Online Journal of Animal and Feed Research

Volume 3, Issue 1: 80-86 (2013) *ISSN 2228-7701*

OBSERVATIONS CONCERNING HAEMATOLOGICAL PROFILE AND CERTAIN BIOCHEMICAL IN SUDANESE DESERT GOAT

E.A. BABEKER[1,*] and Y.H.A. ELMANSOURY[2]

[1]*Department of Biology, Faculty of Science, University of Bakht Alruda, El Dweem, Sudan*
[2]*Department of radioisotopes, Central veterinary Research Laboratories, Khartoum, Sudan*

*E-mail: esamalibabeker@gmail.com

ABSTRACT: *Blood samples were collected from 30 (15 male and female) apparently healthy Sudanese desert goats ranging under the same field conditions from North Kordofan State, Sudan. This study had analyzed the hematological profile of goats and the influence of sex on the hematological and some biochemical values. On the Erythrocyte parameters sex had any influence: The mean of red blood cell (RBCs) {(12.10 ± 0.53) (×106 /µL) } and the mean corpuscular hemoglobin concentration (MCHC) (35.69 ± 2.94) in males were higher than females {(12.27 ± 0.74) (×106 /µL), 36.45 ± 2.49)%}, while the hemoglobin (HB), packed cell volume (PCV), mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH), were high in males than females. In leukocytary series: Total W.B.Cs, Monocytes (%) and Neutrophils (%) were higher in females, while Lymphocytes (%) and Eosinophils (%) high in males. Neutrophils (%) average was smaller than normal (23.67 ± 1.96) % and mean of Monocytes (%) was higher, which may be interpreted as a potential infection or hermetic aggression. In biochemical: Glucose was elevated in females goats, while total protein and urea higher in male animals. Ever Since the animals are apparently healthy, any value may be regarded as possible infection or metabolic and nutritional disorder.*

ORIGINAL ARTICLE

Key words: *Haematological Profile, Biochemical Indices, Blood, Desert Goat.*

INTRODUCTION

In Sudan goats are estimated to be about 42.5 million head which is a very large population compared to other African countries (Yousif and Fadl El-Moula, 2006). This population composed of four major local breeds, Nubian, Desert, Nilotic and the Dwarf, distributed throughout the country (Wilson, 1991). The Desert goat is characterized by the long drooping (lop) ears, as in the Zaraibi of Egypt and Nubian of the Sudan. Similar types of goats are heavily represented in the atlas region of north Africa, western Mediterranean region as well as in Syria, Iraq and India. At present their major breeding area is considered to be in India. However, no traces of this type of goats (Zaraibi, Damascus, Jamnapari, etc.) have been found in the Indus valley or west of it. The ancestral stock might have evolved either in India subsequent to the Indus valley civilization, or west of India, possibly Iran, from where it spread to Syria and Egypt in the west. It also appears from the occasional occurrence of homonymous screw-like horns in Zaraibi and Jamnapari bucks, that this goat type was evolved from the screw-horned goats common throughout the ancient world from India in the east to Libya in the west. The so-called Nubian goat probably does not in fact originate from Nubia (the area of southern Egypt and northern Sudan), and certainly not from Ethiopia, and the convex profile is a common characteristic of goats in the Middle East and India (General breed information from Mason, 1984).

Despite the social and economic values of goats as source of meat, milk and hides, with a great production potential, the research effected on goats in our country were neglected for long time. The goats revaluation depends on various factors, including the great prevalence of diseases, poor management practices and extensive production systems. The diseases action is the most aggressive on animals. From this point view, clinic and Para clinic exams are essential to sanitary strategies (control, prevention or treatment). The hematological tests served as information base for animal health assistance. It has been reported that regardless of age, sex and climate, goats reared under traditional husbandry system have low hematological values compared to those reared under modern husbandry (Coles, 1980; Schalm et al, 1975). Low nutritional grassland pasture, stress, parturition and climatic factors greatly alter the blood values of goats (Anosa and Isoun, 1978, Radostits et al 1994). Blood is an important and reliable medium for assessing the health status of individual animals (Oduye, 1976). Determination of the main haematological and biochemical parameters of animals helps veterinarians to confirm clinical

