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Haematological and hematochemical evaluation of Marecha camel reared under farming system

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Abstract

Biochemical and hematological parameters were poorly determined in Pakistani camels. An attempt was therefore made to characterize these parameters of the breed of Marecha dromedarius camels reared in agricultural desert conditions. The research was designed to determine the biochemical parameters of blood in Marecha dromedary camels of both sexes raised in the desert ecology of the farm. About 14 camels were divided into G1 - from four females (without oestrus) and G2 - from ten females (non-pregnant) raised under semi-open stables, fed concentrate, straw, browsing and water twice a day. Deworming and vaccination were carried out at three-month intervals. Hemoglobin (Hb), hematochemical parameters and minerals were tested. The mean Hb concentration was significantly higher in males than in females (15.16±0.79 and 14.46±0.68 g/dl). Mean concentrations of cholesterol and triglycerides were higher in male camels than in females (60.18±5.24, 37.44±4.16 and 58.32±4.88, 34.98±4.12 respectively, in G1 and G2), while glucose concentration was higher in she-camels. Total proteins, albumin and globulin values were significantly higher in males than in females (8.12±1.66, 4.06±1.28, 3.86 ±0.92 and 6.96 ±1.22, 3 ,16 ±1.44, 3.28 ±1.26 respectively, in G1 and G2). Urea and creatinine values did not show any treatment effect. In the mineral

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analysis, the average concentrations of calcium and phosphorus were 9.82 ±1.26, 4.72 ±1.12 and 9.39 ±1.18 and 4.33±0.98 in G1 and G2, respectively. It is opined that these results could be used as a baseline for future studies.
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Introduction

Around 35 million camel population spread across 47 countries, Pakistan ranks 8th having 1.1 million camels (GOP, 2020-21; FAOSTAT, 2019). There are 95% dromedary camels in world, 50% contributed by Sudan and Somalia while India and Pakistan comprise 70% population of dromedary breed (Singh *et al*., 2017). Pakistani camels have well adaptation and tolerating very well high temperatures and harsh desert ecology (Faraz et al., 2019a,b). It is main font of food, particularly in the regions where the productive performances of rest livestock is negatively influenced (Faraz, 2020) related to its exceptional physiology permitting to tolerate high temperature, radiations, food shortage and tempestuous terrain (Faraz et al., 2019c).

Camel is very important to daily life for desert people in Africa and Asia as a font of meat, milk and means of transport (Gader and Alhaider, 2016). In arid zones and under harshly environment camel can produce milk for longer periods. A biochemical profile is a biomarker of general health status (Getnet et al., 2005) but only limited information about blood biochemicals of the camel is available. Though, this breed is adaptable to various environmental, physiological and pathological situations hence it may be used for calculating correct dosage and their productive performance (Abebe et al., 2002).

The alterations of the haematological and biochemical parameters are considered significant indicator of the physiology and metabolism status of livestock. Mostly the survey reports are published about Pakistani camels in conventional husbandry (Iqbal et al., 2001), while the data reporting the blood physiological parameters in camels are poor. The purpose of this experimentation was to assess haematological and biochemical parameters of Marecha camels of both sex raised under intensive farming conditions. So the information may be used as model or baseline in camel production discipline.

Materials and Methods

Animals and Management

Fourteen Marecha camels aged between five to ten years divided in group G1 was composed of four non-rutting males, while the group G2 was composed of ten non-pregnant she-camels. Camels were examined at start of the study and considered healthy based on the clinical evaluation. The prophylaxis against endoparasites was performed every three months using Ivermectin injection (1%; 1ml/50 kg weight). The prophylaxis against ectoparasites was performed with a piretroid solution sprayed on animals and on shed. They were vaccinated for Trypanosomiasis every three months in accordance with farm routine practices.

