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Serum Profiles And Prevalence of Blood Protozoa And Gastrointestinal Parasites of Red Chittagong Cattle in Bangladesh

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ABSTRACT: *A study was conducted to determine the biochemical profiles and prevalence of Red Chittagong Cattle and local cattle in 5 regions of Chattogram state. All the serum values were within the normal limit, except the level of magnesium was found significantly higher in Red Chittagong heifer than a local heifer. Within the same breed, calcium showed significant (P <0.05) variation between cow and heifer. In both Red Chittagong and local cattle, all the values were found to decrease with the advancement of age except the values of magnesium. The prevalence of Fasciola spp., Paramphistomum spp., Oesophagostomum spp., Bunostomum sp., Haemoncus sp., Trigostrongylus sp., Tapeworm, Coccidial oocysts, B.coli, Babesia sp., Anaplasma sp., Theileria sp. were higher in local cattle than Red Chittagong Cattle.*

Keywords: *Red Chittagong Cattle, Local Cattle, Serum profiles, Parasitic prevalence.*

I. INTRODUCTION

About 90% of the cattle population of the country is zebu type, which is known as low producing indigenous cattle. While at present many crossbred cattle are available throughout the country, but there are few original varieties of cattle localized in some areas in Bangladesh. They also have better performance compared to other available indigenous cattle. The Red Chittagong Cattle (RCC) is one of such varieties of cattle, which are usually found in Chittagong district and Chittagong Hill Tract at varying concentrations but are rare in other parts of Bangladesh. In a study, it has been reported that the RC cattle require lower input support than other indigenous cattle with high-quality milk and beef production [1]. The production performances of indigenous cattle like RC cattle are not as high as those of the crossbred animals reared in the country, but it is easy to be adopted by the existing farming system and harsh environmental circumstances. Alongside good management issues, disease resistance is a significant factor to gain maximum benefit from the RC cattle reared in Bangladesh. This genotype has some positive characters, like early maturity, short post-partum heat period, high conception rate, etc. But now some cases, these RC cattle show delayed maturity, long post-partum heat period & low conception rate due to poor nutrition, mainly protein, vitamins & minerals. Metabolic status partially helps to find out the causes of the above problems. To detect metabolic status, blood chemistry is a vital diagnostic aid. It is, therefore, essential that its application should be based on firm scientific foundations. The uses of certain blood parameters as indicators of the physiological, nutritional, metabolic, and clinical status of farm animals are gaining a wider application. The Compton Metabolic Profile Test (CMPT) is only one approach to this. CMPT is not a primary nutritional test, but it is the index of nutritional status [2]. The blood biochemical constituents of many indigenous breeds of cattle have been reported by many researchers. However, the blood biochemical constituents of RC cattle and Local cattle in the Chittagong region have not yet been studied.

Parasitic diseases are responsible for significant losses through morbidity and mortality in cattle in Bangladesh. Parasitism is the major cause hindering the development of the livestock population in the country [3]. Several studies have indicated the incidence of different parasitic diseases and their seasonal prevalence of cattle in Bangladesh [4], [5]. These parasitic infections are more severe in younger animals than in adults. Fasciolosis is reported to be one of the important diseases of cattle and small ruminants in the country [6]. Similarly, gastrointestinal nematodes are also serious problems for ruminants, especially young animals. Previous reports suggest that 50% of calves up to 1 year of age died due to gastrointestinal parasites that cause digestive disturbances and malnutrition, leading to calf mortality [7]. Different helminth infections are responsible for about 54.22% of calf mortality in Bangladesh. Strongyles are another harmful group of bovine parasites due to their feeding habit or development process in the digestive system [3]. The prevalence of blood protozoa in animals and birds of Bangladesh also has been reported by several authors [8], [9], [10]. They are the common anemia-producing agents in indigenous cattle, causing great economic losses to the farmers of Bangladesh. It was recorded that *Trypanosoma theileri* was prevalent in 5 out of 857 cattle in different parts of Bangladesh [11]. Another study revealed that bovine babesiosis, caused by *Babesia bigemina*, which is transmitted by the tick *Boophilus microplus*, is widespread in Bangladesh [9]. There were

several other studies where bovine babesiosis was reported in different parts of the country [10], [12]. The present study was, therefore, undertaken to determine the serum calcium, inorganic phosphorus, and magnesium level and parasitic prevalence of GI parasites and blood protozoan and also find out the variation between RC cattle and Local cattle.

