



## Haemato-biochemical profile, mineral and electrolyte concentration, and antioxidant status of Zobawng cattle of Mizoram

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Received: 20 September 2019; Accepted: 27 September 2019

**Keywords:** Antioxidant, Blood biochemistry, Haematology, Mizoram, Zobawng

Mizoram, one of the north eastern states of India, comprises rocky, steep mountain ranges and interspersed valleys. The total cattle population of Mizoram is 34,803 out of which local cattle accounts for about 67%, i.e. 23,456 (Rahman *et al.* 2015). The local cattle of the state are called as Zobawng (zo means high land and bawng means cattle), i.e. cattle of hills. The non-descript (local) cattle represent 80% of the total cattle population in India (Pampori *et al.* 2015). Over the centuries these cattle have evolved through natural selection for adoption to adverse climatic conditions, disease resistance etc. Further, unlike crossbred animals, these local cattle do not require high quality feeds and sophisticated management practices. However, there is dearth of information regarding the haematology, blood biochemistry of Zobawng. Besides, the haematological and serum biochemical analytes can serve as an important tool for diagnosing different metabolic and pathological disorders that affect the overall performance of the animal (Pampori *et al.* 2015). Being an indigenous cattle, utmost importance should be given for its conservation through a thorough understanding of its normal physiological and biochemical status. Thus, the present study was undertaken to estimate the haemato-biochemical parameters of Zobawng which will be helpful for evaluating its health status.

The present study was conducted during June 2019 in 10 apparently healthy local cattle, i.e. Zobawng of 1–4 years of age. These cattle were selected randomly from remote areas of Champhai and Serchip districts of Mizoram. The indigenous characters of the animals were ascertained by morphological characterisation as per the method reported by Rahman *et al.* (2015) and inputs from the local owners of the Zobawng cattle. Blood (10 ml) were collected aseptically observing ethical aspect from each animal. Blood parameters were studied immediately after collection. Serum was separated as per the standard protocol (Stephen *et al.* 2009).

Peripheral blood film examination was performed in all 10 animals as per the method described by Adewoyin and Nwogoh (2014). Haematological examination was also carried out using Blood Cell counter (Model: MS4e Vet) of

HD Consortium India Ltd, Kolkata. The values recorded were red blood cells (RBC), white blood cells (WBC), packed cell volume (PCV), mean corpuscular volume (MCV), haemoglobin (Hb), thrombocytes, mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), lymphocytes, monocytes and granulocytes.

The biochemical parameters like glucose, total cholesterol, triglycerides, total protein, albumin, blood urea nitrogen (BUN), uric acid, creatinine, total bilirubin, direct bilirubin, gamma glutamyl transferase (GGT), alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP) and minerals like calcium, magnesium, inorganic phosphorus and electrolytes such as sodium, potassium and chloride were estimated using Automated Clinical Chemistry Analyser, Fuji Dry Chem 4000i (Fujifilm).

The total antioxidant, glutathione, superoxide dismutase and lipid hydroperoxide (LPO) levels were determined in the serum using commercial assay kit (Cayman Chemical, USA) as per the manufacturer's instructions.

Analyses of the data were done using Microsoft Office Excel 2007 software and values were expressed as mean±standard error.

### RESULTS AND DISCUSSION

All haematological parameters were within the normal range for cattle (Radostits *et al.* 2009). The values recorded for Hb, PCV, RBC and WBC were higher (Table 1) as compared to the values reported earlier in crossbred cows (Modi *et al.* 2015, Giri *et al.* 2017). Nevertheless, the haematological parameters recorded in our study were similar to the values reported in Indian Zebu cattle (Kalyani *et al.* 2018).

The concentration of different biochemical analytes in the serum (Table 2) was comparable to the values obtained in Indian Zebu cattle (Kalyani *et al.* 2018). Further, the total protein, albumin and globulin values recorded in present study were found to be similar to the earlier reported values in indigenous Kashmir cattle (Pampori *et al.* 2015). Nevertheless, total protein and globulin values recorded in our study were slightly higher than the normal value for

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cattle. The higher concentration of globulin may account for higher disease resistance of the local cattle as compared to crossbred and thus further substantiate the view that the local cattle are more disease resistant than the exotic.

The protein values altered during changes in feeding habits (Xuan *et al.* 2018); according to lactation stages and age (Bobbo *et al.* 2017) as well as some inflammatory conditions like mastitis (Zandkarimi *et al.* 2019). Further, Blood Urea Nitrogen (BUN) was higher in comparison with reference value. Dairy cattle tend to feed with more protein diet for increasing their milk production. BUN is a reflection of protein metabolism and it may fluctuate around calving and energy deficit period where there is tissue catabolism (Cheng *et al.* 2015). Further, BUN values are associated with rumen ammonia and protein catabolism and thus are good indicators of changes of nutritional status (Kalyani *et al.* 2018).

