Haematological and biochemical indices of camels (*Camelus dromedarius*) fed some preferred forages

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Abstract

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The study was aimed at investigating the hematological parameters and biochemical profile of camels fed some preferred forages in the Sudan Savannah ecological zone of Nigeria. A total of five healthy male camels were used in six feeding periods. The blood indices were determined at an interval of one week during the feeding period. The results show significantly ($P<0.05$) higher Mean Corpuscular Haemoglobin Concentration (MCHC). No significant difference ($P>0.05$) was recorded in neutrophils, amylase and cholesterol. Also, the blood urea level, total protein, serum globulin and albumin were affected significantly ($P<0.05$) by the experimental forages. It was however concluded that experimental forages could induce significant changes in the physiological responses of the dromedary camel blood without deleterious effect.

Keywords: Blood and serum, camel, forages, haematology, preference

Introduction

Camels in the tropics are raised extensively with little or no supplementation of feed (Wilson, 1998). The dromedary camel exploits rangeland resources in order to meet up with its nutritional requirements (Wardeh and Farid 1990). The fodder trees and shrubs which constitute the integral part of the diet of this animal vary in terms of their quantity and quality over the years (Njidda, 2011). The Forages have been recognized as an important component of animal feed supplying nutrients especially in harsh environmental conditions (Devendra and Leng, 2011). The utilization of such trees and forages is constrained by many factors among which are the anti nutritional factors (Olafadehan *et al.*, 2010). The effects of feeding animals with range plants containing these anti nutritional factors for an extended period

has not been reported in camels but reported in other animals (Kassily, 2002 and Olafadehan *et al.*, 2010). The camel can be able to survive in a hot temperature that is normally fatal to other species (Wilson, 1998). It can walk 5-7 days with little or no food and water; and can lose a quarter of its body weight without impairing its normal functions (Wilson, 1998). It has been reported to play a significant role in the economic, social and ecological roles in the pastoral society (Wardeh, 2004; Barbeker *et al.*, 2013 and Alkali and Saleh, 2013). Wardeh and Farid (1990) reported that camels are adapted to a dry ecosystem of arid zones and with severe fluctuations in their nutritional status, which in turn affects their integral performance and can also satisfy most of its protein requirements by consuming many plant species in order to perform their various physiological

functions (Wilson, 1998).

The marked fluctuations in seasonal nutrients supply in the tropics significantly affect the certain concentration of blood metabolites which are indicators of nutritional status of the animal (Pamba-Gollah *et al.*, 2000). For example, in Sudanese camels, the concentrations of plasma glucose and serum, urea, creatinine, phosphorous, calcium, blood urea and serum glyceride have been reported to be affected by a diet (Wasfi *et al.*, 1987; Amin *et al.*, 2007). The seasonal variation in rainfall influences both the quality and quantity of the pasture (Schwartz and Dioli, 1992) which consequently affects the nutritional status and the blood constituents of the camels. These constituents reflect the well being of the animals and are used extensively as diagnostic tests (Barbeker *et al.*, 2013). This study was therefore intended to study the changes in some of the hematological and biochemical profile of camel's blood fed various forages in the Sudan Savannah zone of north western Nigeria.

Materials and methods

Study area

This study was conducted at the Department of Animal Science Teaching and Research Farm, Bayero University, Kano, Nigeria. Kano state lies on latitude 11°59" and is situated within the semi arid Sudan Savannah zone of West Africa, about 840 Kilometers from the edge of Sahara desert on an altitude of 472.45m above sea level. The average rainfall is 873mm and is at its peak in August (Ekpoh, 2011). The soil is light to moderate leached yellowish brown sandy, like most savannah parts of northern Nigeria.

Experimental design

The experiment was laid in a completely randomised design with six treatments and

replicated five times.