To cite this paper: Babeker E.A. and Elmansoury Y.H.A. 2013. Observations concerning haematological profile and certain biochemical in sudanese desert Goat. *Online J. Anim. Feed Res.*, 3 (1): 80-86.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

diagnoses, estimate the severity of cases, administer appropriate treatment, and evaluate outcomes (Roubies et al., 2006). To interpret data correctly, the results obtained in the laboratory must be compared with values corresponding to the reference values of clinically healthy animals, which serve as a guide to the clinician in evaluating parameters (Yokus, et al., 2006). It is unequivocal that a large number of factors, such as species status, breed, sex, age, nutrition, illness, and seasonal variations, can affect the pattern of these values (Swanson, et al., 2004; Nazifi, et al., 2003). The significance of determining haematological and biochemical indices in animals is well documented (Oduye and Adadevoh, 1976; Obi and Anosa, 1980), and changes in these parameters have been studied in cattle (Ghergariu, et al., 1984), sheep (Kaushish, and Arora, 1977), and goats (Tschuor, 2008; Tibbo, 2008). There is great variation in the haematological and biochemical parameters observed between goat breeds (Azab and Abdel-maksoud, 1999; Tambuwal et al., 2002; Daramola, et al., 2005).

These differences have underscored the need to establish an appropriate physiological baseline values for various breeds of livestock including the desert goat which could be used in the realistic evaluation of the management practice, nutrition and diagnosis of health condition, furthermore, this paper focused on the hematological and some biochemical values of apparently healthy Desert goats as influenced by sex and attempt has been made to provides references ranges for these variables of Sudanese Desert goats.

MATERIALS AND METHODS

Survey background

This study was carried out in North Kordofan State, Sudan (Latitudes 13^0 and 29^0 North, Longitudes 21^0 and 33^0 East). It was conducted in July 2011 ranging under the same field conditions (at El Obied Animal market). Blood samples were collected from thirty Desert goats (15 male and female) apparently healthy goats of adult age. The goats herds were naturally ranging and had no feed supplementation, water was available ad labium.

Blood analysis

Samples of blood were collected from goats by jugular vein puncture. Five milliliter blood samples were collected from each goat using 5 mL plastic disposable syringes. Tow milliliter of the blood sample were immediately transferred to capped and heparinzed tubes (Medical Disposable Industrial Complex MDIC). These samples were used for the hematological analyses and the determination of plasma glucose concentration. The rest of the samples were allowed to clot for 2h at room temperature, the sera were then separated by centrifugation at 3000 rpm for 15 min and stored frozen at -20C for further analysis. Erythrocytic indices were determined according to the methods described in Schalm's Veterinary Hematology (Jain, 1986). The packed cell volume of erythrocytes was determined by the micro-haematocrit method using a special centrifuge. Haemoglobin concentration was determined by the cyano- methaemoglobin method as described by Van kampen and zijlstra (1961). Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC) and Mean Corpuscular Volume (MCV) calculated from the following formula (Simon. et al, 2001):

MCV fl (femtoliter) = {PCV % × 10} / {RBCs count (in million /uL)}

MCH pg (picogram) = {Hemoglobin (in gm/dL) × 10} / {RBCs count (in million /uL)}

MCHC (g/dL) ={Hemoglobin (in gm/dL) × 100} / {PCV (in %)}

Differential leukocyte count (DLC) was determined microscopically from a count of 100 leukocytes in thin May-Giemsa stained blood smears (Kelly, 1984). Serum total protein was determined by the Biuret reagent method according to King and Wooton (1965), Plasma glucose level was determined by the enzymatic colorimetric method using a kit (Plasmatec Laboratory at Products Ltd Germany). The concentration of serum urea was determined by the colorimetric method according to Harold (1988).

Statistical analysis

The data obtained from the blood samples collected from the goats have been subjected to standard methods of statistical analysis was performed using windows based SPSS (Version 10.0, 1999). The analysis of student t-test was used to evaluate the effects of sex on haematological and biochemical parameters in Sudanese desert goats.

RESULTS AND DISCUSTION

The hematological and biochemical values obtained in this study in Tables 1-3 in both sexes in goats were in reference range and comparable to those previously reported concerning the influence of sex and values of Sudanese goats (Holman and Dew, 1965; Schalm et al, 1975; Oduye, 1976; Azab and Abdel-maksoud, 1999; Egbe-Nwiyi et al., 2000; Tibbo et al., 2004; Daramola, et al., 2005; Kamal, 2008; Tschuor, 2008; Waziri et al., 2010 Addass et al., 2010).

