

Original Research Article

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## Studies on Haemato-biochemical Profile of Goats in Vindhyan Region of Uttar Pradesh, India

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### ABSTRACT

#### Keywords

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Haematological and biochemical variables of blood are generally used to monitor and evaluate health, nutritional and physiological status of ruminants. The present research was conducted to study haemato-biochemical profile of goats in Vindhyan region of Uttar Pradesh, India. Total 120 blood samples were collected from 120 goats. All haematological parameters taken were within the normal range except haemoglobin, which was lower side of the normal range of the males and was the less than the normal range in females. The range of haemoglobin observed was 8.01 to 8.3 in male and 6.35 to 6.85 in female animals. In females, the packed cell volume was least and significantly lower in Mirzapur district (25.66). The range of total leucocyte count varied from 18.03 to 18.07 in male and 18.00 to 18.07 in females. The value of liver function test was within normal range. There were no significant changes in Liver function test enzymes (AST, ALT and Alkaline phosphatase) and bilirubin profile of goats in different districts of Vindhyan Zone. The value of kidney function test was within normal range. Only blood urea level is slightly higher in Sant Ravidas Nagar.

### Introduction

Haematological tests are important tools for evaluation of physiological and health status of farm animals and almost indispensable in organic farming, where permitted veterinary interventions are strictly regulated and limited in scope. Haematological analyses in farm animals have been extensively discussed as an essential part of clinical examination often pointing to a specific differential diagnosis or

suggesting a prognosis (Braun *et al.*, 2010; Polizopoulou, 2010; Antunovic *et al.*, 2019).

Biochemical and haematological variables of blood are generally used to monitor and evaluate health, nutritional and physiological status of ruminants (Al-Eissa *et al.*, 2012). The evaluation of blood constituents has been widely used as a marker to determine the efficacy of feed nutrient content and supplements (Belewu and Ogunsola, 2010)

but also an index of transportation stress (Ambore *et al.*, 2009). There is a correlation between peripheral blood relation, circulating blood on tissues and organs, as well as haematopoietic organs and other body systems (Dini *et al.*, 2016).

Serum bio-chemical and haematological references constitute important panels in the diagnosis, prognosis and treatment of livestock diseases via the investigations of myriads of parameters influencing blood and serum bio- chemical indices (Yokus *et al.*, 2006).

The biochemical and haematological profiles can also be used to assess the immunity status in goats. These profiles could be altered during pregnancy (Waziri *et al.*, 2010) and seasonal variations had also an effect on these profiles. Finally, nutrition, stress, reproductive status, age, sex, genetics, management, housing, and other environmental factors (temperature, relative humidity etc.) are known to have a profound effect on the haematological and biochemical profiles of small ruminants (Olayemi *et al.*, 2009).

Haemoglobin and packed cell volume are good indicators of thermal tolerance (McManus *et al.*, 2009). Enzymes like AST and ALT are involved in amino acid metabolism and hence protein turnover. ALP is involved in energy metabolism and is an indicator of alkalosis and stress. Metabolic regulators are important in elucidating a picture of modulation in physiological mechanisms during stressed conditions and are best assessed by determining the enzymes governing various metabolic reactions in plasma or serum.

Blood composition of animal might be influenced by certain factors such as nutrition, management, and great of animals, sex, age

diseases and stress factors that might affect blood values (Alex and La Verne, 1983; Swanson *et al.*, 2004; Adegun *et al.*, 2011). The hematological and geochemical indices are an index and reflection of the effects of dietary treatment on the animals in terms of the type and amount of feed ingested and were available for the animals to meet its physiological geochemical and metabolically necessities (Altman, 1979; Awodi *et al.*, 2005; Adegun *et al.*, 2011; Antunovic *et al.*, 2019).

## **Materials and Methods**

### **Blood sample**

Based on the nature of research problem, Ex-post facto research design was followed in the present study. The Vindhyan zone of Uttar Pradesh comprises the districts of Sant Ravidas Nagar, Mirzapur and Sonbhadra. From each selected district, two blocks were selected on the basis of highest goat population. From each block two villages were selected. Total 120 blood samples were collected from 120 goats. Total 8-10 ml blood was collected from the jugular vein of all the animals in clean, dry and sterilized tubes. Out of which 5 to 6 ml of blood was subjected for harvesting of serum, which was stored at -20°C and subsequently used for biochemical studies. For assessing the biochemical parameters, SPAN Diagnostic kits was used. About 2 to 3 ml blood was stored in a glass vial containing Ethylene Diamine Tetra Acetate (EDTA) @ 1 mg/ml of blood and used for haematological studies.