Experimental animals and their management

Five (5) healthy male camels were purchased from Maigatari livestock market and were used for the study during wet season (June – October). The animals were treated prior to the experiment with a broad spectrum antibiotic (Oxytetracyclin L.A) at 1ml/10kg, multivitamin at 2ml/10kg and Ivermectin at 1ml/50kg. The animals were dewormed orally with albendazole. Fresh leaves of *Acacia nilotica*, *Acacia sieberian*, *Balanite aegyptiaca*, *leptadania hastata* *Guiera senegalensis* and *Bauhinia rufescens* were collected and offered ad libitum. Animals were allowed access to water once a day.

Feeding and management

The experimental animals were housed individually and intensively for a period of 18 weeks including two weeks adaptation period and one week for sample collection for each of the experimental forage. Animals were allowed access to fresh drinking water once daily.

Sample collection and analyses

The blood collection was done very early in the morning (6:00am). The blood samples (10ml) collected for hematological analyses were obtained from jugular vein into a liquid heparin bottles using 10ml disposable syringe and 16 gauge needle. These samples were used for the hematological analyses and the determination of plasma glucose concentration. Part of the sample was allowed to clot at room temperature where the serums were separated by centrifuging at 3000rpm for 15 minutes and stored frozen for further analyses. An erythrocyte index was determined by the method described by (Jain, 1986) in Schalms Veterinary Hematology. Packed cell volume was determined by a method of micro-hematocrit using special centrifuging. Hemoglobin concentration was determined by the cyano-

methaemoglobin method. Differential leukocyte was determined microscopically from a count of 100 leukocytes in thin May-Grunwald-Giemsa stained blood smears (Jain, 1986). Serum albumin concentration was determined by the biuret reagent method while the globulin concentration was calculated by subtracting the concentration of serum albumin from the serum proteins. Glucose levels were determined by the enzymatic colorimetric method. The concentration of serum urea was determined by the calorimetric method as described by Evans, (1968). Urea creatinine concentration was determined by a calorimetric method described by Henry (1974).

Statistical analysis

The data obtained from the blood samples of the camels were subjected to standard methods of statistical analysis to evaluate the effect of the forages on the blood the constituents. The statistical analysis was performed using windows based SPSS

(version 10.0, 1999). The analysis of variance (ANOVA) test was used to analyse the effect of the forages on the blood constituents of the camels.

Results

Variation in erythrocyte indices of camels fed experimental forages

All the erythrocyte indices studied varied significantly ($P < 0.05$) due to forage effect (Table 1). Red Blood Cells (RBC) values are lower in camels fed *Guiera senegalensis* ($5.33 \times 10^6/P$) and higher in those fed *leptadania hastata* ($7.26 \times 10^6/P$). Parked cell volume (PCV) was also affected by the dietary treatment; values are higher in animals fed *Balenite aegyptiaca*. Hemoglobin (Hb) concentration also demonstrated significant differentiation to the diets. Higher Hb values were observed in *Acacia nilotica* (12.26 g/dl) while the mean corpuscular hemoglobin concentration showed lower significant values in animals fed *Leptadania hastata* and *Acacia nilotica* respectively.

Table 1: Effect of forage type on the erythrocytes concentration in camel

Parameters	I	II	III	IV	V	VI	SEM
RBC ($\times 10^6/P$)	7.09 ^a	7.26 ^a	6.80 ^a	6.86 ^a	5.33 ^b	6.72 ^a	0.16
PCV (%)	25.58 ^b	25.58 ^b	37.00 ^a	32.03 ^a	28.36 ^b	27.28 ^b	1.03
Hb (%)	10.52 ^b	10.32 ^b	10.10 ^b	9.13 ^b	12.26 ^a	9.03 ^{cb}	0.29
MCHC (g/dl)	10.59 ^a	9.39 ^b	9.81 ^b	9.40 ^b	9.66 ^{ab}	10.48 ^a	0.13

RBC: Red Blood Cells, PCV: Park Cell Volume, Hb: Hemoglobin, MCHC: Mean Copuscular Hemoglobin, I: *Acacia Sieberiana*, II: *Leptadania hastata*, III: *Balenite aegyptiaca*, IV: *Acacia nilotica*, V: *Guiera senegalensis*, VI: *Bauhinia rufescens*, SEM: Standard Error of Means: Superscripts ^{abcd} Means with different superscripts within the row differ significantly ($P < 0.05$).