Erythrocyte indices of Sudanese desert goats

Mean Erythrocyte values (± Std) of adult male and female goats are presented in Table 1 and Figure 1 indicating the influence of Sex along with Mean values of all the 30 animals. In erythrocytes indices: Except R.B.Cs count and MCHC all Erythrocyte indices were slightly higher in males than females animals. The R.B.Cs mean on male and female was (12.10 ± 0.53) and (12.27 ± 0.74), respectively. The coefficients of variance permits the use

To cite this paper: Babeker E.A. and Elmansoury Y.H.A. 2013. Observations concerning haematological profile and certain biochemical in sudanese desert Goat. *Online J. Anim. Feed Res.*, 3 (1): 80-86.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

of mean as statistic interpretation. This means are closed to the normal mean of R.B.Cs (8 – 18) (Table 1). In both, males and females the coefficient of variance is less than 30% which revealed that the mean of erytrocytes and erytrocitar constants are representative for this category of goats. The erythrocyte parameters HB, PCV, MCV, MCH and MCHC were analyzed in both sexes. HB mean was (8.47 ± 0.86) g/dl in females and (8.67 ± 0.85) g/dl in males. PCV had the following values: (25.60 ± 1.38)% in males and (23.80 ± 1.41)% in females. MCV, MCHC and MCHC were slightly higher in females compared with males animals. Coefficient of variance did not exceed the limit of 35%, which can be used in statistically interpretation. The RBC values in the ruminants in this study may, among other things, be due to excitement or strenuous exercise during handling (Gartner et al., 1969). This leads to the release of adrenaline and hence spleen contracts and this causes the release of more RBC into circulation. The mean of MCV was (21.52 ± 1.33)% in males and (19..96 ± 1.37)% in females, in MCHC the mean was (36.45 ± 2.49)% in females and (35.69 ± 2.94) in males animals. These values of MCV and MCHC in both sexes had been fluctuated and their values are dependent upon RBC, Hb and PCV values. The fluctuation of this values are represented in figure 1, where we observed the vaguely differences between females and males.

Table 1 - Erythrocyte indices (mean ± Std) of Sudanese desert goats

Parameter	Statistics									
	Sex	N	Mean	Std	SD	Min	Max	Median	CV	Reference values*
R.B.Cs ($\times 10^6$ /µL)	Male	15	12.10	0.53	2.07	10	18.7	11.8	17%	8 - 18
	Female	15	12.27	0.74	2.88	10.8	22.3	11.4	23%	
	Overall	30	12.18	0.45	2.47	10.0	22.3	11.55	20%	
HB (g/dL)	Male	15	8.67	0.85	3.31	3	13	10	38%	8 - 12
	Female	15	8.47	0.86	3.34	3	14	10	39%	
	Overall	30	8.57	0.60	3.27	3	14	10	38%	
PCV (%)	Male	15	25.60	1.38	5.34	13	34	24	21%	22 - 38
	Female	15	23.80	1.41	5.47	13	34	24	23%	
	Overall	30	24.70	0.98	5.39	13	35	24	22%	
MCV (fl)	Male	15	21.52	1.33	5.17	15.38	30.48	19.49	24%	16 - 25
	Female	15	19.96	1.37	5.30	10.31	30.09	20	27%	
	Overall	30	20.74	0.95	5.20	10.31	30.48	19.75	25%	
MCH (pg)	Male	15	7.28	0.76	2.92	2.38	11.54	8.20	40%	5.2 - 8
	Female	15	7.04	0.75	2.91	2.63	12.61	7.19	41%	
	Overall	30	7.16	0.52	2.87	2.38	12.61	7.34	40%	
MCHC (g/dl)	Male	15	35.69	2.94	17.09	11.43	75	34.38	48%	30 - 36
	Female	15	36.45	2.94	11.38	14.29	52.38	37.04	32%	
	Overall	30	35.57	2.60	14.27	11.43	75	35.91	40%	

N= Number of animals, Std= Standard error of mean, SD= Standard Deviation, Min= Minimum value, Max= Maximum value and CV= Coefficients of Variance. *Reference values Adapted from Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc. Whitehouse Station, NJ USA.; © 2011, from Duncan J.R. and Prasse K.W., Veterinary Laboratory Medicine, 2nd ed., Iowa State University Press, 1986.