### **Examination of blood samples**

#### **Estimation of hemoglobin concentration**

Haemoglobin was determined by Sahli's haemoglobin meter. Total Erythrocyte Count: (TEC): An improved Neubaur's chamber was

used for counting RBC by Baker *et al.*, (1982). Total Leukocyte Count (TLC):Neubaur's haemocytometer for counting leucocytes was used as per Baker *et al.*, (1982). Differential Leucocytes Count (DLC): Thin smear of blood were prepared and stained with Leishman's stain. Neutrophils, monocytes, eosinophils and basophils, lymphocytes, were differentiated and expressed in percent. Haematocrit or Packed Cell Volume: The analysis was done according to England *et al.*, (1972).

## Biochemical parameters

### Liver function test

**Total protein:** Peptide bonds of protein react with cupric ions in alkaline solution to form colored chelate, the absorbance of which is measured at 578 nm. The biuret reagent contains sodium potassium tartrate to complex cupric ions and maintains their solubility at alkaline P<sub>H</sub>. Absorbance data are proportional to protein concentrations.

**Albumin and Globulin:** Determination of albumin in serum or plasma is based on the binding behavior of the protein with the dye bromocresol green. At pH 3.68, Albumin acts as a cation and binds to the anionic dye, forming a green complex, the absorbance of which is measured at 630 nm.

**Bilirubin:** Serum bilirubin when reacted with diazotized sulfanilic acid (Ehrlich's Reagent), bilirubin is converted to azobilirubin molecules which give a red purple colour in acid the intensity of which is read colorimetrically. Both conjugated and unconjugated bilirubin gives purple azobilirubin with diazotized acid. Conjugated bilirubin can react in aqueous solution (Direct Reaction), whereas unconjugated requires an accelerator or solubilizer, such as methanol (Indirect Reaction-which gives total bilirubin i.e. conjugated + unconjugated bilirubin).

**SGOT/AST:** The method used for analysis is an UV-Kinetic method, based on the rate of NADH oxidation in a coupled malic dehydrogenase reaction The TC Matrix System automatically proportions the appropriate sample and reagent volumes into the cuvette. The system monitors the change in absorbance at 340 nanometers. This change in absorbance is directly proportional to the activity of aspartate aminotransferase in the sample and is used by the TC Matrix System to calculate and express aspartate aminotransferase activity.

**ALT /SGPT:** The method used here is a modification of the classical Reitman-Frankel colorimetric endpoint reaction. In this procedure ALT (SGPT) catalyzes L-alanine and a-ketoglutarate to form pyruvate and glutamate. The pyruvate is then reacted with 2 4-dinitrophenylhydrazine (2 4-DNPH-one) to form 2 4-DNPH-one. The addition of sodium hydroxide dissolves this complex allows 2 4-DNPH-ones to be measured at 505 nm.

### Kidney function test

**Blood Urea Nitrogen (Beckman Synchron Method):** The LX20 modular chemistry is used to quantitatively determine the concentration of blood urea nitrogen in serum by means of the enzymatic conductivity rate. A volume of sample is injected into the urease reagent in a reaction cup containing an electrode that responds to changes in solution conductivity. Electronic circuits determine the rate of increase in conductivity, which is directly proportional to the concentration of urea in the sample(Beckman, 2001).

**Serum creatinine:** Serum creatinine when introduced with picric acid in alkaline medium it forms creatinine picrate. The orange color can be measured calorimetrically, where the intensity of the obtained color is directly proportional to the concentration of creatinine in the sample.

**Statistical analysis:** Statistical analysis of the data was performed by using the one-way analysis of variance (ANOVA).

**Results and Discussion**

**Blood profile of goats in different districts of Vindhyan zone of Uttar Pradesh**

Mean (SEM) Blood profile of goats in different districts of Vindhyan zone of Uttar Pradesh is given in table 1.

**Hematological parameters**

All these haematological parameters were within the normal range except haemoglobin, which was lower side of the normal range of

the males and was the less than the normal range in females.

**Hemoglobin (g/dl):** The haematological parameters of goat were studied and compared for different districts of Vindhyan zone. Mean (SEM) haemoglobin (g/dl) of goat in different districts of Vindhyan zone. Male had significantly higher haemoglobin than female in the entire district. Haemoglobin of males of Sant Ravidas Nagar was significantly lower in comparison to haemoglobin of other districts of Vindhyan zone. There is a great variation in the haematological and biochemical parameters as observed between breeds of goats. In this regard it may be difficult to formulate a universal metabolic profile test for goats.

