



Original Research

Haematological and Biochemical Profile of Lactating Kangeyam Cows

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Abstract

Kangeyam cattle are a draught breed native cattle of Tamilnadu, India. They are well known for their draught power and endurance. The aim of this study is to establish a normal haematological and biochemical values for lactating kangeyam cows. Blood samples were collected from 3 – 4 year old lactating kangeyam cows present in the native tracts of Erode district. Blood samples are used for estimation of haematological parameters like haemoglobin, packed cell volume, red blood cells count, erythrocyte indices, total leukocyte count, platelet count and biochemical parameters like blood urea nitrogen, creatinine, total protein, albumin, aspartate transaminase, glucose, cholesterol, calcium, phosphorous, magnesium, sodium, potassium and chloride. The haematological and biochemical parameters were estimated, statistically analysed and they were in the normal range. It was concluded that these can be used as reference values for lactating kangeyam cattle and also as a baseline data for assessing the managemental practice, physiological status, nutritional deficiency and various diseases of these kangeyam animals.

Key words: Biochemical Parameters, Draught Breed, Haematology, Kangeyam Cattle, Reference Values

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Introduction

India has the biggest cattle genetic resource and endowed with many cattle breeds that are being adapted to various agro climatic conditions, one among them is kangeyam cattle. Kangeyam cattle are extensively reared in the kangeyam taluk of Erode district of Tamilnadu which is known for its draught power and endurance. It is one of the excellent indigenous draught cattle of India. It is also called as Kanganad or Kongu, (Gunn, 1909). Kangeyam bullocks are high power animals with the maximum power ability of 0.8 hp per pair of bullocks and they are adapted to harsh climate. Cows have the ability to produce moderate



milk yield in harsh environment and scanty rations, (Surendrakumar, 1988). In olden days they are used for drawing water from wells and ploughing activities in farm practise. Information regarding normal haematological and biochemical profile of these type of indigenous cattle will be helpful in evaluating their health status and managerial practice. The perusal of literature did not reveal any reports on normal values for haematological and biochemical parameters of kangeyam cattle. Therefore, this study was designed to establish the normal values for haematological and biochemical parameters of lactating kangeyam cattle.

Materials and Method

Thirty lactating kangeyam cows of about 3 to 5 years of age reared in the kangeyam taluk of Erode district, Tamilnadu by the local farmers were selected for the study. Blood samples for the study were collected from these animals at rest, undisturbed or under least excitement. Blood samples were collected from the jugular vein puncture in both EDTA added vacutainer for haematological study and clot activating tubes for biochemical study. Serum was separated by centrifuging the blood collected in the clot activating tubes at 3,000 rpm for 15 minutes and used for biochemical studies. Haematological parameters like haemoglobin (Hb), packed cell volume (PCV), red blood cells count (RBC), total leukocyte count (TLC) and platelet count were calculated using the automated hematology analyzer (Mindray – BC-2800 VET[®], Shenzhen Mindray Bio-Medical Electronics Co., Ltd., China). Mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and mean corpuscular volume (MCV) were calculated as per the formula given by Coles, 1986. Biochemical parameters like blood urea nitrogen (BUN), creatinine, total protein, albumin, aspartate transaminase (AST), glucose, cholesterol, calcium, phosphorous, magnesium, sodium, potassium and chloride were estimated using the semi-automated biochemical analyser (A-15 Biosystem Random Access Analyser[®], Biosystem, Barcelona, Spain). The data obtained were statistically analysed viz., mean and standard deviation were done as per the methodology given by Snedecor and Cochran, 1980.

Result and Discussion

Mean and standard error (SE) values of haematological parameters like haemoglobin (Hb), packed cell volume (PCV), red blood cells (RBC), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), mean corpuscular volume (MCV), total leukocyte count (TLC), platelet count and biochemical parameters like blood urea nitrogen (BUN), creatinine, total protein, albumin, aspartate transaminase (AST), glucose, cholesterol, calcium, phosphorous, magnesium, sodium, potassium, chloride were tabulated in Table 1.

Table 1: Mean and standard error (SE) of haematological and biochemical parameters of lactating kangeyam cow.

Parameters	Mean \pm SE
Haematological Parameters	
Hb (g/dL)	13.23 \pm 0.34
PCV (%)	34.62 \pm 1.15
MCV (fl)	45.77 \pm 1.70
MCH (pg)	18.34 \pm 0.98
MCHC (g/dL)	38.99 \pm 1.37
RBC ($10^6/\mu\text{L}$)	7.68 \pm 0.24
WBC ($10^3/\mu\text{L}$)	4.95 \pm 0.41
Platelet($10^3/\mu\text{L}$)	293.8 \pm 20.05
Biochemical Parameters	
BUN (mg/dL)	17.57 \pm 0.83
Creatinine (mg/dL)	1.18 \pm 0.05
Total protein (g/dL)	7.20 \pm 0.08
Albumin (g/dL)	3.24 \pm 0.06
Globulin (g/dL)	3.96 \pm 0.11
A:G	0.84 \pm 0.04
AST (IU/L)	61.44 \pm 1.94
Glucose (mg/dL)	47.24 \pm 1.76
Cholesterol (mg/dL)	152.16 \pm 11.62
Calcium (mg/dL)	11.2 \pm 0.20
Phosphorus (mg/dL)	7.87 \pm 0.25
Magnesium (mg/dL)	8.51 \pm 0.28
Sodium (mmol/L)	137.12 \pm 1.35
Potassium (mmol/L)	4.13 \pm 0.08
Chloride (mmol/L)	104.88 \pm 1.29