Table 2 - leukocytes indices (mean ± Std) of Sudanese desert goats

Parameter	Statistics									
	Sex	N	Mean	Std	SD	Min	Max	Median	CV	Reference values*
Total W.B.Cs ($\times 10^3$/µL)	Male	15	3.50	0.60	2.31	0.8	8.9	2.8	66%	4 - 13
	Female	15	5.38	1.06	4.11	1.1	19.2	4.9	76%	
	Overall	30	4.44	0.62	3.41	0.8	19.2	3.65	77%	
Lymphocytes (%)	Male	15	61.33	2.16	8.36	47.0	80	60	14%	50 - 70
	Female	15	56.47	2.15	8.31	41	73	56	15%	
	Overall	30	58.90	1.56	8.56	41	80	58.5	15%	
Monocytes (%)	Male	15	7.20	0.94	3.63	1.0	13	6	50%	0 - 4
	Female	15	7.47	1.12	4.32	1.0	18	8	58%	
	Overall	30	7.33	0.72	3.92	1	18	8	53%	
Neutrophils (%)	Male	15	23.67	1.96	7.58	9.0	34	25	32%	30 - 48
	Female	15	27.40	2.27	8.80	9.0	40	30	32%	
	Overall	30	25.53	1.51	8.29	9	40	27.5	32%	
Eosinophils (%)	Male	15	7.93	1.29	4.99	2.0	21	7	63%	1 - 8
	Female	15	7.07	0.81	3.15	1.0	12	8	45%	
	Overall	30	7.50	0.75	4.13	1	21	7	55%	
Basophils (%)	Male	15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0 - 1
	Female	15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Overall	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

N= Number of animals, Std= Standard error of mean, SD= Standard Deviation, Min= Minimum value, Max= Maximum value and CV= Coefficients of Variance. *Reference values Adapted from Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc. Whitehouse Station, NJ USA.; © 2011, from Duncan J.R. and Prasse K.W., Veterinary Laboratory Medicine, 2nd ed., Iowa State University Press, 1986.

To cite this paper: Babeker E.A. and Elmansoury Y.H.A. 2013. Observations concerning haematological profile and certain biochemical in sudanese desert Goat. *Online J. Anim. Feed Res.*, 3 (1): 80-86.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

In leucocytes indices

Total W.B.Cs, Monocytes (%) and Neutrophils (%) were faintly higher in females, while Lymphocytes (%) and Eosinophils (%) elevated in males are shown in Table (2) and Figure (2). The total W.B.Cs mean in males and females is between (3.50 ± 0.60) with a minimum of 0.8 and a maximum of 8.9 and (5.38 ± 1.06) with a minimum of 1.1 and a maximum of 19.2, respectively. The male category of goats had faintly lower values than normal (4 - 13) and can be attributed to immune response to different environmental factors and physiological status (Table 2). In leukocytary series: the mean of lymphocytes was (61.33 ± 2.16)% in male and (56.47 ± 2.15)% in females, respecting the normal rapport (50 – 70)%. The Eosinophils are in the same normal limit (1 - 8)% and their means are (7.07 ± 0.81)% for females and (7.93 ± 1.29)% in males. Neutrophils (%) average was smaller than normal (30 - 48)% as follows: (23.67 ± 1.96)% in males and (27.40 ± 2.27)% in females, can be attributed to occurrence of some viral infection or have been long term bone marrow damage as designated of the low neutrophils numbers (neutrophenia). The (7.20 ± 0.94)% value of Monocytes in males and (7.47 ± 1.12)% in females were higher than normal (0 - 4)% in both sexes, this could be due to chronic infections, carcinomas, leukemia (monocytic) or lymphomas. The white blood cells (WBCs) are the soldiers of the body and their high counts may also be due to the increase of the complement in the immune systems of the animals. It may also be attributed to physiological phenomena i.e. excitement or strenuous exercise during handling.

Biochemical parameters in Sudanese Desert goats

Glucose was diminutive higher in females goats, while total protein and urea higher in male animals, Table (3) and Figure (3). The overall value of glucose, total protein and urea were (65. 20 ± 3.24) mg/L, (6.90 ± 0.12) mg/dl and (15.60 ± 0.89) mg/dl, respectively. The coefficients of variance permits the use of mean as statistic interpretation, this means are closed to the normal mean of glucose (80 - 100) mg/L , total protein (6.4 – 7.8) mg/dl and urea(10 - 27) mg/dl.