**Table.1** Mean (SEM) values of blood profile of goats in different districts of Vindhyan zone

Attribute	Sex of Goat	Sant Ravidas Nagar	Mirzapur	Sonebhadra	SEM	P Value
Hb (g/dl)	Male	8.01 <sup>b</sup>	8.3 <sup>a</sup>	8.3 <sup>a</sup>	0.1397	<.001
	Female	6.85 <sup>c</sup>	6.35 <sup>d</sup>	6.73 <sup>c</sup>		
PCV (%)	male	26 <sup>b</sup>	27.83 <sup>ab</sup>	28.66 <sup>a</sup>	0.35	0.036
	female	28.5 <sup>a</sup>	25.66 <sup>b</sup>	27.83 <sup>ab</sup>		
TEC (million/cumm)	male	7.01 <sup>a</sup>	6.95 <sup>a</sup>	7.01 <sup>a</sup>	0.041	0.948
	female	6.91 <sup>a</sup>	7 <sup>a</sup>	6.9 <sup>a</sup>		
TLC (1000/cumm)	male	18.03 <sup>a</sup>	18.02 <sup>a</sup>	18.07 <sup>a</sup>	14.16	0.689
	female	18.07 <sup>a</sup>	18.00 <sup>a</sup>	18.01 <sup>a</sup>		
MCV (fl)	male	37.07 <sup>b</sup>	40.16 <sup>ab</sup>	41.5 <sup>a</sup>	0.578	0.067
	female	40.39 <sup>ab</sup>	36.67 <sup>b</sup>	40.33 <sup>ab</sup>		
MCH (pg)	male	11.4 <sup>a</sup>	11.95 <sup>a</sup>	11.84 <sup>a</sup>	0.208	<.001
	female	9.9 <sup>b</sup>	9.01 <sup>c</sup>	9.76 <sup>b</sup>		
MCHC (g/dl)	male	30.46 <sup>a</sup>	29.93 <sup>a</sup>	29.06 <sup>a</sup>	0.588	<.001
	female	44.1 <sup>b</sup>	25 <sup>b</sup>	24.22 <sup>b</sup>		
Neutrophils (%)	male	37.33 <sup>a</sup>	36.16 <sup>a</sup>	35.83 <sup>a</sup>	0.291	0.571
	female	36.33 <sup>a</sup>	35.5 <sup>a</sup>	35.83 <sup>a</sup>		
Lymphocytes (%)	male	57.33 <sup>a</sup>	57.16 <sup>a</sup>	57.33 <sup>a</sup>	0.188	0.86
	female	56.66 <sup>a</sup>	57.5 <sup>a</sup>	57 <sup>a</sup>		
Eosinophils (%)	male	2.83 <sup>a</sup>	2.66 <sup>a</sup>	2.66 <sup>a</sup>	0.12	0.965
	female	2.83 <sup>a</sup>	3 <sup>a</sup>	2.66 <sup>a</sup>		
Monocytes (%)	male	2.83 <sup>b</sup>	3.66 <sup>b</sup>	3.83 <sup>b</sup>	0.149	0.428
	female	4.16 <sup>a</sup>	4 <sup>a</sup>	3.5 <sup>ab</sup>		
Basophils (%)	male	0	0	0	0	<.001
	female	0	0	0		

Values with different small letter subscripts in row differ between group significantly (p<0.05)

**Table.2** Mean (SEM) values of liver function test profile of goats in different districts of Vindhyan zone

Attribute	Sant Ravidas Nagar	Mirzapur	Sonebhadra	SEM	P Value
Total bilirubin (mg/dl)	0.48	0.5	0.48	0.011	0.767
Direct bilirubin (mg/dl)	0.23	0.23	0.24	0.008	0.696
Indirect bilirubin (mg/dl)	0.25	0.26	0.24	0.011	0.823
Total protein (g/dl)	5.74	5.92	5.73	0.125	0.791
Albumin (g/dl)	3.1	3.45	3.09	0.109	0.31
Globulin (g/dl)	2.67	2.75	2.95	0.096	0.477
A/Gratio	1.2	1.31	1.1	0.06	0.367
SGOT (U/L)	57.23	58.49	59.21	1.05	0.751
SGPT (U/L)	60.91	61.53	59.74	0.983	0.762
Alkalinephosphatase (U/L)	146.25	153.25	154.25	4	0.704

