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Sex and Strain Effects on Hematology Parameters of Broiler Chickens at Makurdi

T. Ahemen, H.O. Ukwu and T.T. Anongo
Department of Animal Breeding and Physiology, University of Agriculture, Makurdi-Nigeria
Corresponding author: T. Ahemen; E-mail: drtahemen@gmail.com**;** Phone: 08132046850

Abstract
This study was carried out to investigate the effect of sex and strain on haematology of broiler chickens in Makurdi, Benue State. A total of one hundred and sixty (160) day old chicks of two commercial broiler strains (80 each of Arbor-acre and Hubbard) were used for the study. The birds were divided into four (4) groups based on the strains and sexes designated M_1, F_1, M_2 and F_2 for Arbor acre male strain, Arbor acre female strain, Hubbard male strain and Hubbard female strain respectively. The birds were reared for a period of 56 days (8 weeks). At the end of the 56th day, blood samples were collected from the experimental group and analysed. The results indicate significant ($p< 0.05$) effect of strain on blood platelet and significant ($p<0.05$) influence of sex on red blood cell counts. Significant interactive ($p< 0.05$) effect between sex and strain were observed for white blood cells, mean corpuscular haemoglobin, and mean corpuscular haemoglobin concentration. The values obtained in this study fall within the normal ranges recommended for healthy broilers. It is therefore concluded that the two strains of broilers investigated can be successfully raised in Makurdi environment without adverse effect on their health since their haematological values compared favourably with standard reference values. Values obtained in this study could also serve as a baseline data of these strains in this environment

Keyword: Hematology, broiler, day old chicks

Introduction
Haematology is the study of the morphology and blood-forming organs. Haematological studies are important because blood is the major transport system of the body and evaluations of haematological profile usually furnishes vital information on the body's response to injury of all forms, including toxic injury (Etim *et al*., 2014). The values of hematological indices in domestic and wild birds could be an important source of information with valuable diagnostic meaning . They could provide or support an objective assessment of the health status and could support the correct diagnosis in different pathological situations (Lashev *et al.,* 2009). Determination of blood values of chicken are influenced by age, sex, breed, climate, geographical location, season, day length, time of day, the nutritional status, present status of individual and such other physiological factors (Islam *et al*., 2004; Awotwi, 1991).

However**,** hematological studies carried out in Nigeria and most developing countries are mostly nutritional in nature, aimed at investigating and establishing the safety and safe levels of unconventional feedstuffs in animal nutrition; in a bid to alleviating the cost of production resulting from feeding. Little efforts are geared at providing a baseline data of values of the common breeds and strains of poultry reared in our environment. Reference blood profiles of different broiler strains under the warm humid tropical region as in Nigeria are very essential for accurate interpretation of hematological tests (Ikhimioya *et al*., 2000) as well as selection for adaptation and superior production traits for enhanced productivity.

The rationale for the study therefore, was to investigate the effect of sex and strain on haematological parameters of broiler chickens in Makurdi and establish baseline data for these parameters in broiler chickens in this environment.

Materials and Methods
The experiment was conducted at the poultry unit of the Livestock Teaching and Research Farm of The University of Agriculture Makurdi. The site is located on latitude 7° 14'N and longitude 8°21'E and is characterized by two seasons- dry and rainy season. Annual rainfall ranges from 508mm to 1016mm. The area is warm with a minimum temperature range of 0.73°C to 24.5°C with relative humidity of between 47%and 87% (TAC, 2009).A total of 160 healthy day-old chicks of two commercial broiler strains (80-Abor Acre and 80- Hubbard) were procured from Ota Farm, Oyo state. The birds were fed broiler starter commercial diet (Animal care) during the four weeks of age (brooding phase). At the end of four weeks, the birds were divided into four (4) groups based on the strains and sexes designated M_1, F_1, $M_2$and F_2 for Arbor acre male strain, Arbor acre female strain, Hubbard male strain and Hubbard female strain respectively. The birds were fed broiler finisher's commercial diet (Animal care) for the remaining 4 weeks period. Feed and water were provided *ad libitum*.

At the 56th day of the study 2 ml blood samples were collected from medial metatarsal vein in tubes containing ethylene diaminetetra acetic acid (EDTA). Hematological parameters evaluated included packed cell volume (PCV), red blood cell (RBC) white blood cell (WBC) counts, Haemoglobin concentration (Hb), Mean Corpuscular Volume (MCV), mean corpuscular Haemoglobin (MCH). Evaluations were conducted according to the methods already described by Ahemen (2015).

Data collected were subjected to two-way analysis of variance (ANOVA). Significant differences ($p<0.05$) among means were separated using Duncan Multiple Range Test (DMRT) as outlined by steel and Torrie (1980).

Results and Discussion

The results of the effect of sex and strain on haematological parameters are presented in Table 1. All haematological parameters measured did not reveal any significant ($p>0.05$) effect of between sex and strain of broilers with the exception of blood platelets and red blood cell counts (RBC). The packed cell volume (PCV) values (23.47% to 24.40%) obtained in the study were within the normal range of 22.00 to 35.00% reported by Jain (1993). Red blood cell value was significantly ($p>0.05$) higher in male than female. The finding of this study was in agreement with the findings of Addass (2012) who reported a significant effect of sex on RBC of intensively managed chickens in Mubi, Adamawa State. White blood cell, Hb, MCH, and MCHC values showed no significant ($p>0.05$) variations between sexes and strains of broiler chickens. Values obtained reasonably compared with standard reference values reported by Jain (1993). Similar to the result of the present study is the finding of Nowaczeweski and Kontecka, (2012) who also observed similarities between broiler sexes in all haematological indices with the exception of MCV which differed significantly between sexes.

Table 1: Effect of sex and strain on haematological parameters of broiler chickens

Parameters/ Treatments	PCV (%)	RBC (x 10^{12}/L)	Hb(g/dl)	MCV(fl)	MCH(pg)	MCHC (g/dl)	WBC (x 10^9/L)	PLT (x10^9)
Strain								
Abor Acre	23.47 ± 1.39	4.43 ± 2.78	8.93 ± 0.50	140.23±2.10	53.35±1.02	38.08±0.24	8.59 ± 0.93	21.67±0.76^a
Hubbard	24.40±1.78	1.79±0.12	9.38±0.64	136.50±1.46	52.50±0.67	38.55±0.57	9.83±0.54	17.83±0.48^b
Sex								
Female	24.00 ± 1.62	1.76 ± 0.11^b	9.22 ± 0.58	136.47±1.54	52.42±0.67	38.48±0.58	9.1.20±1.08	19.33±1.26
Male	23.87 ± 1.60	4.46 ± 2.77^a	9.10± 0.59	140.27±2.03	53.43±1.01	38.15±0.23	9.3.88±0.92	20.17±0.79
Interaction								
Strain x sex	Ns	Ns	Ns	Ns	**	*	*	Ns

^{a,b} means in the same column with different superscripts differ significantly ($p< 0.05$), *$p< 0.05$, **$p< 0.01$, Ns=not significantly different ($p< 0.05$) PCV = packed cell volume, RBC = red blood cell, Hb =hemoglobin, WBC = white blood cell, MCV = mean corpuscular volume, MCH = mean corpuscular hemoglobin, MCHC = mean corpuscular hemoglobin concentration, PLT = platelet

Sex and strain interaction effect was significant ($p< 0.05$) on white blood cell (WBC), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC). The values of WBC obtained in this study were comparable to range of 8.50±0.35 x 10 ^{9}/l to 9.40 ± 0.30 x10 ^{9}/L) reported by Addass (2012). According to Reilly (1993), normal range of values for WBC indicated that the animals were healthy. Platelets were significantly ($p<0.05$) higher in the Arbor acre (21.67 x 10^9) than Hubbard (17.83 x 10^9). Since platelets are implicated in blood clotting (Etim *et al.,* 2014), the higher value recorded in Arbor acre implied better clotting properties compared to the Hubbard strains of broiler chickens. Strain therefore, is a determinant factor of blood platelet. Platelets were however similar in both sexes.

Conclusion and Recomendation

It was concluded that haematological values of the two broiler strains, showed slight but no significant ($p>0.05$) differences in most parameters indicating that the two broiler strains are nearly similar to each other in haematological parameters. The haematological values obtained in this study could serve as a basiline data of this strain in this environment

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