Table 3 - Some biochemical indices (mean ± Std) of Sudanese desert goats

Parameter	Statistics									
	Sex	N	Mean	Std	SD	Min	Max	Median	CV	Reference values*
Glucose (mg/dl)	Male	15	65.20	3.24	12.54	48	81	63	19%	60 - 100
	Female	15	65.67	2.44	9.44	50	79	66	14%	
	Overall	30	65.43	1.99	10.91	48	81	65.5	17%	
Total protein (g/dl)	Male	15	6.95	0.20	0.76	5.9	8.0	7	11%	6.4 - 7.8
	Female	15	6.85	0.14	0.53	6.0	8.1	6.8	8%	
	Overall	30	6.90	0.12	0.65	5.9	8.1	6.85	9%	
Urea (mg/dl)	Male	15	15.73	1.19	4.60	10.0	26	14	29%	10 - 27
	Female	15	15.47	1.38	5.33	8.0	26	16	34%	
	Overall	30	15.60	0.89	4.9	8	26	14.5	31%	

N= Number of animals, Std= Standard error of mean, SD= Standard Deviation, Min= Minimum value, Max= Maximum value and CV= Coefficients of Variance. * Reference values Adapted from Veterinary Drug Handbook, D.C. Plumb, Iowa State University Press, 1999.

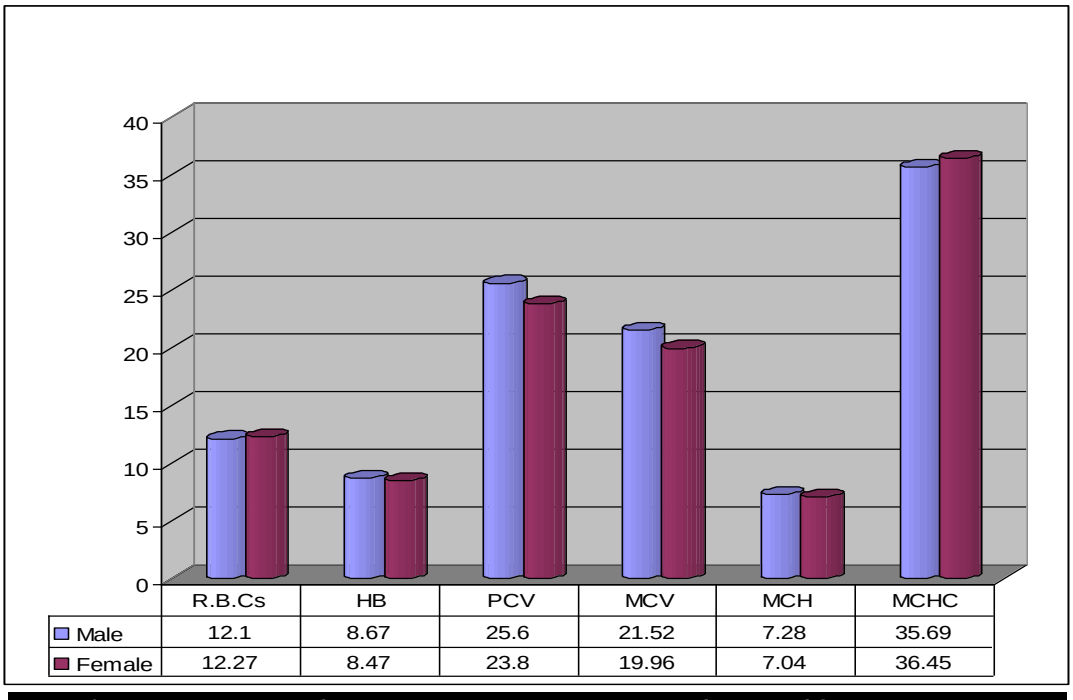
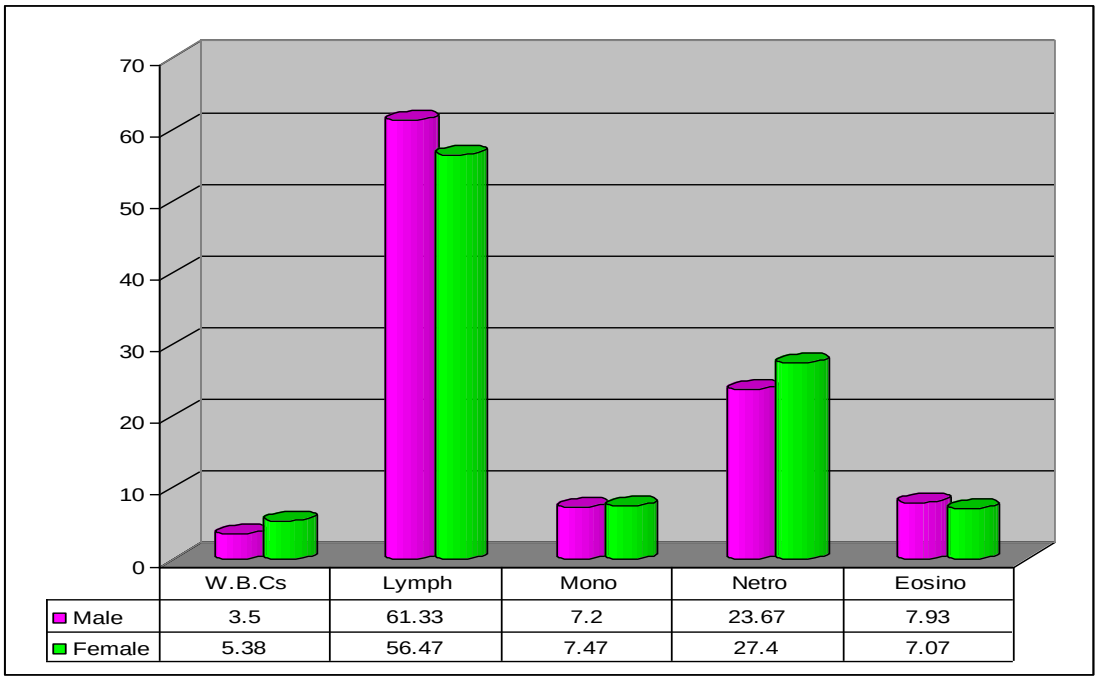