They were fed three to four kg concentrate daily consisting of 10 percent maize, 23 percent wheat bran, 26 percent cotton seed cake, 7 percent rape seed cake, 18 percent corn gluten30, 14 percent molasses, 1 percent di-calcium phosphate and common salt each. This having 91 percent dry matter, 30 percent neutral detergent fiber, 18.5 percent

crude protein, 72 percent total digestible nutrients, 16 percent acid detergent fiber, and 2.52 Mcal/kg dry matter of metabolizable energy. The same quantity of ration was administrated for each camel and other experimental conditions. They allowed desert browsing for 6-8 hours daily and fed with the *Cicer arientinum* residues adlib for the rest of time. Twice watering, salt lumps was provided, 100 g of di-calcium phosphate was given as extra allowance to all females. The chemical analysis is presented in table 2.

Laboratory Analyses

Blood samples were collected at the same time (09.00 am) from all animals through jugular vein and it was divided into two different types of conduits; one containing tripotassium ethylenediaminetetraacetic acid (K3EDTA) (S-Monovette®, Sarstedt) for haemoglobin assay and the other with no additive for biochemical evaluation. Haemoglobin (Hb) was assayed by Spinreact kits in BC2300 haematology analyzer. Stock kits of biochemistry analyzer Diagnolab-DL-9000-Italy were used to analyze serum samples. The samples were digested (Faraz et al., 2018) and calcium, phosphorus values were assayed in atomic absorption spectrophotometer (AA320N, Wincom Company LTD, Changasha, Hunan province, P.R.C.) (AOAC, 1990). The chemical composition of straws and browsing species was also performed (AOAC, 1990; Van Soest et al., 1991).

Statistical Analysis

Analysis of variance technique by GLM of statistics software was applied to compare each variable. Least Squares Means and standard error were calculated (Steel et al., 1997).

Results

Table 1 showed the means of Hb (P=0.035) were 15.16±0.79 and 14.46±0.68 g/dl for G1 and G2, respectively. A significant difference was observed in Hb concentration, that was higher in G1 than G2 (P=0.035).

The mean values of cholesterol and triglycerides were significant higher in males than females (P=0.028) (Table 1), as well as the mean values of total proteins, albumins and globulin (P=0.045). No statically significant difference was observed in levels of urea, creatinine and glucose among the two groups (Table 1).

The concentration of Ca and P was significant higher in males than females (P= 0.035) (Table 1).

Table 1. Haematological and hematochemical parameters of Marecha camels of CBRS

Variables	Males (No.4)	Females (No.10)	Overall Mean
Hemoglobin-g/dl)	15.16 [a] ±0.79	14.46 [b] ±0.68	14.64±0.74
Glucose-mg/dl	136.78±6.86	138.92±8.26	137.85±7.56
Cholesterol-mg/dl)	60.18 [a] ±5.24	58.32 [b] ±4.88	59.25±5.06
Triglycerides-mg/dl	37.44 [a] ±4.16	34.98 [b] ±4.12	36.21±8.28
Total Protein-g/dl	8.12 [a] ±1.66	6.96 [b] ±1.22	7.54±1.44
Albumins-g/dl	4.06 [a] ±1.28	3.16 [b] ±1.44	3.61±1.36
Globulins-g/dl	3.86 [a] ±0.92	3.28 [b] ±1.26	3.57±1.09
Urea-mg/dl	47.17±3.42	46.65±4.44	46.91±3.93
Creatinine-mg/dl	1.58±0.16	1.45±0.17	1.52±0.17
Calcium-mg/dl	9.82 [a] ±1.26	9.39 [b] ±1.18	9.61±1.22

Phosphorus-mg/dl	4.72 [a] ±1.12	4.33 [b] ±0.98	4.53±1.05

Along the row, different lowercase letters indicate significant differences between males and females

Data are expressed as LSM and standard error.

