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

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Mizoram, one of the north eastern states of India, comprises the 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 bawn 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 haematological and 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 Champai 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 the 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...
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 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.

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 (Konvièná 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 haematobiochemical profile, mineral and electrolyte concentration and antioxidant-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 higher.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb (g/dL)</td>
<td>12.61±0.40</td>
</tr>
<tr>
<td>PCV (%)</td>
<td>43.36±0.99</td>
</tr>
<tr>
<td>RBC (10⁶/μL)</td>
<td>9.10±0.55</td>
</tr>
<tr>
<td>MCV (fL)</td>
<td>48.54±2.12</td>
</tr>
<tr>
<td>MCH (pg)</td>
<td>13.99±0.55</td>
</tr>
<tr>
<td>MCHC (g/dL)</td>
<td>28.98±0.35</td>
</tr>
<tr>
<td>Thrombocytes (10⁵)</td>
<td>137.44±16.69</td>
</tr>
<tr>
<td>WBC (10⁶/μL)</td>
<td>11.52±1.13</td>
</tr>
<tr>
<td>Granulocyte (%)</td>
<td>36.51±1.53</td>
</tr>
<tr>
<td>Lymphocyte (%)</td>
<td>58.10±1.81</td>
</tr>
<tr>
<td>Monocyte (%)</td>
<td>6.62±0.28</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Glucose (mg/dL)</td>
<td>52±1.75</td>
</tr>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>101.22±4.25</td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>12.11±1.86</td>
</tr>
<tr>
<td>Total protein (g/dL)</td>
<td>8.30±0.17</td>
</tr>
<tr>
<td>Albumin (g/dL)</td>
<td>3.52±0.10</td>
</tr>
<tr>
<td>BUN (mg/dL)</td>
<td>10.68±0.68</td>
</tr>
<tr>
<td>Uric acid (mg/dL)</td>
<td>1.01±0.05</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>1.96±0.10</td>
</tr>
<tr>
<td>Total bilirubin (mg/dL)</td>
<td>0.23±0.03</td>
</tr>
<tr>
<td>Direct bilirubin (mg/dL)</td>
<td>0.10±0.00</td>
</tr>
<tr>
<td>GGT (U/L)</td>
<td>19.22±1.29</td>
</tr>
<tr>
<td>ALT (U/L)</td>
<td>24.89±1.10</td>
</tr>
<tr>
<td>AST (U/L)</td>
<td>93.44±10.11</td>
</tr>
<tr>
<td>ALP (U/L)</td>
<td>92.33±8.07</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium (mmol/L)</td>
<td>9.78±0.13</td>
</tr>
<tr>
<td>Magnesium (mmol/L)</td>
<td>2.43±0.07</td>
</tr>
<tr>
<td>Inorganic phosphorus (mmol/L)</td>
<td>6.76±0.27</td>
</tr>
<tr>
<td>Sodium (mmol/L)</td>
<td>136.44±0.82</td>
</tr>
<tr>
<td>Potassium (mmol/L)</td>
<td>5.56±0.37</td>
</tr>
<tr>
<td>Chloride (mmol/L)</td>
<td>102.44±1.06</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total antioxidant (mM Trolox equivalents)</td>
<td>8.66006874±0.133953</td>
</tr>
<tr>
<td>Glutathione (GSH) (μM)</td>
<td>0.85248903±0.035453</td>
</tr>
<tr>
<td>Superoxide dismutase (U/mL)</td>
<td>34.901185±0.018968</td>
</tr>
<tr>
<td>Lipid hydroperoxide (LPO) (μM)</td>
<td>1.330514±0.153134</td>
</tr>
</tbody>
</table>
also on higher side. Further, the minerals like calcium,
magnesium and inorganic phosphorus values were higher
than exotic breeds and Indian Zebu cattle. Total antioxidative
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±0.40 g/dL), RBC (9.10±0.50
10⁶/μL), WBC (11.52±1.13 10³/μL), PCV (43.36±0.99%),
total protein (8.30±0.17 g/dL), globulin, BUN (10.68±0.68
mg/dL) were on higher side than the exotic cattle breeds.
Creatinine (1.96±0.10 mg/dL) and GGT (19.22±1.29 U/L)
were also towards upper limit. Calcium (9.78±0.13 mmol/
L), magnesium (2.43±0.07 mmol/L) and inorganic phosphorus (6.76±0.27 mmol/L) values were higher than
the exotic breeds and also higher than the Indian Zebu cattle.
Total antioxidiant 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.

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