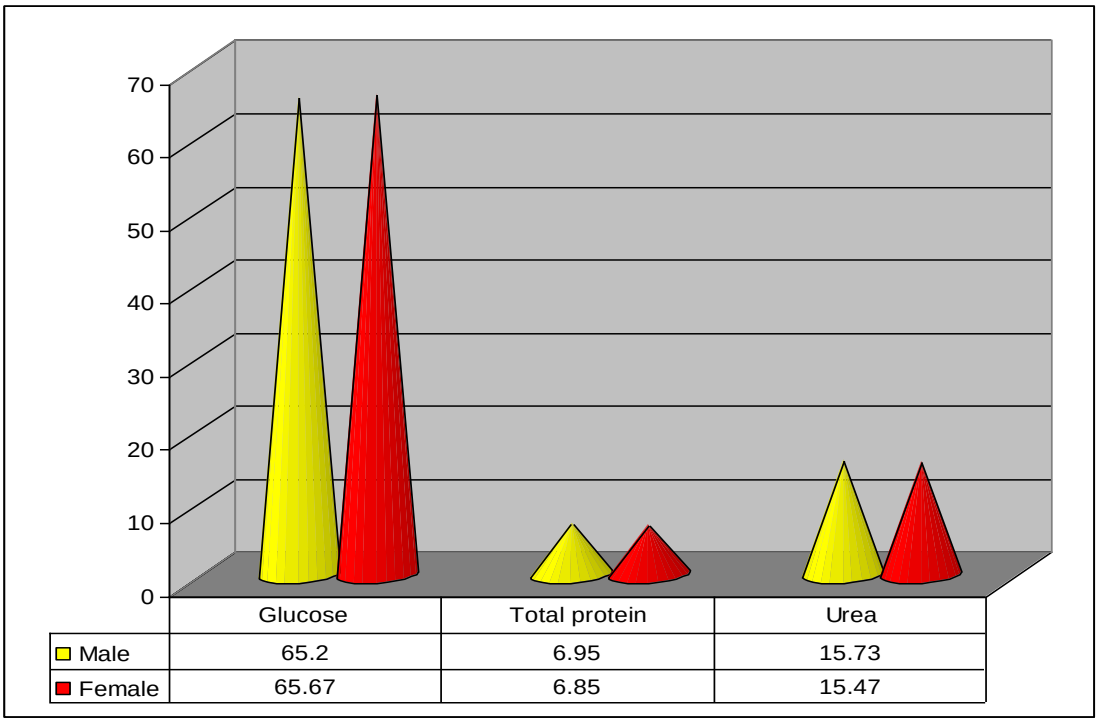
Figure 1 - Representation of erythrocytic indices in male and female of Sudanese desert goat

To cite this paper: Babeker E.A. and Elmansoury Y.H.A. 2013. Observations concerning haematological profile and certain biochemical in sudanese desert Goat. *Online J. Anim. Feed Res.*, 3 (1): 80-86.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir



	W.B.Cs	Lymph	Mono	Netro	Eosino
Male	3.5	61.33	7.2	23.67	7.93
Female	5.38	56.47	7.47	27.4	7.07

Figure 2 - Representation of leukocytic indices in male and female of Sudanese desert goat



	Glucose	Total protein	Urea
Male	65.2	6.95	15.73
Female	65.67	6.85	15.47

Figure 3 - Representation of Some biochemical indices in male and female of Sudanese desert goat

CONCLUSIONS

Sex showed relatively influence on the haematological and biochemical values of the goat studied, existing fluctuations in all the hematological and biochemical parameters of both sexes. In this study the MCV and MCHC values in both sexes fluctuated and their values are dependent upon RBC, Hb and PCV values. The low neutrophils ratio in the animals in this study might be attributed to occurrence of some viral infection; the Monocytes values can translate to an infection or hermetic aggression. The fluctuation in various parameters may be undetected minor infections, weather extremities and poor management.

REFERENCES

Addass PA, A Midau and DM Babale (2010). Haemato-biochemical findings of indigenous goats in Mubi Adamawa State, Nigeria. J. Agric. Soc. Sci., 6: 14–16

To cite this paper: Babeker E.A. and Elmansoury Y.H.A. 2013. Observations concerning haematological profile and certain biochemical in sudanese desert Goat. *Online J. Anim. Feed Res.*, 3 (1): 80-86.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Anosa VO and Isoun TT (1978). Haematological studies of domestic animals in Nigeria. Zbc. Vet. Med. 25: 640 – 646.
Azab ME and Abdel-Maksoud HA (1999). Changes in some hematological and biochemical parameters during pre-partum and post-partum periods in female Baladi goats. Small Ruminant Res., 34: 77-85.
Coles EH (1980). Veterinary clinical pathology, 3rd Edn., W.B. Sanders Co. Philadelphia, pp 10 –20.
Daramola JO, Adeloye AA, Fatoba, TA and Soladoye AO (2005). Haematological and biochemical parameters of West African Dwarf Livest. Res. Rural Dev., 17: 95.
Egbe-Nwiyi TN, SC Nwaosu and HA Salami (2000). Haematological values of apparently healthy sheep and goats as influenced by age and sex in arid zones of Nigeria. African J. Biomed. Res., 3: 109 – 115.
Gartner RJW, Callow LL and Granzien CK (1969). The concentration of blood constituents in relation to handling of cattle. Res. Vet. Scie. 10:7.
Ghergariu S, Rowlands GJ, Pop, A, Danielescu N. and Moldovan NA (1984). A comparative study of metabolic profiles obtained in dairy herds in Romania. Br. Vet. J., 140: 600-608.
Harold S (1988). Practical Clinical Biochemistry. C.B.S. Publishers, New Delhi, 132-140.
Holman HH and Dew SM (1965). The blood picture of the goat III. Changes in Hb concentrations and physical measurements occurring with age. Res. Vet. Sci. 6: 245.
Ikhimioya I and Imasuen JA (2007). Blood profile of West African Dwarf goats fed Panicum maximum supplemented with Afzelia Africana and Newbouldia laevis. Pak. Vet. J. Nutrition, 6: 79-84.
Jain CN (1986). Schalm's Veterinary Haemoatology. 4th Edn., Lee and Febiger Publishing, Philadelphia.
Kamal EE (2008). Various Factors Affecting Birth weight of Sudanese Nubian Goat Kids. Res. J. Agric. & Biol. Sci., 6: 700-703.
Kaushish SK and Arora KL (1977). Studies on reproduction in sheep: blood and plasma contents before and after parturition in Nali sheep. Haryna Vet., 16: 74-77.
Kelly WR (1984). The Blood and Blood Forming Organs. In: Bailliere Tindal, London. Veterinary Clinical Diagnosis. 3rd Edn., pp: 312-337.
King ES and JGP Wooton. (1965). Determination of total protein in plasma or serum. In: Bhagavan N V (Ed.), Churchel Ltd., London. Medical Biochemistry, 1st Edn., pp: 138-140.
Mason IL (1984). Evolution of Domesticated Animals. Goat: (ed.). Longman: London. pp 85-99.