Table 2. Chemical composition of feeding/browsing species

Feed/Forage Species	Dry Matter	Crude Protein	Ether Extract	Crude Fiber	Neutral Detergent Fiber	Acid Detergent Fiber	Crude Ash
Cicer arientinum	94.13	9.94	2.84	45.2	67.8	47.9	9.14
Acacia nilotica	29.12	16.62	2.16	26.12	54.8	26.2	6.12
Acacia modesta	54.3	12.84	2.44	36.35	47.2	29.12	7.12
Cenchrus ciliaris	32.8	15.12	4.12	27.11	39.44	19.12	16.13
Cymbopogon choenanthus	35.4	9.34	2.46	36.13	63.13	44.2	7.66
Kochia indica	34.16	11.22	4.86	28.12	59.2	38.14	12.94
Capparis spinosa	37.2	18.12	2.14	31.26	50.6	32.6	7.15
Haloxylon salincornicum	35.4	16.17	2.88	33.12	52.14	38.2	12.16
Calligonam polygonoides	35.6	9.15	4.66	24.13	48.9	32.3	9.67

Discussion

The levels higher of Hb detected in males are probably due to the testosterone effect. In fact, in males the testosterone stimulates the production of erythropoietin in the kidney accelerating the erythropoiesis (Murphy, 2014). Hb values, as well as glucose levels, may be influenced by a wide range of physiological conditions such as age, sex, breed, dry or lactation, season and various type of management. Studied performed in different countries reported various values of Hb. The reported concentration of Hb vary in different references as 9.4-15.6 g/dl (Faye and Bengoumi, 2018).

Al-Busadah and Osman (2000) reporting Hb mean values of 10.2±0.8, 13.3±0.6 and 12±0.2 g/dl respectively in calve, dry, and lactation. Reporting range of Hb was 9-115.5 g/dl (Hassan et al., 1968), 11.5-14.4 (Higgins and Kock, 1984), 7.9-16 g/dl (McGrane and Kenyon, 1984), and 11.6 g/dl (Omer et al., 2006). Single humped camel of India had high values of Hb level were studied by Narnaware et al., 2016. The reporting range of Hb in males was: 7.2-17.3 and females: 8.2-17.4 g/dl in Pakistani dromedaries (Farooq et al., 2011). Reporting Hb mean value was 10.68±0.18 in dry and 10.72±0.19 g/dl in green season (Amin et al., 2007).

Al-Harbi, (2012) reported the Hb concentration that were 14.80±1.15 g/dl in male dromedarius, while 14.06±0.24 g/dl Hb value in female dromedarius studied by Zaher et al., 2017.

Adah et al., (2017) showed lower Hb concentrations as 7.33±0.35 g/dl in Nigerian dromedarius, while in Bangladeshi was 10.4 g/dl (Islam et al., 2019).

Ghafoor et al., (2018) reported Hb value in Pakistani dromedarius that was 11.8±0.6 g/dl.

Elitok and Cirak (2018) reported Hb values were 12.4±0.2g/dl in pregnancy and as well as in non-pregnancy cow-camel, in accordance with what was reported in Libyan dromedary she-camels in the same conditions (pregnant, 2.55±0.27; non pregnant, 7.28-17.70 g/dl) (Abdalmula et al., 2018a).

Abdalmula et al. (2018b) described the Hb concentration of 11.06±0.59, 13.44±0.27 and 10.95±0.59 g/dl in Sirtaweya, Fakhreya and Mahari Libyan dromedary camels, respectively. In Libyan dromedarius camels the reporting Hb values were 13.4±0.3 and 11±0.4 g/dl respectively in dromedarius female and male camels (Abdalmula et al., 2019) and Ebissy et al. (2019) reported 10.62 ±0.55 g/dl in dromedarius.

Faraz et al., (2018) reported haemoglobin concentrations were 15.9±0.2, 16.6±0.2 and 14.1±0.2, 14.7±0.2, g/dL for female and male dromedarius calves in intensively and semi-intensively reared, respectively. Significant differences of hemoglobin concentration were found for males and females dromedary calves, in relation to type of management system (Faraz, 2021).

Higher glucose levels were reported in camels; may be related to high lactic levels in the blood of camels. Osman and Al-Busadah, (2003) reported glucose triglyceride and cholesterols concentration as 134.4 ±11, 31.4 ±3, and 58.4 ±8.6 mg/dl in Saudi dromedarius she-camels.