Creatinine value is a marker of kidney function and was within the normal range, but value was towards the upper limit. Our data is also in line with the earlier findings (Sreedhar *et al.* 2013, Kalyani *et al.* 2018) who reported higher serum creatinine level in crossbred cattle and Indian Zebu cattle such as Gir, Sahiwal respectively. The higher level of creatinine in Zobawng can be attributed to low heat tolerant capacity of the animal and muscle mass as well. GGT value was above the normal range for cattle. Minimal

Table 1. Haematology of Zobawng cattle (Mean±SE)

Parameter	Value
Hb (g/dL)	12.61±0.40
PCV (%)	43.36±0.99
RBC (10 <sup>6</sup> /μL)	9.10±0.50
MCV (fL)	48.54±2.12
MCH (pg)	13.99±0.55
MCHC (g/dL)	28.98±0.35
Thrombocytes (10 <sup>3</sup> )	137.44±16.69
WBC (10 <sup>3</sup> /μL)	11.52±1.13
Granulocyte (%)	36.51±1.53
Lymphocyte (%)	58.10±1.81
Monocyte (%)	6.62±0.28

Table 2. Serum biochemistry of Zobawng cattle (Mean±SE)

Parameter	Value
Glucose (mg/dL)	52±1.75
Total cholesterol (mg/dL)	101.22±4.25
Triglycerides (mg/dL)	12.11±1.86
Total protein (g/dL)	8.30±0.17
Albumin (g/dL)	3.52±0.10
BUN (mg/dL)	10.68±0.68
Uric acid (mg/dL)	1.01±0.05
Creatinine (mg/dL)	1.96±0.10
Total bilirubin (mg/dL)	0.23±0.03
Direct bilirubin (mg/dL)	0.10±0.00
GGT (U/L)	19.22±1.29
ALT (U/L)	24.89±1.01
AST (U/L)	93.44±10.11
ALP (U/L)	92.33±8.07

changes in GGT level without associated disturbances may be considered as normal and increased values or fluctuations in GGT can be observed according to age and sex in healthy animals (Kataria and Kataria 2012).

The mean values for the serum minerals and electrolytes are presented in Table 3. The values recorded for calcium, magnesium and inorganic phosphorus in present study were higher than the normal value of cattle and also higher than the Indian Zebu cattle (Kalyani *et al.* 2018). Sreedhar *et al.* (2013) also reported higher serum calcium and phosphorus level in crossbred cows. Being adopted in cold climate of Mizoram, overproduction of parathormone stimulated by heat owing to its low heat tolerant capacity may be the reason for its higher calcium level in serum. The higher serum phosphorus level can be ascribed to muscular contractions due to heat stress resulting in deranged carbohydrate metabolism.

Table 3. Minerals and electrolytes of Zobawng cattle (Mean±SE)

Parameter	Value
Calcium (mmol/L)	9.78±0.13
Magnesium (mmol/L)	2.43±0.07
Inorganic phosphorus (mmol/L)	6.76±0.27
Sodium (mmol/L)	136.44±0.82
Potassium (mmol/L)	5.56±0.37
Chloride (mmol/L)	102.44±1.06

The mean values of different antioxidants such as glutathione, superoxide dismutase and total antioxidant status as well as the lipid peroxidation is presented in Table 4. Superoxide dismutase catalyzes the dismutation of superoxide radicals into hydrogen peroxide and molecular oxygen and glutathione plays an important role in protecting cells against oxidative stress and toxic agents (Celi 2010). Lipid peroxidation is one of the important consequences of oxidative stress (Konviěná *et al.* 2015). In the present study, the total antioxidant was on higher side and the oxidative stress index was lower. This indicates that these cattle are less susceptible different metabolic and production diseases.

The objective of the study was to assess the haemato-biochemical profile, mineral and electrolyte concentration and oxidant-antioxidant status of the indigenous cattle (Zobawng) of Mizoram. The haematological parameters like Hb, RBC, WBC, PCV and serum biochemical parameters such as total protein, globulin and BUN, were on higher side than the exotic cattle breeds. Creatinine and GGT were

Table 4. Oxidant-Antioxidant status of Zobawng cattle (Mean±SE)

Parameter	Value
Total antioxidant (mM Trolox equivalents)	8.66006874±0.133953
Glutathione (GSH) (μM)	0.85248903±0.035453
Superoxide dismutase (U/mL)	34.90118±5.018968
Lipid hydroperoxide (LPO) (μM)	1.330514±0.153134

also on higher side. Further, the minerals like calcium, magnesium and inorganic phosphorus values were higher than exotic breeds and Indian Zebu cattle. Total antioxidant was higher and the oxidative stress index was lower as compared to the crossbred or exotic cattle.

#### SUMMARY

Blood biochemical profile plays a pivotal role in assessing health status of animals. The present study was conducted to evaluate haematological and biochemical parameters, trace element and electrolyte concentration, oxidant and antioxidant status in local cattle (Zobawng) of Mizoram. The values recorded for Hb ( $12.61 \pm 0.40$  g/dL), RBC ( $9.10 \pm 0.50 \times 10^6/\mu\text{L}$ ), WBC ( $11.52 \pm 1.13 \times 10^3/\mu\text{L}$ ), PCV ( $43.36 \pm 0.99\%$ ), total protein ( $8.30 \pm 0.17$  g/dL), globulin, BUN ( $10.68 \pm 0.68$  mg/dL) were on higher side than the exotic cattle breeds. Creatinine ( $1.96 \pm 0.10$  mg/dL) and GGT ( $19.22 \pm 1.29$  U/L) were also towards upper limit. Calcium ( $9.78 \pm 0.13$  mmol/L), magnesium ( $2.43 \pm 0.07$  mmol/L) and inorganic phosphorus ( $6.76 \pm 0.27$  mmol/L) values were higher than the exotic breeds and also higher than the Indian Zebu cattle. Total antioxidant was higher and the oxidative stress index was lower as compared to the crossbred or exotic cattle. This study provides first insight into the blood biochemistry of these indigenous cattle indicating its higher disease resistance and will be useful for its better management.

#### ACKNOWLEDGEMENTS

The authors thank the authorities of Central Agricultural University (Imphal) for providing facility for conducting this research work.

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