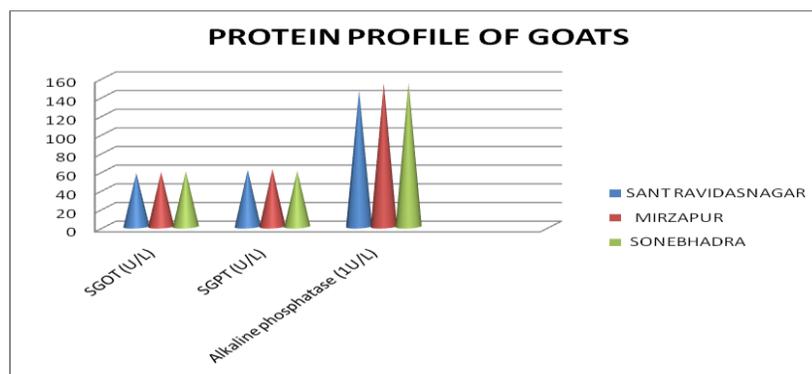
Values with different small letter subscripts in row differ between groups significantly (p<0.05)

**Table.3** Mean (SEM) values of kidney function test profile of goat in different districts of Vindhyan zone

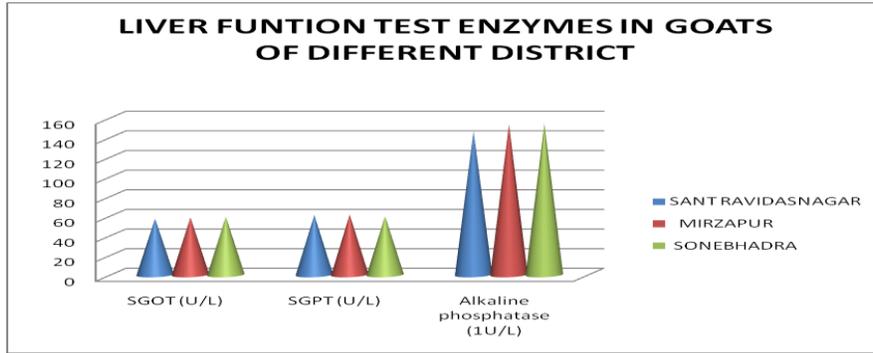
Attribute	Sant Ravidas Nagar	Mirzapur	Sonebhadra	SEM	P value
Creatinine (mg/dl)	1.42	1.45	1.4	0.048	0.89
Blood urea (mg/dl)	25.86	25.43	25	0.514	0.799
BUN (mg/dl)	12.48	12.47	12.21	0.23	0.868
Uric acid (mg/dl)	3.4	3.45	3.56	0.092	0.766
Serum Calcium (mEq/L)	7.55	7.56	7.55	0.101	0.998
Serum Phosphorus (mEq/L)	4.11	4.24	4.15	0.062	0.711

Values with different small letter subscripts in row differ between groups significantly (p<0.05)

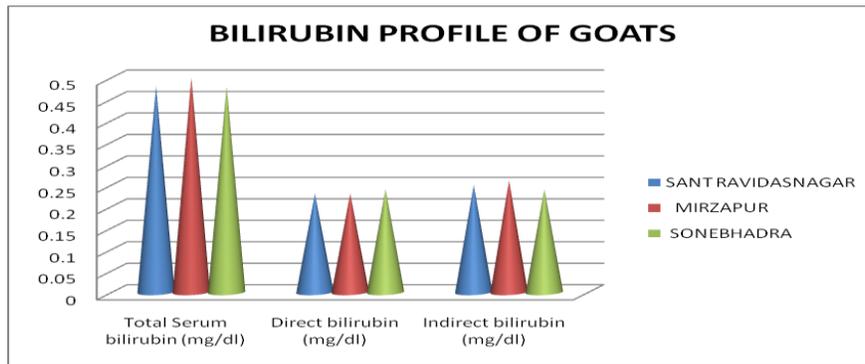
**Graph.1.1** Mean (SEM) values of protein profile of goats in different districts of Vindhyan zone



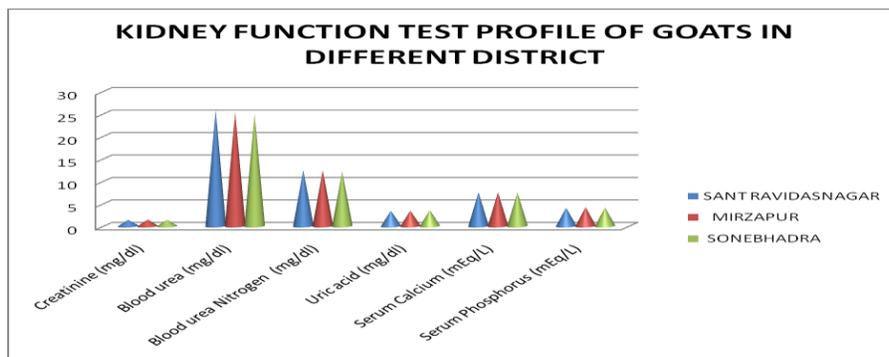
**Graph.1.2** Mean (SEM) values of liver function test enzyme in goats of different districts of Vindhyan zone