Variations in differential leukocytes indices of camels fed experimental forages

The Mean $\pm$ SEM of neutrophils, basophils and leukocytes are presented in Table 2. All leukocytes examined showed a significant variation ($P < 0.05$) among the experimental forages. The highest leukocyte count (32.90g/dl) was observed

in camels fed *Balenite aegyptiaca* while the least recorded (29.72g/dl) in *Guiera senegalensis*. Basophils ranged from 0.62g/dl to 1.53g/dl. Neutrophils were not affected by the dietary treatments ($P > 0.05$). Higher values were recorded in *Bauhinia rufescens* (66.53g/dl) and the least is 62.64g/dl.

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Table 2: Effect of forage type on the differential leukocytes counts in camel

Parameters (g/dl)	I	II	III	IV	V	VI	SEM
Leukocytes	30.13 ^c	32.90 ^a	31.16 ^{ab}	30.10 ^c	29.72 ^d	30.92 ^c	0.13
Basophils	25.58 ^b	25.58 ^b	37.00 ^a	32.03 ^a	28.36 ^b	27.28 ^b	0.10
Neutrophils	65.03	63.95	66.80	63.65	62.18	64.81	0.31

I: *Acacia Sieberiana*, II: *Leptadania hastata*, III: *Balenite aegyptiaca*, IV: *Acacia nilotica*, V: *Guiera senegalensis*, VI: *Bauhinia rufescens*, SEM: Standard Error of Means: Superscripts ^{abcd} Means with different superscripts within the row differ significantly (P<0.05).

Variations in blood metabolites of camels fed experimental forages

Table 3 shows the level of some blood metabolites examined in camels fed the experimental forages. Results revealed significant (P<0.05) difference in the serum glucose, albumin and globulin, urea nitrogen except for amylase and cholesterol. Values obtained ranged

between 76% to 79% for glucose, 41.14 to 43.25U/l Amylase and 40.13 to 41.95mg/dl for cholesterol respectively. Alkaline phosphatase concentration also differ significantly (P<0.05) among the treatment forages with *Balenite aegyptiaca* having the highest value of 3.38U/L while *Guiera senegalensis* had the least value 2.21U/L.

Table 3: Effect of forage type on the erythrocytes concentration in camel

Parameters	I	II	III	IV	V	VI	SEM
Glucose (U/I)	77.11 ^c	78.50 ^b	76.71 ^c	79.13 ^a	78.32 ^b	76.64 ^c	0.19
Amylase (mg/dl)	41.14	41.58	42.10	42.84	43.25	42.66	0.23
Urea Nitrogen (mg/dl)	31.16 ^f	32.84 ^d	34.12 ^b	35.78 ^a	33.02 ^c	31.92 ^c	0.36
Albumin (g/dl)	5.14 ^e	4.12 ^f	5.56 ^d	6.11 ^c	6.92 ^b	5.83 ^b	0.24
Globulin (g/dl)	2.17 ^f	2.73 ^e	3.81 ^a	3.03 ^c	3.56 ^b	2.83 ^d	0.13
Cholesterol (mg/dl)	40.78	41.95	40.13	41.67	41.20	40.90	0.21
Alkaline Phosphatase (U/I)	2.57 ^{cd}	2.30 ^e	3.38 ^a	2.76 ^{bcd}	2.21 ^{ab}	2.84 ^{bc}	0.95

