

**Short Communication**

**QUANTITATIVE ANALYSIS OF GLUCOSE LEVEL IN BLOOD SERUM OF THREE GOAT BREEDS (*CAPRA HIRCUS*) IN NORTHERN PAKISTAN**

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**ABSTRACT**

Glucose is used as fuel for energy production, leading to maintaining physiological phenomena of cell and animal body. The blood glucose level in ruminants is actively transported through bloodstreams and circulating carbohydrates. The study aimed to evaluate the glucose level as an indicator of energy in goat breeds (Koh-e-Ghizer, Gojali and Baltistani) inhabiting three regions of Gilgit-Baltistan (GB), namely Ghizer, Baltistan and Hunza-Nagar. Data were collected from both male and female goats with the age of two years and above, determined based on teeth composition. Samples of blood were randomly taken from 270 goats (120 male & 150 females) by using 5ml clinical syringes and serum was obtained by centrifugation process. The quantity of glucose in mg/dl of serum was determined by analyzing the serum in Micro-lab 300. These goats majorly feed on pure organic forage in high altitude pastures in all three regions. The results revealed that the average level of glucose obtained from male goats was 65.50±16.77 mg/dl in Ghizer, 76.40±16.11 mg/dl in Baltistan, 87.95±11.52 mg/dl in Hunza-Nagar and glucose level in female was 67.94±15.02 mg/dl in Ghizer, 70.92±15.01mg/dl in Baltistan, and 83.82±9.51 mg/dl in Hunza Nagar respectively. The analysis of variance (ANOVA) has shown significant differences of glucose within sex and region at  $p \leq 0.001$ . Serum glucose was observed higher in female goats in comparison with male goats in district Ghizer. It also reflects the pastures' potential in the three major regions of Gilgit-Baltistan, need to be noticed by the herders and livestock department in the regions while taking initiatives for pasture management.

**Key words:** Goats, serum glucose, Gilgit-Baltistan, pastures potential.

**Abbreviations:**

ANOVA	Analysis of Variance
FAO	Food and Agriculture Organization
GB	Gilgit-Baltistan
NUFU	Norwegian Programmed for Development, Research and Education
SPSS	Statistical Package for the Social Sciences
SE	Standard Error

<https://doi.org/10.36899/JAPS.2020.4.0119>

Published online April 25, 2020

**INTRODUCTION**

Goat (*Capra hircus*) is among one of the anciently domesticated animals by human and is a seasonal polyestrous animal. Goats are domesticated throughout the world for the production of milk, meat; fibre and skin and also used in biomedical research (FAO, 2003). In Gilgit-Baltistan (GB), livestock is reared under trans-humane as well as nomadic pastoralist systems (Hasnain, 1985). However, goat management is generally poor in GB, where kid mortality reported to be as high as 33%, mainly due to starvation and freezing temperatures (Khan and Ashfaq, 2003). The efficiency of goat production depends on the type of feeding system, level of feeding management and availability of nutrients for high production (Devendra, 1981). During pasturing,

goats distinctly choice feeds at the trough or vegetation fractions and tend to make more refusals than other ruminants if feed availability is unlimited (Morand-Fehr, 2003). The major feed resources are alpine grasses and forbs in high altitude pastures during summers, followed by Artemisia and other shrubs in sub-alpine scrub in spring and autumn, while in winters the stall-feeding includes alfa, trifolia, crop residues (maize clover, barley and wheat straw), and branches of trees (Khan, 2003; Khan and Ashfaq, 2003).

Previous studies indicate that the biochemical parameters of serum have a significant role in the body homeostasis and thus providing pivotal signs on the body's response to the disease and production (Parmar *et al.*, 2017), and play important role in disease diagnosis. These biochemical parameters varied among age and sex

classes as well as different environmental conditions (Sakha and Mohamad-Zadeh, 2008 ). In goats, the normal range for glucose was reported 60-100 mg /dl of blood and this level is maintained in man and livestock by a constant range of two hormones, namely insulin and glucagon (Randox, 2006.; Singh, 2004).

The present study was undertaken to determine the blood glucose level to evaluate the impact of feeding strategies prevailing during summer in pastures of Gilgit-Baltistan for improving the nutritional values. Such a study has never been previously conducted in Gilgit-Baltistan of Pakistan. This study will provide baseline values of the different biochemical profile of healthy goats as well as the influence of age, sex, and region on biochemical parameters of goat in GB.

## MATERIALS AND METHODS

**Study area:** The study was carried out at three regions namely, Ghizer, Hunza-Nagar, and Baltistan (Skardu and Ghanche) and the goats reared in these three regions are known as Koh-e-Ghizer breed, Gojali breed and Balti breed, respectively.

**Animals:** Data was collected from goats (male & female) having two years of age at two teeth stage. All experimental procedures were performed following the regulations of Karakorum International University, Gilgit.