**Graph.1.3** Mean (SEM) values of bilirubin profile of goats in different districts of Vindhyan zone



**Graph.2** Mean (SEM) values of kidney function test profile of goats in different districts of Vindhyan zone



These differences have further underlined the need to establish appropriate physiological baseline values for various goats of vindhyan zone of Eastern Uttar Pradesh, which could help in realistic evaluation of the management

practice, nutrition and diagnosis of health condition. The range of haemoglobin observed was 8.01 to 8.3 in males and 6.35 to 6.85 in females.

**PCV (%):** The pack cell volume (26) in males of Santravidas nagar was significantly lower than PCV recorded in goats of Sonebhadra district. In female the PCV was least and significantly lower in Mirzapur district (25.66)

**TEC:** There was no significant difference recorded in T.E.C of male and female in different district of Vindhyan zone.

**TLC:** No significant difference recorded in TLC of male (18.07) and female (18.01) in different district of Vindhyan zone. The range varied from 18.03 to 18.07 in male and 18.00 to 18.07 in females.

**MCV:** Santravidas Nagar had least MCV which was significantly lower than the males of Sonebhadra district.

**MCH:** Significant difference of MCH of males of three districts ware of MCH of female of all the districts differ significantly.

**MCHC:** There was no significant difference in MCHC of males as against the MCH of female that differed significantly in all districts under study.

**(DLC):** The DLC value was within the normal range as described by Schalm and Jaim.

### **Liver function test profile of goats in different districts of Vindhyan zone**

Mean (SEM) Liver function test profile of goats in different districts of Vindhyan zone is given in table 2 and graph 1.1, 1.2 &1.3. The value of liver function test was within normal range. There was no significant difference in different districts of Vindhyan zone. Liver function test enzymes (SGOT, SGPT & Alkaline phosphatase) and bilirubin profile of goats was no significant difference in different districts of Vindhyan Zone.

When the helminth infected goats are in accordance with that of Knox *et al.*, (1993) who reported decrease in the total protein content in the small ruminants infected with nematode parasites. It is also reported the decrease in total protein content in goats. Teleb *et al.*, (2007) reported the decrease in total protein content in serum of Farafrasheep experimentally infected with *Fasciola gigantica*. The decrease in total protein is due to haematophagous parasites especially *Haemonchus contortus* and *Ostertagia ostertagi* which suck 0.05ml of blood/worm/day (Soulsby, 1986). The infection of liver and destruction of liver parenchyma also resulted in alteration in protein values (Mohamed, 2000; Matanovic *et al.*, 2007; Antunovic *et al.*, 2019).

### **Kidney function test profile of goats in different districts of Vindhyan zone**

Mean (SEM) Kidney function test profile of goats in different districts of Vindhyan zone is given in table 3 and graph 2. The value of kidney function test was within normal range. Only blood urea level is slightly higher in Sant Ravidas Nagar. There was no significant difference in different districts of Vindhyan zone. Serum bio-chemical and haematological references constitute important panels in the diagnosis, prognosis and treatment of livestock diseases via the investigations of myriads of parameters influencing blood and serum bio- chemical indices among which are packed cell volume (PCV), mean corpuscular volume (MCV), total blood glucose (TBG), total protein (TP), urea, creatinine, uric acid, alanine aminotransferase or alanine transaminase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), lactate dehydrogenase (LDH), creatinine kinase (CK), albumin (Alb), c- glutamyl transpeptidase (GGT), amylase, globulin, cholesterol, very low density lipoprotein (VLDL), triglyceride, folate,

vitamin A and E, triiodothyronine (T3), thyroxine (T4), free triiodothyronine (fT3) and free thyroxine (fT4) concentrations, serum retinol and  $\alpha$ -tocopherol concentration in livestock animals (Yokus *et al.*, 2006).

In conclusion biochemical and haematological variables of blood evaluate health, nutritional and physiological status of goats. The evaluation of blood constituents may be widely used as a marker to determine the efficacy of feed nutrient content and supplements. Serum bio-chemical and haematological references constitute important panels in the diagnosis, prognosis and treatment of diseases related to goats.

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### Conflict of interest

The authors report no conflict of interest.

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