Nazifi S, Saeb M Rowghani E and Kaveh K (2003). The influences of thermal stress on serum biochemical parameters of Iranian fat-tailed sheep and their correlation with triiodothyronine (T3), thyroxine (T4) and cortisol concentrations. Comp. Clin. Pathol., 12: 135-139.
Obi TU and Anosa VO (1980). Haematological studies of domestic animals in Nigeria. IV. Clinico-haematological features of bovine trypanosomiasis, theileriosis, anaplasmois, eperythrozoonosis and helminthiasis. Zentralbl. Veterinarmed. B, 27: 789-797.
Oduye OO and Adadevoh BK (1976). Biochemical values in apparently normal Nigerian sheep. Nigerian Vet. J., 5: 43-50.
Oduye OO (1976). Haematol. Val. of Nigeria goats and sheep. Trop. Animal. Health. and prod. 8:131-136.
Radostits OM Blood DC (1994).Vet. Med., 8th edition, Bailliere Tindall, London, pp 86-180.
Roubies N, Panousis N, Fytianou A, Katsoulos PD, Giadinis N and Karatzias H (2006). Effects of age and reproductive stage on certain serum biochemical parameters of Chios sheep under Greek rearing conditions. J. Vet. Med. A Physiol. Pathol. Clin. Med., 53: 277-281.
Schalm OW Jain, NC and Carol EI (1975).Veterinary Heamatology. 3rd edn. Lea and Fibinger, Philadelphia. Pg: 144 – 167.
Simon J Kenyon and Gundy S Casmir (2001). Manual of veterinary investigation Laboratory techniques. Part (3); Biochemistry. Part (4). and Hematology.
SPSS (1999). SPSS Base 10.0: User's Guide. Published: Chicago, Il: SPSS Cop. ISBN: 0-13-017902-7.
Swanson KS, Kuzmuk KN, Schook LB and Fahey GC Jr (2004). Diet affects nutrient digestibility, hematology, and serum chemistry of senior and weanling dogs. J. Anim. Sci., 82: 1713-1724.
Taiwo VO and VO Anosa (1995). Fibrinogen, leucocyte and haematocrit values of cattle with various disease conditions. Trop. Vet., 13: 51-57.
Tambuwal FM, Agale BM and Bangana A (2002). Haematological and biochemical values of apparently healthy Red Sokoto goats. In: Proceeding of 27th Annual Conference of Nigerian Society of Animal Production (NSAP), FUTA, Akure, Nigeria, 50-53.
Tibbo M, Jibril Y, Woldemeskel M, Dawo F, Aragaw K and Rege JEO (2004). Factors Affecting Hematological Profiles in Three Ethiopian Indigenous Goat Breeds. Intern. J. Appl. Res. Vet., 2: 297-309.
Tibbo M, Jibril Y, Woldemeskel M, Dawo F, Aragaw K and Rege JE (2008). Serum enzymes levels and influencing factors in three indigenous Ethiopian goat breeds. Trop. Anim. Health Prod., 40: 657-666.
Tschuor AC, Riond B, Braun U and Lutz H (2008). Hematological and clinical biochemical reference values for adult goats and sheep. Schweiz. Arch. Tierh., 150: 287-295. (article in German with an abstract in English).
Van Kampen EJ and W G Zijlstra (1961). Standarization of haemoglobinometry. II. The haemoglobinocyanide method. Clin. Chem. Acta., 6: 538-544.
Waziri MA, Abdulahdi YR and Nallatanby Sivachelvannd (2010). Changes in the blood profile in the gestation period in the Sahel goats. Vet. Arhiv., 80: 215-224.

To cite this paper: Babeker E.A. and Elmansoury Y.H.A. 2013. Observations concerning haematological profile and certain biochemical in sudanese desert Goat. *Online J. Anim. Feed Res.*, 3 (1): 80-86.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Wilson T (1991). Small ruminant production and the small ruminant genetic resource in tropical Africa. In: FAO Animal Production and Health Paper, 88: 181.
Yousif A and Fadl El-Moula A. (2006). Characterization of Kenana cattle breed and its production environment. Agri., 38: 47-56.
Yokus B, Cakir DU, Kanay Z, Gulten T and Uysal E (2006). Effects of seasonal and physiological variations on the serum chemistry, vitamins and thyroid hormone concentrations in sheep. J. Vet. Med. A Physiol. Pathol. Clin. Med., 53: 271-276.

To cite this paper: Babeker E.A. and Elmansoury Y.H.A. 2013. Observations concerning haematological profile and certain biochemical in sudanese desert Goat. *Online J. Anim. Feed Res.*, 3 (1): 80-86.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir