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Comparative studies on biochemical profile of apparently healthy jersey cross-bred cows and graded Murrah buffaloes in Proddatur region of Andhra Pradesh

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Abstract

Biochemical profile is essential in the evaluation of the health status of animals and is a prerequisite for the diagnosis of various pathophysiological, metabolic and nutritional disorders in dairy animals. A very less amount of data is available on the biochemical parameters of the dairy animals maintained in and around Proddatur region of Andhra Pradesh. Therefore, the present study was undertaken to estimate the various biochemical parameters of apparently healthy Jersey cross-bred cows and graded Murrah buffaloes in Proddatur region of Andhra Pradesh during Kharif season. A total of 24 blood samples were analyzed in both Jersey cross-bred cows and graded Murrah buffaloes for various biochemical parameters. The concentration of total cholesterol (mg/dl) and calcium (mg/dl) were found to be significantly different between Jersey cross-bred cows (Group I) and graded Murrah buffaloes (Group II) ($p < 0.05$). No significant difference was found in the concentrations of Total protein (g/dl), Albumin (g/dl), Creatinine (mg/dl), Urea (mg/dl), Triglycerides (mg/dl), Phosphorus (mg/dl), Glucose (mg/dl), AST (IU/L) and ALT (IU/L) between the two groups. These values obtained can serve as baseline values for Jersey cross-bred cows and graded Murrah buffaloes of this particular region during the availability of abundant green fodder and also for the comparison with the animals maintained during peak summer.

Keywords: base-line values, biochemical profile, jersey cross-bred cows, graded murrah buffalo, balanced diet, green fodder availability

Introduction

Cross bred cattle and graded buffaloes are being preferred in India because they produce more milk per animal, yield higher income and also give provision for high value food (Singh CV., 2016) [20]. But there are certain limitations with cross bred cows and graded buffaloes compared to the non-descriptive ones in terms of demand for better infrastructure, higher input requirement and higher demand for health care (Shiferaw *et al.*, 2005) [19]. In dairy cattle farming, it is critical to identify and monitor health status and disease incidence. Relying on reference intervals from other countries or regions may lead to inappropriate clinical management of animals and an underestimation or overestimation of disease. Studies had also shown that the values of these parameters once obtained cannot remain standard forever and needs re-evaluation from time to time (Kieferndorf and Keller., 1990; Kollakowski and Keller., 1990; Sommer and Styrie., 1990) [12, 13, 21].

The interaction of the host with air, water and soil is multifactorial depending on the type of the fodder fed to the animals, soil composition, quality of water used for agricultural purposes, type of mineral mixture or concentrate feed used, the gaseous composition of the air and the micro-environment in which the animal lives, which can make a significant difference in the biochemical parameters of the animals maintained in specific geographic areas. Seasonal variations also alter the biochemical and hematological parameters (Radkowska I and Herbut E 2014; Sharma MC *et al* 2002; Sorathiya LM 2015; Sahoo J *et al* 2017; Garkal RA *et al* 2016; Pandey P *et al* 2017; Khan R *et al* 2012; Varra M *et al* 2017; Chand N *et al* 2017; Chaudhary SS *et al* 2015; Ganaie AH *et al* 2013; Mazzullo G *et al* 2014) [16, 18, 22, 17, 6, 15, 11, 25, 3, 4, 5, 14]. Further, there exists difference between the cattle and buffaloes with respect to the utilization of feed. Buffaloes have better digestive ability than cattle to utilize poor quality roughage and they also degrade crude protein and protein free dry matter better than cows (Terramocchia *et al.*, 2000) [24].

With this background, the present study was planned to estimate the various biochemical parameters of apparently healthy Jersey cross-bred cows (Group I) and graded Murrah buffaloes (Group II) and also to compare the metabolic profile between both the groups. The

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determination of these blood metabolites could then aid in exploring the differences in the metabolism of both the groups of animals and their organ function during the particular season.

Materials and methods

The present study was conducted on apparently healthy, lactating Jersey cross bred cows (Group I) and graded Murrah buffaloes (Group II) of 5-6 years of age. Animals maintained in the Livestock farming complex (LFC), College of veterinary science, Proddatur, various semi-organized farms in and around proddatur region of Andhra Pradesh were included in the study. The study was conducted during kharif season, where there was availability of abundant green fodder. These animals were fed with a balanced ration including fresh green fodder, paddy straw and concentrates. Water was provided at *ad libitum*.

