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Comparative Study on Haematological Values of Blood of Indigenous Chickens in Sudan

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ABSTRACT

An experiment was conducted to study the haematological parameters in the males and females of three indigenous Sudanese chicken ecotypes. Sixty chickens from the three different ecotypes (30 males and 30 females) were tested at mature ages ranging from 1.5-2.0 years. Total Red Blood Cells count (RBC), Packed Cell Volume (PCV), Haemoglobin concentration (Hb), total White Blood Cells (WBC), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) were assessed. Hb, WBC, MCH and PCV were not significantly ($p>0.05$) different among the three different ecotypes. RBC, MCV and MCH were significantly ($p<0.05$) different among the three ecotypes. The haematological values of Betwil ecotype: WBC, RBC, Hb, MCH, were significantly ($p<0.05$) different between males and females, however PCV, MCV, MCHC were not significantly ($p>0.05$) different between the two sexes. The haematological values of Bare Neck: WBC, RBC, Hb, MCH were significantly ($p<0.05$) different between males and females, however, PCV, MCV and MCHC were not significantly ($p>0.05$) different between the two sexes. The haematological values of Large Beladi ecotype: WBC, RBC, PCV, Hb, MCV and MCH were significantly ($p<0.05$) different between males and females, however, MCHC, were not significantly ($p>0.05$) different between male and female.

Key words: Haematological parameters, indigenous chicken, male, female

INTRODUCTION

Traditional poultry production in the Sudan is practiced in rural and periurban areas where conditions permit settled life. The household poultry production system is based on scavenging indigenous domestic chickens accompanied by pigeons, guinea fowls, ducks or turkeys. Indigenous birds are usually raised as scavengers in an open yard, scratching and picking on the grounds (Ravi-Kumar *et al*., 2002). Sudanese indigenous chickens are classified into three main ecotypes; Large Beladi, Bare Neck and Betwil (Desai and Halbrook, 1961).

Analysis of normal haematological parameters of chickens is essential for the diagnosis of various pathological and metabolic disorders. It can be used as a diagnostic tool in order to assess the health status of an individual and/or a flock; Haematological changes are commonly used to determine the body status and to assess the impact of environmental, nutritional and/or pathological stresses.

Haematological parameters provide valuable information on the immune status of animals (Kral and Suchy, 2000). Such information, apart from being useful for diagnostic and management purposes, could equally be incorporated into breeding programmes for the genetic improvement of indigenous chickens.

It is desirable to know the normal physiological values under local conditions for proper management, feeding, breeding, prevention and treatment of diseases. Meager information about the local ecotypes of birds and their characterization are available in the literature and no reliable data describing traditional poultry production are available. However, according to approximate figures released by FAO/IAEA in 2007, the number of all types of indigenous poultry birds in Sudan is approximately 45.3 million birds.

However, normal haematological information on Sudanese local birds is hardly available in the literature as researches on these lines had rarely been carried out under Sudan conditions. The present study was designed to partly rectify this deficiency and to provide baseline data on haematological parameters of three different indigenous ecotypes in Sudan.

MATERIALS AND METHODS

Sixty mature birds from indigenous types (Betwil, Bare Neck and Large Beladi) 30 males and 30 females were used. Birds were kept in an open sided house in the poultry experimental unit of the Faculty of Animal Production, University of Khartoum from March to June 2009. Birds were fed standard layer diet; feed and water were provided *ad libitum*. Light was provided 18 hours daily.

Blood samples were collected from the wing vein of birds using 3 mL disposable syringe then taken into syringe and directly transferred into a labeled test tube containing anticoagulant (heparin). It was immediately used for measuring the haematological values: Red blood cells, haemoglobin, WBC, packed cell volume. The red blood cells indices (MCV, MCH and MCHC) were calculated from RBC count, Hb concentration and PCV. The data was subjected to analysis of variance according to Statistical Package of Social Science (SPSS) using computer program. Means were compared using Duncan's multiple range tests.

RESULTS

Table 1 show the haematological values in three different ecotypes of Sudanese indigenous chicken. There was no significant ($p>0.05$) difference in haemoglobin, white blood cells, mean corpuscular haemoglobin concentration and packed cell volume between the three different ecotypes.

Data on Table 2 represents the haematological values of males and females of the Betwil ecotypes. Haemoglobin, white blood cells, red blood cells and mean corpuscular haemoglobin in males and females of the Betwil ecotype were significantly different ($p<0.05$). However, there was no significant ($p>0.05$) difference in packed cell volume, mean corpuscular haemoglobin concentration and mean cell volume between males and females of the same ecotype.

The haematological values of male and female of Bare Neck ecotype were shown in Table 3.

Table 1: Haematological values of Sudanese indigenous breed

Ecotype	WBC $(10)^6$ mm	RBC $(10)^6$ mm	PCV (%)	Haemoglobin (g dL^{-1})	MCV (FL)	MCH (pg)	MCHC (%)
Overall mean±S.E	2.30±0.03	2.42±0.086	43.38±.873	17.83±0.43	203.45±.26	80.41±3.41	41.51±.99
Betwil	2.33	2.67^{a}	44.40	17.45	169.75^{b}	66.44^{b}	39.84
Bare Neck	2.35	2.14^{b}	39.95	17.35	249.34^{a}	92.53^{a}	41.44
Large Beladi	2.23	2.47^{ab}	44.21	18.70	191.28^{b}	82.27^{ab}	43.24
±SE	±0.06	±0.15	±1.51	±0.75	±10.84	±5.91	±1.71

*Values with different letters is not significant. ±SE: Standard error

Table 2: The haematological values of male and female of Betwil ecotype

Parameters	Males	Females	±SE	SL
Wbc $(10)^6$ mm	2.34	2.31	±0.79	*
Rbc $(10)^6$ mm	2.83	2.50	±0.21	*
Pcv (%)	46.30	42.50	±2.14	NS
Hb (g dL^{-1})	18.90	15.99	±1.06	*
MCV (FL)	169.05	170.46	±15.33	NS
MCH (pg)	67.93	64.95	±8.36	*
MCHC (%)	41.07	36.62	±2.42	NS

*Significant difference ($p<0.05$). NS: Not significantly different. ±SE: Standard error. SL: Significance level

Table 3: The haematological values of male and female of Bare Neck ecotype

Parameters	Males	Females	±SE	SL
Wbc $(10)^6$ mm	2.27	2.43	±0.79	*
Rbc $(10)^6$ mm	2.83	1.70	±0.21	*
Pcv (%)	47.70	36.20	±2.14	NS
Hb (g dL^{-1})	18.59	16.10	±1.06	*
MCV (FL)	279.10	219.58	±15.33	NS
MCH (pg)	88.93	96.13	±8.36	*
MCHC (%)	38.20	44.68	±2.42	NS

*Significant difference ($p<0.05$). NS: Not significantly different. ±SE: Standard error. SL: Significance level

Table 4: The haematological values of male and female of Large Beladi ecotype

Parameters	Males	Females	±SE	SL
Wbc $(10)^6$ mm	2.27	2.19	±0.79	*
Rbc $(10)^6$ mm	2.70	2.10	±0.21	*
Pcv (%)	49.20	38.40	±2.14	*
Hb (g dL^{-1})	20.66	16.44	±1.06	*
MCV (FL)	184.59	197.96	±15.33	*
MCH (pg)	78.44	86.07	±8.36	*
MCHC (%)	42.65	43.84	±2.42	NS

*Significant difference ($p<0.05$). NS: Not significantly different. ±SE: Standard error. SL: Significance level

They were as follows: Haemoglobin, white blood cells, red blood cells and mean corpuscular haemoglobin were significantly ($p<0.05$) different between males and females. However, packed cell volume, mean corpuscular haemoglobin concentration and mean cell volume were not significantly ($p>0.05$) different in the two sexes of the same breed.

Table 4 shows the haematological values of males and females of Large Beladi ecotype. Haemoglobin, white blood cells, red blood cells and mean corpuscular haemoglobin were significantly ($p<0.05$) different in males and females. In contrast, packed cell volume, mean corpuscular haemoglobin concentration and mean cell volume were not significantly different ($p>0.05$) in males and females of the Large Beladi ecotype.

DISCUSSION

Haematological parameters in birds have been shown to be influenced by various factors such as age, sex, season and nutrition. PCV and Hb values have also been reported to be higher in males than in females in turkeys (Oyewale and Ajibade, 1990) and pigeons (Pavlak *et al*., 2005).

In general haematological parameters are affected by diurnal fluctuations or changes in daily physical and metabolic activities (Sanni *et al*., 2000; Piccione *et al*., 2001, 2005). The mean haematological values RBC, Hb and E.S.R. of birds vary among species. Other factors, which affect the RBC counts, include breed, sex and the nutrition supplied to the bird (Sturkie, 1965). Packed Cell Volume (PCV), haemoglobin concentration and red blood cell count had been reported to increase with age in chickens (Islam *et al*., 2004).

In the current study the haematological values of indigenous types recorded high values compared to standard values of birds reported by Schalm's *et al*. (2000). This is in agreement with the result found by Oyewale (1987) who reported a high Hb concentration in Nigerian domestic fowls. This was attributed to several factors, including environment, nutrition and management procedures.

The values of RBC, PCV and Hb in males and females of Sudanese indigenous chicken were higher in males than females. This result was in agreement with the finding of Sharmjin and Myenuddin (2004), who reported significant higher values of Hb, RBC and PCV in male than female of indigenous chicken. Similar findings have been reported in turkeys and pigeons by Oyewale and Ajibade (1990) who reported that PCV and Hb values were higher in males than in females in turkeys and a similar result was found in pigeons by Pavlak *et al*. (2005). In this study the values of WBC was higher in male than female, this finding agree with the finding of Islam *et al*. (1999) but disagree with Sharmjin and Myenuddin (2004), who found that WBC was higher in female than in male.

In general, it was observed that the haematological values recorded in this study were close to values reported by Schalm's *et al*. (2000) for the American reference values in ducks and geese. In conclusion the values of haematological parameters obtained are close to those found in other avian such as pigeon, duck and geese. The results are an important step in the characterization of indigenous types of chicken.

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