In the present study, the standard protocols for estimation of haematological and biochemical parameters have been adopted, which can be used as an effective tool for assessing the animal's body homeostasis, to know their synergy with environmental factors and farm managemental status, to know about underlying pathology of any existing diseases and also to know about the prognosis if they are ailing from diseases, (Kaneko, 1997). All the haematological and biochemical parameters are within the physiological limits described for the cattle reported by Jain, 1986.

In the present study, the haemoglobin level (13.23 \pm 0.34 g/dl) and the erythrocyte count (7.68 \pm 0.24 X $10^6/\mu\text{l}$) and RBC indices indicate the level of body cellular metabolism in maintaining the effective haemoglobin turn over and the processes of erythrolysis, as in animals which are put in to heavy work, the demand of oxygen is more for oxidative phosphorylation of adenine diphosphate molecule to supply energy to the muscles to perform the task. The animals reared in the draught conditions were expected to be exposed to high load of pathogens that hinder their working ability. The total leucocyte count (4.95 \pm 4.10 X $10^3/\mu\text{l}$) indicates the function of their immune system. It should be kept in harmony with the environment

to combat the invading microbes by destroying them with the help of different cytokines and interleukins production and there by the activation of the complement system and formation of membrane attack complex to kill the pathogens.

Primary test in evaluating the function of clotting system of the body is the thrombocyte count ($293.8 \pm 20.05 \times 10^3/\mu\text{l}$), in this study the thrombocyte count of the animals were normal and within the range of earlier reports implying that there is an ideal megakaryopoiesis with the help of key regulators of megakaryopoiesis like thrombopoietin, interleukin 3, etc. The level of metabolic end products like creatinine ($1.18 \pm 0.05 \text{ mg/dl}$) and BUN ($17.57 \pm 0.83 \text{ mg/dl}$) indicate the effective functioning of the body system to eliminate the toxic substance and maintain the balance between catabolism and anabolism to provide enough energy to the vital organs of the body to survive in dry climatic conditions. Animals which are under heavy working conditions need high protein profile for the supply of muscle protein and to maintain muscle mass for working, the results of this study shows that these animals were having normal protein ($7.20 \pm 0.08 \text{ g/dl}$) level in the body and also the albumin, globulin level indicates the ideal functioning of the immune system which is augmented by the WBC count. Leakage enzyme like AST ($61.44 \pm 1.94 \text{ IU/L}$) provides the information about the normal liver metabolic and productive functions and this was supported with the normal albumin: globulin ratio. Heavy working animal's need high metabolic energy. Euglycemic status of these animals indicates the effective glycolytic process and oxidative phosphorylation happening in them to provide needed energy for surviving in the draught conditions.

Cholesterol is an important key factor in synthesis of many steroid hormones, normally all these animals are having high sex libido compared to crossbreed animals, one of the reason for this may be effective utilization of this element in steroid genesis rather than accumulating them in blood vessels and organs in different forms leading to diseases. This study also shows that these animals are having normal cholesterol level ($152.16 \pm 11.62 \text{ mg/dl}$) in the body system. Eucalcemic ($11.2 \pm 0.20 \text{ mg/dl}$) and euphosphotemic ($7.87 \pm 0.25 \text{ mg/dl}$) levels of these animals indicate the strong skeletal system provided for heavy working conditions and also the normal homeostasis of the metabolic hormones responsible for the maintenance of this mineral profile in the body system. The electrolyte composition of these animals are in normal range, which indicates normal electrolyte composition of body fluids present in both intra cellular and extra cellular compartments of the body system and maintains the electrogenic balance across the cell membrane which help in conduction of impulses and excitation of the cells to response the stimuli. Besides these electrolytes maintain the normal hydration level and the blood volume of the body by providing signals to the osmo-regulatory centres of hypothalamus to regulate the secretory and absorptive process of various substances in the renal tubules. This mechanism is very much important in these animals because they exhibit tendency to work in draught climatic conditions where the conservation of body fluid and maintenance of blood volume is an important criteria for survival.



The haematological and biochemical parameters can vary among the different species and breeds. Hence it is necessary to establish a reference values for these parameters for each species and breed to know the health status of the animals. Anything deviation from the normal physiological process is said to be pathology, to understand that deviation pathway there should be a reference value for each physiological parameter (Kaneko, 1997). So this research findings can be considered as a normal reference level for haematological and biochemical parameters of lactating kangeyam cows.

Conclusion

The various haematological and biochemical parameters reported in this study can be used as a baseline data for interpreting the different pathological conditions of an animal and to know about the physiological status of an animal for diagnosing the diseases and for planning the different therapeutic options in lactating kangeyam cow which is an ideal indigenous germplasm suited for draught condition.

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