A total of 24 blood samples each from Jersey cross bred Cows (Group I) and graded Murrah buffaloes (Group II) were collected from jugular vein using 16G needle in the heparinized vacutainers. Serum sample was also collected with the help of blood clot activator vials. Serum and plasma (whole blood collected in sodium fluoride vials was used for glucose estimation) was separated from the samples and analysed for various biochemical parameters using U.V – visible spectrophotometer of Eppendorf. Serum enzymes – ALT & AST were analysed immediately followed by Total Protein, Albumin, Urea, Creatinine, Glucose, Total Cholesterol, Triglycerides, Calcium and Phosphorus using commercial kits from ERBA company. The completely randomized design method was followed for the experiment and the data collected were analysed statistically (Zimmerman and Donald, 1997) [26] and expressed at 95% level of confidence as Mean and Standard Error.

Results and Discussion

The mean /average levels of blood biochemical parameters in Jersey Cross-bred Cows (Group I) in comparison to graded Murrah buffaloes (Group II) were listed in Table 1. The average concentrations of blood biochemical parameters in cows available in certain standard reference books were listed in Table 2. The results revealed significant variation in serum enzymatic levels of Total Cholesterol and Calcium between Jersey cross bred cows and graded Murrah buffaloes. Jhambh *et al* 2016 [8] also reported a significant difference between the serum concentrations of Total Cholesterol among cows and buffaloes maintained in unorganized farms in Hisar district of Haryana. Kapale *et al.*, 2008 [10] reported average serum concentrations of total cholesterol as 195.26±11.90 mg/dl in adult Gaolao cows of Vidarbha region. Sreedhar *et al* 2013 [23] reported that, Jersey cross-bred cows maintained in tropical environment showed serum calcium levels of 14.77±0.35 mg/dl. Total cholesterol and calcium concentrations in serum of lactating Egyptian buffaloes were found to be 57.22±10.14 and 4.55±0.21 respectively (Ashmawy 2015) [2].

Average concentration of phosphorus in serum of Jersey cross bred cows was found to be 8.04±0.33 mg/dl. Whereas, the concentration of phosphorus in serum of graded Murrah buffaloes was found to be 7.97±0.22 mg/dl with a no significant difference between the two groups. The results are in agreement with Jhambh *et al* 2016 [8] who found no significant differences between serum phosphorus

concentrations of cows and buffaloes. Sreedhar *et al* 2013 [23], reported an average phosphorus concentration of 8.35±0.10 mg/dl in Jersey cross bred cows maintained in tropical environment. Hagawane *et al* 2009 [7] reported an average serum phosphorus concentrations of 6.55±0.28 mg/dl and 5.18±0.44 mg/dl respectively in healthy control animals and buffaloes in mid-lactation respectively.

There was found to be no significant difference between the plasma concentration of glucose between both the groups (54.91±2.55 mg/dl in Jersey cross bred cows and 50.16±3.88 mg/dl in graded murrah buffaloes) in the present study which is again in agreement with the findings of Jhambh *et al* 2016 [8] (47.24±2.88 mg/dl in cattle and 45.75±1.14mg/dl in buffaloes) Hagawane *et al* 2009 [7] reported an average plasma Glucose concentrations of 50.06±0.57 mg/dl and 48.22±2.81 mg/dl respectively in healthy control animals and buffaloes in mid-lactation respectively. In lactating Egyptian buffaloes an average glucose concentration of 49.17±2.16 was reported by Ashmawy 2015 [2]. Whereas, Sreedhar *et al* 2013 [23], reported that the average glucose concentration of Jersey cross bred as 72.31±0.96mg/dl. With respect to the serum concentrations of Triglycerides, no significant difference was found between both the groups (37.45±4.63 mg/dl in Jersey cross bred cows and 35.16±4.83 mg/dl in graded murrah buffaloes) in the present study which is again in agreement with the findings of Jhambh *et al* 2016 [8] (13.73±2.75 mg/dl in cattle and 13.55±0.74 mg/dl in buffaloes). A higher average concentration of serum triglycerides was reported in Egyptian buffaloes with 123.00±6.83 mg/dl.

The concentrations of Total protein and albumin in Jersey cross bred cows and graded murrah buffaloes in the present study was found to be 7.16±0.31 g/dl & 2.95±0.13 g/dl and 6.46±0.28 & 3.13±0.1 respectively, with no significant differences in these parameters between the two groups. Globulin concentration was calculated by subtracting the individual Albumin concentrations from Total Protein concentrations and the A/G ratio was calculated. A/G ratio of 0.70±0.08 and 0.91±0.2 was obtained for Jersey cross bred cows and graded murrah buffaloes respectively in the present study. Whereas, Jhambh *et al* 2016 [8] reported a significant difference between the serum albumin concentrations of cattle and buffaloes.

There was found to be no significant difference between the serum concentration of Creatinine and Urea between both the groups (2.44±0.09 mg/dl and 16.40±0.91 mg/dl in Jersey cross bred cows & 2.43±0.17 mg/dl and 16.35±1.67 mg/dl in graded murrah buffaloes) in the present study which is again in agreement with the findings of Jhambh *et al* 2016 [8] (1.25±0.05 mg/dl and 26.06±3.91mg/dl in cattle and 1.36±0.02 mg/dl and 28.63 ±1.20 mg/dl in buffaloes). Higher average concentrations of serum urea was reported in lactating Egyptian buffaloes by Ashmawy 2015 [2] with 41.94±1.38 mg/dl.

The concentrations of AST and ALT in Jersey cross bred cows and graded murrah buffaloes in the present study were found to be 82.85±8.92 IU/l and 93.67±5.69 IU/L respectively, with no significant differences in these parameters between the two groups. In contrary to this, Jhambh *et al* 2016 [8] reported a significant difference between the serum concentrations of AST between cattle and buffaloes with 80.35±8.02 IU/L and 144.39±4.03 IU/L respectively.

Table 1: Mean± SE blood biochemical parameters in lactating Jersey Cross bred cows and Graded Murrah buffaloes

S. No.	Biochemical Parameter	Jersey Cross bred cows (Group I)	Graded Murrah buffaloes (Group II)
1.	Total cholesterol (mg/dl)	131.55± 10.08	83.67± 8.81*
2.	Calcium (mg/dl)	6.14±0.32	6.86±0.29*
3.	Phosphorus (mg/dl)	8.04±0.33	7.97±0.22 ^{NS}
4.	Glucose (mg/dl)	54.91±2.55	50.16±3.88 ^{NS}
5.	Triglyceride (mg/dl)	37.45±4.63	35.16±4.83 ^{NS}
6.	Total protein (g/dl)	7.16±0.31	6.46±0.28 ^{NS}
7.	Albumin (g/dl)	2.95±0.13	3.13±0.1 ^{NS}
8.	Creatinine (mg/dl)	2.44±0.09	2.43±0.17 ^{NS}
9.	Urea (mg/dl)	16.40±0.91	16.35±1.67 ^{NS}
10.	AST (IU/L)	82.85±8.92	93.67±5.69 ^{NS}
11.	ALT (IU/L)	26.47±2.05	24.08±2.99 ^{NS}

*Mean values observed within a row differ significantly ($p < 0.05$); NS: Non-Significant

Table 2: Average concentrations of blood biochemical parameters in cows available in certain standard textbooks

S. No.	Biochemical Parameter	Cows (Kaneko <i>et al</i> 2009) ^[9]	Cows (Allen DG <i>et al</i> 2016) ^[1]
1.	Total cholesterol (mg/dl)	80-120	
2.	Calcium (mg/dl)	9-12	8-11.4
3.	Phosphorus (mg/dl)	5.5-6.5	5.6-8.0
4.	Glucose (mg/dl)	45-75	40-100
5.	Triglyceride (mg/dl)	0-14	
6.	Total protein (g/dl)	6-7	6.7-7.5
7.	Albumin (g/dl)	3-3.5	2.5-3.8
8.	Creatinine (mg/dl)	1-2	0.5-2.2
9.	Urea (mg/dl)	20-30	10-25
10.	AST (IU/L)	78-132	60-125
11.	ALT (IU/L)	11-40	

Conclusion

The concentration of only Total Cholesterol (mg/dl) and serum calcium (mg/dl) differed significantly ($p < 0.05$) between Jersey cross bred cows and graded murrah buffaloes in the observed locality. In other studies conducted at different states of India, say Haryana, significant difference ($p < 0.05$) was found with the concentrations of Total cholesterol (mg/dl) and AST (IU/L) between cattle and buffaloes. Though a significant variation was not observed in the present study with the concentrations of Phosphorus (mg/dl), Glucose (mg/dl), Triglyceride (mg/dl), Total Protein (g/dl), Albumin (g/dl), Creatinine (mg/dl), Urea (mg/dl), AST (IU/L) and ALT (IU/L) between Jersey cross bred cows and graded murrah buffaloes; higher /lower concentrations of certain parameters like Urea and Triglycerides were reported by various researchers from different parts of India which included different breeds of cattle/ buffaloes. Therefore, it can be concluded that there is an important need to obtain baseline values for dairy cattle and buffaloes maintained at specific localities and this can help in clinical/ sub-clinical diagnosis of metabolic/ & nutritional diseases, adopting alternative strategies for optimizing milk yield or even planning for treatment interventions.

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