I: *Acacia Sieberiana*, II: *Leptadania hastata*, III: *Balenite aegyptiaca*, IV: *Acacia nilotica*, V: *Guiera senegalensis*, VI: *Bauhinia rufescens*, SEM: Standard Error of Means: Superscripts ^{abcd} Means with different superscripts within the row differ significantly (P<0.05)

Discussion

This study describes the changes in the haemogram and biochemical blood constituents of camels in comparison with some researches (Abokouider, 2001; Alia *et al.*, 2007 and Barbeker, 2013) and this will be useful in establishing the normal hematological indices and normal serum profile of camel. Hematological components, which consist of red blood cells, white blood cells or leucocytes, mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration are valuable in monitoring feed toxicity that affect the blood as well as the health status of farm animals (Oyawoye and Ogunkunle, 2004). Most of the studies on the constituents of camel blood changes were mainly concerned about physiological status of the

animals and some genetic and other non-genetic factors such as age, sex, breed and as well as management systems (Hussein *et al.*, 1992; Alia *et al.*, 2007). Most of these researches recorded wide range of variation as a result of these but failed to provide an insight on the effect of diets on the blood constituents of the camels. This study therefore provides the normal pattern of variations in the hematological profile of camels fed different forages. Results indicated significant forage effects on some of the blood indices.

The marked variation in the RBC count in this study is attributed to the moisture content variation in the forages which in turn affects the longer half life and survival time of the RBCs which is common during dehydration (Wensvoort *et al.*, 2004). Values reported here fall within the range reported

by Wilson (1984) and Alia *et al.*, (2007) but slightly lower to the report of Abdelqader *et al.*, (1984). This is probably due to the similarity and or dissimilarity in the different levels of hydration of the experimental animals.

Packed Cell Volume, haemoglobin and mean corpuscular haemoglobin are major indices for evaluating circulatory erythrocyte, and are significant in the diagnosis of anaemia and ability of bone marrow capacity to produce red blood cells in mammals (Chineke *et al.*, 2006). The values of PCV, Hb and MCHC reported in this study fall within the range reported by many authors (Ragab, 1975, Wilson, 1984; Abdelqader *et al.*, 1984 and Patodkar *et al.*, 2010). The observed similarities in the MCHC values might not be unconnected with the increase or decrease in Hb concentration and PCV levels. Chineke *et al.* (2006) reported that high Packed Cell Volume (PCV) values indicates either an increase in number of Red Blood Cells (RBCs) or decrease in circulating plasma volume which in turn indicates anemia. This shows that the experimental animals were not anemic (Aster, 2004). Blood metabolite mean values reported in this study varied with the different diets with the exception of amylase and cholesterol. All values (Glucose, Urea Nitrogen, Albumin, Globulin and Alkaline phosphatase) fall within normal values reported by many authors (Azwai *et al.*, 1990; Grings *et al.*, 1991 and Patodkar, 2010). The observed variation in blood glucose could be attributed to the increase or decrease in the forage quality which was affected by either age of the plant or the nutritional quality of the forages. Food deprivation was also reported to decrease the plasma glucose level in monogastric as well as ruminants (King and Wootton, 1965 and Wensvoort *et al.*, 2004). Similarly, feeding camels after fasting was reported to

affect glucose level particularly during dry season (Wensvoort *et al.*, 2004). However, Wilson (1984) and Abokouider *et al.*, (2001) also reported decrease in plasma glucose during dry season. The variation in urea creatinine in this study might not be unconnected with the quality of the forages offered. Payne, (1990) reported that the level of proteins of pasture plants in the two growing seasons affects the blood urea nitrogen. It has also been reported that level of serum urea is related to forage intake and consequently the energy and crude protein concentration of the forage (Grings *et al.*, 1991).

Conclusion

Result obtained from this study indicated that different forages could induce significant changes in the physiological responses of the dromedary camel without any adverse effect in the blood indices. It is further recommended that the effect of different anti-nutritional factors on the camel blood be investigated.

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Received: 27th July, 2017

Accepted: 9th December, 2017