Al-Busadah, (2007) reported cholesterol in Saudi Arabian dromedary camels which was ranged 1.9-4.2 mmol/L. The influence of season (dry vs green) on glucose and triglycerides concentration in Sudanese dromedary camel were reported by Amin et al. (2007). Saini et al. (2014) studied showed the significant low glucose values in grazing prepubescent dromedarius than stall-fed animals. The studies of Kelanemer et al. (2015) in pregnancy Algerian dromedarius cow-camel showed the cholesterol, triglycerides and glucose mean concentrations of 29.93±1.3 (mg/l), 399.09±1.9 (mg/l) and 0.91±0.0 (g/l), respectively.

Zaher et al., (2017) reported the glucose value in female dromedarius which was 88.6±1.67 mg/dl. Abdalmula et al. (2018a) reported the means of glucose, triglycerides and cholesterol were 111.8±5.4 g/dl, and 31.6±1.8 mg/dl 36.4±1.7, respectively in dromedarius of Libya. Faye and Bengoumi, (2018) reported dromedarius plasma glucose concentrations were 62-142 mg/dl.

Elitok and Cirak (2018) reporting glucose concentrations of 96.5±1.5and 100.5+1.0 mg/dl in pregnant and non-pregnant she-camels while 228±5.2 mg/dl in Egyptian transition cow-camel (Ebissy et al., 2019) and 114.9 mg/dl in Bangladeshi dromedarius (Islam et al., 2019). Kelanemer et al., (2015) studied in Egyptian lactating dromedarius cow-camel showed that glucose mean was 176±11 mg/dl. Recently, glucose values were found as 126±1, 131±2; 130±2, 136±1; 125±3, 128±3 mg/dl respectively in male and female dromedarius calves reared intensively, semi-intensively and extensively (Faraz, 2021).

Osman and Al-Busadah (2003) reported creatinine and urea values in in Saudi Arabian cow-camels as 1.5±0 and 49.8±5 mg/dl, while albumins and total proteins reported 3.7±0 and 7.1±0 g/dl respectively. Reporting creatinine values were 0.16-0.5 mmol/L (Al-Busadah, 2007). Amin et al. (2007) documented significant difference in concentrations of total proteins, albumin, globulin, urea, creatinine in Sudanese dromedarius in dry and green season.

Saini et al. (2014) documented a significant increase of urea concentration in grazing prepubescent grazed than stall-fed dromedaries. Kelanemer (2015) studied urea and total protein values in Algerian dromedarius pregnancy cow-camel as 372.7±1.8 mg/l and 57.8±0.5 g/l while total protein studied by Adah et al., (2017) in Nigerian dromedarius was 73±2.2 g/l. Zaher et al., (2017) described entire proteins, gm per dL of albumin and creatinine values at the tune of 6.2±0.1, 3.8±0.1 and 1.1±0.0 in dromedarius cow-camel. Faye and Bengoumi, (2018) reported urea concentrations were 6-41 mg/dl, creatinine 0.9-2 mg/dl, and albumins 26-44 g/l.

Elitok and Cirak (2018) reporting total proteins, globulins (g/l), albumins, plasma urea nitrogen, creatinine (mg/dl) mean values as 5.9+0.0, 3.5±0.0, 2.5±0.0, 7.9±1.5, 1.2±0.0 and 6.4±0.0, 3.7±0.0, 2.7±0.0, 15.5±1.5, 1.4±0.0 respectively, in non-pregnancy and pregnancy cow-camels. Abdalmula (2018a) reported Libyan dromedarius ranges and concentrations of total protein, albumins, globulins (g/l) and urea, creatinine (mg/dl) as 43.3±1.4, 17.0-69.0; 1.5±0.0, 1.0-2.1 and 50.9±0.9, 31.0-67.8; 30.6±0.6, 17.5-39.5; 20.4±0.8, 4.4-46.0 respectively. Total protein, albumins, globulins, urea, creatinine (mg/dl) concentrations were to be 55.16 ±1.45, 36.64 ±0.60, 18.52 ±1.30, 37.39 ±2.72, 1.58 ±0.05; 48.87 ±1.09, 30.45 ±0.61, 18.42 ±0.74, 47.29 ±1.61, 1.48±0.03 and 54.27 ±2.24, 25.86 ±1.45, 28.41 ±2.30, 35.47 ±2.80, 1.46 ±0.06, respectively in Sirtaweya, Fakhreya and Mahari Libyan dromedarius (Abdalmula et al., 2018b).

Islam et al., 2019) studied Bangladeshi dromedarius, total protein, urea (mg/dl) and albumins (g/dl) were 8.2, 25.04 and 4.4. Mohamed et al. (2019) reporting total protein, creatinine (mg/dl), albumins and globulins (g/l) as 5.8±0.0, 0.9±0.0, 2.4±0.0 and 3.5±0.1 in Egyptian lactating dromedarius. Faraz et al. (2018) reporting total proteins, albumin, urea and creatinine as 6.5±0.2, 6.4±0.2 & 5.3±0.2, 5.0±0.2 g/dL; 1.5±0.0, 1.5±0.0 & 1.4±0.0, 1.2±0.0 g/dL; 35.4±4.5, 32.0±4.5 & 36.3±4.5, 31.3±4.5 mg/dL; 1.4±0.1, 1.5±0.1 & 1.4±0.1, 1.5±0.1 mg/dL in intensively and semi-intensively male and female dromedarius calves, respectively.

Al-Busadah and Osman (2000) assayed Ca concentrations in Saudi dromedarius reporting values ranged between of 7.6-13.1 mg/dl. Similarly, to other biochemical parameters also Ca and P concentrations are influenced by the season as reported in Sudanese dromedary camel. Amin et al., 2007said that during the wet season, the increase of P and Ca values in serums observed in dromedaries is probably correlated to the accessibility at plants rich in minerals. Other authors have documented an increase in Ca, Na associated to a decrease in K and P in the summer season (El-Harairy et al., 2010). Zaher et al. (2017) mentioned average content of P and Ca were 5.4 ± 0.2 and 10.6 ± 0.2 mg/dl in dromedarius cow-camels. Kelanemer et al. (2015) studied in pregnancy Algerian dromedarius cow camel the P and Ca mean concentrations as 62.7±0.9 and 73.7±1.9 mg/l. Abdalmula et al. (2018a) reporting Ca and P mean concentrations as 9.9±0.1, 7.6-12.8 and 5.2±0.2, 1.7-8.9 mg/dl respectively, in Libyan

dromedarius. Faye and Bengoumi, (2018) reported the values in camels of P and Ca were 4.9-8.5 and 8-12.5 mg/dl, respectively.

P and Ca concentrations reported in Sirtaweya, Fakhreya and Mahari Libyan dromedary camels were 10.08±0.30, 7.97±0.22; 10.05±0.08, 4.42±0.26 and 9.12±0.13, 5.36±0.28 mg/dl, respectively (Abdalmula et al. 2018b). Elitok and Cirak (2018) reporting P and Ca mean concentrations of 3.8±0.5 and 9.0±0.1 mg/dl in dromedarius cow-camel. During the transition period the Ca and P concentrations in the Egyptian female dromedarius were to be 2.22±0.08, 1.70±0.11 mmol/l (Ebissy et al., 2019). Reporting mean values of Ca and P of 2.23 ±0.03 and 1.62 ±0.075 mmol per liter in Egyptian dromedary milking camels (Mohamed et al. 2019).

Faraz et al. (2018) reporting calcium and phosphorus mean values as 9.1±0.4, 7.3±0.4 and 7.0±0.4, 6.4±0.4; 4.5±0.2, 3.5±0.2 and 3.4±0.2, 3.2±0.2 mg/dL respectively in intensively and semi-intensively male and female dromedarius calves. Recently, the reported calcium and phosphorus mean concentrations were 9.1±0.6, 7.3±0.5; 7.0±0.2, 6.4±0.4; 7.1±0.3, 6.5±0.4 and 4.6±0.3, 3.5±0.3; 3.5±0.1, 3.2±0.1; 3.6±0.1, 3.4±0.1 mg/dl in intensively, semi-intensively and extensively males and females dromedarius calves, respectively (Faraz, 2021).

Conclusions

The study could provide information about the general health condition of Pakistani camels reared in farming system, documenting the normal values of hematochemical parameters in both sex. The observing may be due to various factors like breeds, aging and physiological condition which should be investigated in further studies.

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