**Data collection:** Information was collected through a questionnaire about nutritional practices and commonly found vegetation consumed by animals were herbs, shrubs, undershrub and Trees. While for the prediction of climatic condition, we studied the life-form classes of the plant (Raunkjær *et al.*, 1934) at pastures during June to August 2017. In current study, goats with at least 2 teeth were considered for blood samples. The survey was conducted through convenient sampling. Using G\*Power sample size was estimated before conducting the survey. It appears with effect size 0.25, Type I error 5 % and Type II error 5 % two-way ANOVA at least sample of size 250 was required. To be safe, we have collected 270 blood samples (120 from male & 150 from female) covering three regions of Gilgit-Baltistan. 5 ml blood was taken from the jugular vein in a 5cc disposable syringe from each animal and blood was collected in the clot

activator tube and serum was extracted by centrifuge machine 500 to 800 rpm for chemical analyses. During this study biochemical parameters were analyzed by using micro-lab 300 in the laboratory of Department of Biological Sciences, Karakoram International University, Gilgit.

**Statistical analysis:** The difference of glucose level in goats found in the stated regions was analyzed. Since there are two source of variations location and sex, hence two-way ANOVA was used to study the variations in glucose level. The analysis was conducted in SPSS software.

## RESULTS

The average serum glucose level in male goats of Ghizer (Koh-e-Ghizer breed), Hunza-Nagar (Gojali breed), and Baltistan (Balti breed) was 65.50±16.77 mg/dl, 76.40±16.10 mg/dl, and 87.95±11.51 mg/dl, respectively, while in female goats it was 67.94±15.02 mg/dl, 70.92±15.01 mg/dl, and 83.82±9.51 mg/dl, respectively (Table.1). Serum glucose was observed significantly higher in female goats in comparison with male goats in district Ghizer. However, the other two regions, Hunza-Nagar, and Baltistan blood glucose level was higher in the male in comparison with female goats. The glucose level in blood serum of goats of different regions of Gilgit-Baltistan characterizes a significant difference ( $p \leq 0.001$ ). Our results indicate that male goats found in Ghizer and Hunza-Nagar districts exhibit low glucose level in blood serum compared to that of the Baltistan region. Similarly, the serum glucose level in female goats was detected low in goats of Ghizer than that of Hunza-Nagar and Baltistan. Overall serum glucose was significantly higher in goats of Baltistan. The palatable species of the plants may affect the serum glucose of goat. The details of palatable species of the goat in three different regions of the study area are given in the (Table 2).

Multiple comparison tests (LSD) indicated that difference in goats of Ghizer for serum glucose was non-significant compared with Hunza-Nagar but goats found in Ghizer and Hunza-Nagar both significantly differed ( $p \leq 0.001$ ) with that of Baltistan region (Table 1).

**Table I. Blood serum glucose (mg/dl) in male and female goats of three districts of Gilgit-Baltistan.**

Locations	Male	Serum glucose (Mg/dl) (Mean ±SE)	Female	Serum glucose (Mg/dl) (Mean ±SE)
	No. of observation		No. of observation	
Ghizer	40	65.50±16.77	50	67.94±15.02
Hunza-Nagar	40	76.40±16.10	50	70.92±15.01
Baltistan	40	87.95±11.55	50	83.82±9.51
F value		22.46		19.73
P value		≤0.001		≤0.001

Significant at  $P \leq 0.001$  (\*\*\*)

**Table 2. Cumulative check list of palatable species of herb/Shrub and tree on which Goats feed in three different regions of Gilgit-Baltistan.**

S.No	Family name	Species name	Habit	Hunza Nagar	Ghizer	Baltistan	Life-form
1	Amaranthaceae	<i>Amaranthus retroflexus</i> L.	Herb	+	-	-	H
2	Asteraceae	<i>Artemisia</i> Spp.	Under shrub	+	+	+	Ch
3	Capparidaceae	<i>Capparis spinosa</i> L.	Shrub	-	-	+	Ch
4	Chenopodaceae	<i>Salsola tragus</i> L.	Herb	-	-	+	H
5	Chenopodaceae	<i>Chenopodium album</i> L.	Herb	-	-	+	H
6	Convolvulaceae	<i>Convolvulus arvensis</i> L.	Herb	-	-	+	H
7	Cupressaceae	<i>Juniperus communis</i> L.	Tree	-	+	-	Ph
8	Elaeagnaceae	<i>Hippophae rhamnoides</i>	Shrub	-	+	-	Ph
9	Elaeagnaceae	<i>Elaeagnus angustifolia</i> L.	Tree	-	-	+	Ph
10	Grossulariaceae	<i>Ribes alpestre</i> Decne.	Shrub	-	+	-	Ph
11	Poaceae	<i>Calamagrostis decora</i> Hook. f.	Herb	+	-	-	H
12	Poaceae	<i>Cymbopogon pospischilii</i> (K. Schum.) C.E. Hubbard	Herb	+	-	-	H
13	Poaceae	<i>Cynanchum acutum</i> L.	Herb	+	-	-	H
14	Poaceae	<i>Melica persica</i> Kunth	Herb	+	-	-	H
15	Poaceae	<i>Poa sterilis</i> M. Bieb.	Herb	+	-	-	H
16	Poaceae	<i>Saccharum filifolium</i> Nees ex Steud.	Under shrub	+	-	-	Ch
17	Poaceae	<i>Panicum milliaceum</i> L.	Herb	-	-	+	H
18	Poaceae	<i>Sorghum halepense</i> (L.) Pers.	Herb	-	-	+	H
19	Rosaceae	<i>Rosa webbiana</i> Wall.exRoyle.	Shrub	-	+	-	Ph
20	Saxifragaceae	<i>Berginia stracheyi</i> Hook & Thorns.	Under shrub	-	+	-	Ch
21	Urticaceae	<i>Urtica dioica</i> L.	Herb	-	+	-	H
22	Zygophyllaceae	<i>Peganum harmala</i> L.	Under Shrub	-	-	+	Ch
23	Zygophyllaceae	<i>Tribulus terrestris</i> L.	Herb	-	-	+	H