II. MATERIALS AND METHODS

The experiment was conducted in RC cattle concentrated area in the Chittagong district. Serum samples were examined at the laboratory under the Department of Physiology, Biochemistry, and Pharmacology in Chattogram Veterinary and Animal Sciences University (CVASU). The samples were collected from Potia, Anowara, Chandanish, Satkania, and Raojan areas. A brief description of the methodology followed are portrayed below.

A. Experimental design

Samples were collected from different upazillas **I.**of Chittagong district, having concentrated RC cattle and Local cattle. Stratified random sampling was followed to select animals of different ages. The selections for the research were performed by a well-developed questionnaire.

B. Number of samples

A total number of 150 (N=150) samples of RC Cattle and Local cattle from different selected upazillas were collected for the study. Among these, 75 were collected from RC cattle and 75 from Local cattle.

C. Selection of Animal

The RC cattle and Local cattle of various age groups, calves, heifers, and adult cows were selected for the study. Randomized sampling was followed for the selection of animals. Twenty-five samples were collected from each age group and from each species.

D. Time duration

The study was conducted for a one-year-long period from July 2009 to June 2010.

E. Location of Laboratory

The tests for biochemical parameters determination were performed in the Biochemistry laboratory of CVASU. Before starting the biochemical analyzer, the entire instruments were cleaned thoroughly with water and then dry with air. The autoanalyzer was trialed three times before final running.

F. Collection of blood and separation of sera

A total of 150 blood samples were drawn from the jugular vein with the help of a vacutainer without anticoagulant for serum separation. Approximately 5 ml of whole blood was drawn from each animal in serum-separator tubes (BD Vacutainer; NJ, USA) by venipuncture. Samples were collected in the morning, and however, due to the number of animals being processed, the collection time varied slightly. Samples were also collected from animals randomly ordered on the particular collection day and kept in a rack after labeling of age and sex, and put in the icebox until sent to the laboratory. After the formation of serum, it was separated manually by using the sterilized syringe. Then the separated serum samples were centrifuged at 3000 rpm for 10 minutes to obtain clear serum. Finally, centrifuged serum was taken in a clean Eppendorf tube and labeled according to the same way.

G. Storage of sample

The obtained serum samples were stored in the deep freeze at -20°C with capped sterile Eppendorf tube until analysis.

H. Analytical Procedures

Calcium, inorganic phosphorus, and magnesium of the serum were analyzed in a biochemical analyzer (Model: PLD-951/951A/951B). Different diagnostic kits were used for the evaluation of these samples as per instructions given by the manufacturer.

I. Examination of blood smears

Blood samples were examined in the laboratory. One drop of blood was taken on the microscopic slide (as direct smear) from each animal's sample, and a thin smear was made, fixed with ethanol for 10 minutes, and stained with Giemsa stain. The stained blood smears were examined under the microscope at X40 and X100, respectively.

J. Collection of fecal samples

A total of 150 fecal samples were collected from RCC and local cattle aseptically following ethical consideration. Fecal samples of approximately 10 gm were collected directly from the rectum using gloves and stored in a small jeep lock plastic bag filled with 10% formalin. Gross examinations of fecal samples were done. Each sample was brought to the parasitology laboratory, CVASU, for further examination.

K. Examination of fecal samples

Beyond the physical examination of faeces samples (color, odor, consistency), direct smear [13] and floatation technique [14] were followed to detect the parasitic eggs, ova, cyst tapeworm segments, and larvae in the fecal materials.

L. Statistical analysis

At first, raw data were organized by using a computer Excel program and then analyzed by using SPSS(15.5) statistical program for one way analysis of variance (ANOVA) and LSD (Least Significant Differences) was done to know the differences among the groups and breeds of cattle; means at 5% level of significance [15].

III. RESULTS AND DISCUSSIONS

The serum profile and parasitic prevalence obtained from the study are furnished in Table 1, Table 2, and Table 3. In this study, the serum calcium level in RC cow (10.26±.57) was higher than the local cow (9.928±.53) without any significant variation, and such value of calcium was higher

than the result of Shrikhande [16] and Doornenbal [17]. Doornenbal [17] also found lower serum

Calcium in incases of Shorthorn heifers (7.12 mg/dl) than the present findings. There was no significant difference between the breeds. Local calf possessed lower serum calcium (10.88±.46) than RC calf (11.64±.42) without significant difference. Both values were in closed proximate to 11.08±0.67 mg/dl as reported by Coles [18]. Doornenbal [17] recorded a lower value in Shorthorn Calf. Within the same breed, significant variation was only found in serum calcium between the RC cow and RC calf. But in other age groups, the variation was not notable in both breeds. This result showed that calcium levels in the blood decreased with the advancement of age. Doornenbal [17] stated similar findings in Shorthorn breed.

The result of inorganic phosphorus in RC cow (5.94±.33) and local cow (5.67±.34) had no significant difference but merely similar to the findings of Roy [20]. Shrikhande [16] reported a lower value of Indian cattle in the same season. Doornenbal [17] also stated lower value in Shorthorn cows. In the case of the heifer, this level was higher in local (6.70±.30) than RC (6.14±.32), but Roy [19] reported an intermediate value. On the other hand, Doornenbal [17] stated lower (5.57 mg/dl) serum phosphorus in Shorthorn heifer than both breeds.

In this study, serum magnesium level in RC cow and Local cow was 2.98±.133 (mg/dl) and 2.90±.122 (mg/dl) respectively. Coles [18] and Kumar [20] reported a bovine serum magnesium level which was 2.05±0.32 mg/dl. Serum magnesium in RC heifer, Local heifer, RC Calf, and Local Calf was 3.21±.182 (mg/dl), 2.65±.104 (mg/dl), 3.03±.139 (mg/dl) and 3.00±.133 (mg/dl) respectively. The value was significantly higher in the Local heifer than the local calf.

Table 1: Determinants of serum calcium, inorganic phosphorus, and magnesium of Red Chittagong Cattle and Local Cattle

Age group	**Calcium (mg/dl)** (Mean±Std)		**Inorganic Phosphorus (mg/dl)** (Mean±Std)		**Magnesium (mg/dl)** (Mean±Std)	
	RC cattle	**Local cattle**	**RC cattle**	**Local cattle**	**RC cattle**	**Local cattle**
Cow	10.26±.57[a]	9.928±.53	5.94±.33	5.67±.34[a]	2.98±.13	2.90±.12
Heifer	10.51±.47	10.71±.38	6.14±.32	6.70±.30[a]	3.21±.18[a]	2.65±.10
Calf	11.64±.42[a]	10.88±.46	6.71±.33	6.83±.31[a]	3.03±.14	3.00±.13

**Superscript within the same row and same column indicate significant difference.

This result in calf had no significant variation. Within the same breed, significant variation existed among the Local age groups (cow, heifer & calf) only. The serum concentration of phosphorus decreased along with the advancement of age. Such a result was strongly in agreement with the findings of Doornenbal [17] and Roy [19].

The table portrays that the level of serum calcium, inorganic phosphorus, and magnesium of RC and local cattle. Among the detected values, calcium had significant (P<0.05) variation between RC cow and RC calf, but other values showed nonsignificant variations within the same breed. The tested value also showed insignificant variation between breeds in relation to age. RC and local cattle breeds had different age variations. Inorganic phosphorus of local breed had no significant (P <0.05) variation.

Table 2: Seasonal incidences of blood protozoa and GI parasites in RC cattle and Local cattle

Species of parasites	**RC cattle (n=75)**			**Indigenous cattle (n=75)**		
	Summer	**Rainy**	**Winter**	**Summer**	**Rainy**	**Winter**
Fasciola sp.	0.01±0.01	0.03±0.02	-	0.04±0.02[CI]	0.15±0.04[CI]	0.07±0.03
Paramphistomum sp.	0.08±0.03[RC]	0.17±0.04[RC]	0.13±0.04	0.21±0.05[IC]	0.07±0.03[IC]	0.09±0.03
Oesophagostum sp.	0.01±0.01	0.04±0.02	0.01±0.01	0.01±0.01	0.05±0.03	0.03±0.02
Bunostomum sp.	-	0.01±0.01	0.01±0.01	0.04±0.02	0.05±0.03	0.05±0.03
Hemoncus sp.	0.01±0.01	0.01±0.01	0.01±0.01	0.03±0.02	0.04±0.02	0.03±0.02
Cooperia sp.	-	-	-	0.01±0.01	0.03±0.02	0.01±0.01
Tricostrongylus sp.	-	-	0.01±0.01	-	0.01±0.01	0.01±0.01
Tape worm	0.01±0.01	0.01±0.01	0.02±0.02	0.04±0.02	0.05±0.03	0.05±0.03
Coccidal Occyts	-	0.05±0.03	0.07±0.03	0.11±0.04	0.05±0.03	0.09±0.03
B. coli	0.05±0.03	0.12±0.04	0.08±0.03	0.12±0.04	0.21±0.05[CI]	0.08±0.03[CI]
Babesia sp.	-	-	0.04±0.02	0.04±0.02	0.05±0.03	0.01±0.01
Anaplasma sp.	0.24±0.05 [R]	0.12±0.04[R]	0.12±0.04[R]	0.24±0.05 [I]	0.20±0.05 [I]	0.09±0.03[I]
Theileria sp.	-	-	0.05±0.03	-	-	-

**Superscript in the same row indicates a significant difference at 1% level.

The table depicts the seasonal incidence of blood protozoa and GI parasites in RC cattle and local cattle. In general, overall parasitic prevalence (blood protozoa and gastrointestinal parasites) was higher in local cattle than RC cattle during summer, rainy, and winter seasons. Incidence of *Fasciola sp.* and *Pramphistomum sp.* were significantly higher during summer and rainy season in both RC and local cattle. *Cooperia sp.* was found only in local cattle. Prevalence of Babesiosis and Theileriosis were found during the winter season in the case of RC cattle, whereas babesiosis in local cattle was found throughout the year. *Anaplasma sp.* was found in all three seasons. It can be concluded that local cattle are more prone to parasitic infestation than RC cattle.

Table 3: Seasonal incidence of trematode, nematode, cestode, GI protozoa, and blood protozoan parasites in RC and Local cattle

Group of parasites	RC cattle (n=75)			Indigenous cattle (n=75)		
	Summer	Rainy	Winter	Summer	Rainy	Winter
Trematode	0.09±0.03^{RC}	0.20±0.05 ^{RC}	0.13±0.04	0.25±0.05^{IC}	0.21±0.05	0.16±0.04^{IC}
Nematode	0.03±0.02	0.07±0.03	0.05±0.03	0.09±0.03 ^{IC}	0.19±0.05^{IC}	0.13±0.04
Cestode	0.01±0.1	0.01±0.1	0.03±0.02	0.04±0.02	0.05±0.03	0.05±0.03
Gut protozoa	0.05±0.03^{RC}	0.17±0.04^{RC}	0.15±0.04	0.23±0.05	0.27±0.05^{IC}	0.17±0.04^{IC}
Blood protozoa	0.24±0.05 ^{RC}	0.12±0.04^{RC}	0.21±0.05^{RC}	0.28±0.05	0.25±0.05^{IC}	0.11±0.04^{IC}

**Superscript in the same row indicates a significant difference at 1% level.

The table shows the seasonal incidence of trematode, nematode, cestode, GI protozoa, and blood protozoa in RC and Local cattle. The prevalence of trematode between two breeds (RC cattle and local cattle) had a significant difference. But within the breed in RC cattle prevalence of parasitic infestation were significantly higher between the summer and rainy seasons. On the contrary, in indigenous cattle, significant variation was found between the summer and winter seasons. The prevalence of nematode between the breed significantly differed in the rainy season, and within the indigenous cattle, significant variation of parasites was found between summer and rainy seasons. The prevalence of *B. coli* between the breed was differed significantly in summer and in the rainy season. But within the breed, there was significant variation found in all seasons in RC cattle and in indigenous cattle. The prevalence of hemoprotozoan parasites between breeds was varied significantly in the rainy and winter seasons. But within the breed, there was found significant variation in all seasons in both RC cattle and Local cattle.

IV. CONCLUSION

From the above result, it is clear that there was no remarkable variation in serum metabolites between RC cattle and Local cattle. All the values were within the reference level except calcium showed significant (P <0.05) variation between RC cow and RC calf. Serum inorganic Phosphorus of the local breed had significant (P <0.05) variation between cow and heifer or calf. In both RC cattle and Local cattle, all values were found to decrease with the advancement of age. The parasitic infestation rate in cattle is higher in all the seasons, though seasonal variations (summer, rainy, and winter) were distinct. So regular de-worming should be continued to protect the RC population for conservation.

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