difference was significant ( $P < 0.05$  Table 3). This was probably due to the fact that during dry-hot season glucose utilization was high in the body since there was less forage to graze, to provide more energy to the animal in order to dissipate more heat to maintain the body temperature at acceptable limit, and in this season, the feed intake is depressed due to high environmental temperature which confirms with the findings of Walkden Brown (1990) who showed cyclic variations in autumn in cashmere goats and small increments in rectal temperatures, have been associated with adverse effects on livestock production parameters (Wolfensen *et al.* 1988).

Serum total protein values increased during rainy season and were lower significantly during the dry-hot months ( $P < 0.05$ , Table 3). Olusanya, (1977) and Saror and Cole (1973), also reported slightly higher values during the wet season. This could be due to the fact that protein intake increased during the rains because of favourable temperature as shown on Table 1 and fresh green pasture, which contains some essential amino

acids for protein synthesis were more available during this period.

The value of potassium was higher in rainy season, sodium was higher in cold season while inorganic phosphorus and calcium were higher in dry-hot season. Potassium, sodium and inorganic phosphorus levels showed difference across seasons ( $P < 0.05$ ) while calcium level showed non-significant difference (Table 4). Olusanya (1977) also reported non-significant change in serum calcium level within seasons, but inorganic phosphorus level was different in this studies. Probably this was due to the reason that in dry season cereal grains in the form of concentrates were made available for the goats as feeds which was a good source of phosphorus.

The low serum sodium in the dry-hot season confirms with that of Oduye and Fasanmi (1971). This could be due to physiological adaptations as well as dietary intake of salt needed to cope with losses of sodium from sweating under the hot environment.

**Table 3: Summary of results showing some metabolite of Sahel goats, across seasons.**

Metabolite	Glucose (Md/dl)	Protein (g/dl)	Cholesterol (mg/dl)
Dry season	41.24 $\pm$ 0.38	5.83 $\pm$ 0.26	46.9 $\pm$ 1.10
Rainy season	41.86 $\pm$ 0.00	6.54 $\pm$ 0.34	47.31 $\pm$ 0.70
Cold season	42.62 $\pm$ 0.59	6.48 $\pm$ 0.21	4.17 $\pm$ 1.47
Significant level	$P < 0.05$	$P < 0.05$	$P < 0.05$

**Table 4: Summary of results showing some mineral level of Sahel goats, across seasons.**

Minerals	Potassium mEq/L	Sodium mEq/dl	Inorganic phosphorus Mg/dl	Calcium Mg/dl
Dry season	2.35 $\pm$ 0.09	141.55 $\pm$ 0.83	5.73 $\pm$ 0.39	9.6 $\pm$ 0.35
Rainy season	2.68 $\pm$ 0.08	143.8 $\pm$ 1.05	5.00 $\pm$ 0.69	9.55 $\pm$ 0.30
Cold season	2.58 $\pm$ 0.15	144.4 $\pm$ 1.38	5.57 $\pm$ 0.90	9.07 $\pm$ 0.06
Significance level	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$

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