\*Ph stands Phanerophyte, Ch= Chaemephyte, H= hemicyptophyte, (+ stands present and – shows absent),

## DISCUSSION

The biochemical and haematological parameters of animals significantly differ in factors like sex, breed and age (Çelik *et al.*, 2019; Mbassa and Poulsen, 1991). A former study indicated that six goat breeds, Pameri, Gojali, Balti (pashmina bearing), Dareli, Jerakheil and Koh-e-Ghizer are found in Gilgit-Baltistan (Naqvi and Hussain, 2009, 2010). From the above mentioned breed three goat breed Koh-e-Ghizer, Gojali, and Balti from three regions were subjected to the present study. Our findings of the mean glucose levels in goats of Ghizer region (Koh-e-Ghizer) somehow correspond to the blood glucose level previously investigated by (Turner *et al.*, 2005) in Nubian, Boer, and Spanish goats. However, slightly higher mean values were recorded for blood glucose in male and female goats of Hunza-Nagar (Gojali) and Baltistan (Balti). The results of this study are also in line with findings of (Castro *et al.*, 1977), regarding higher glucose levels in blood serum of males

than that of female goats. In a previous study, the blood glucose level of females goats was 52.82±2.51 mg/dL compared to 101.06±6.29 mg/dl in males (Çelik *et al.*, 2019). These findings are in agreement with the glucose level of male goats of Hunza-Nagar and Baltistan. Similarly, the mean values of blood glucose were reported higher in male Persian wild goats (131.78 ± 45.82 mg/dl) than that of female goats (97.36 ± 32.96 mg/dl) (Omidi *et al.*, 2018; Tahas *et al.*, 2012). Although in many previous studies such as (Mbassa and Poulsen, 1991; Singh, 2004; Randox, 2006) reported that serum glucose level does not vary with breed and sex.

In our study two regions namely Ghizer and Hunza did not differ in serum glucose content of the goat breeds, whereas the third region namely Baltistan differed significantly with the two named earlier. Overgrazing by goats could have an impact with respect of decreasing the abundance of plants (Shaukat *et al.*, 2014). A plant life-form is usually understood as a growth form that displays an obvious relationship to key environmental factors

(Mueller-Dombois and Ellenberg, 1974). There are, in Raunkiaer's classification (Raunkiaer *et al.*, 1934), five major classes, arranged according to increased protection of the buds: Phanerophyte, Chaemephyte, hemicryptophytes, cryptophytes, and therophytes (Batalha and Martins, 2002). We found only three life forms in three different regional ranges, namely Phanerophyte, Chaemephyte, and hemicryptophyte. The breakup of the life-forms in these regions was interestingly Chamaephytes were dominant with 56%, while the remaining two were same in proportion was in 21%. The difference in the serum glucose content of the goat breeders in the Baltistan region may be found due to large proportion of the palatable plant species were Chaemephyte. The details of the life forms and habit categories of the palatable species of the goat are given in the (Table-2). Ghizer region lies at northwestern and Hunza-Nagar at the north-eastern side of Gilgit-Baltistan, we assumed that both the regions might have similar environmental conditions and vegetation. Whereas, Baltistan region lies at the south-east of Gilgit-Baltistan, slightly influences by the monsoon in the south-west, having different kind environmental conditions and corresponding vegetation in high pastures. Presence of a high level of glucose in the serum of the goats in the Baltistan region indicates that animals feeding on grasses, and vascular plants have a rich content of sugars. Therefore, in turn, animal shows a significant and high amount of glucose in their blood.

**Conclusion:** This study reflects the comparison of blood glucose level in goats, fed exclusively on pasture at high altitudes of GB. Our findings indicate that glucose level is varying in both sex and districts (regions). This is the first-ever study has been conducted in this area and suggesting more studies on nutrition values and biochemical parameters of goat blood. Glucose level determine the health and vigorousness of animal, which is a contribution to healthy animal's products.

**Acknowledgement:** Many thanks to the NUFU project for financial support to carry out this research. We are also thankful to the livestock Department for their unlimited support and help during the data collection and technical support throughout the experimentation.

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