INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

Haematological Studies in Fulani Ecotype Chickens in South-western Nigeria

Nweke-Okorocha G. O.
Ph.D. Student, Department of Animal Production and Health,
Federal University of Technology, Akure, Ondo State, Nigeria
Chineke, C. A.
Professor, Department of Animal Production and Health,
Federal University of Technology, Akure, Ondo State, Nigeria

Abstract:
This study was conducted using thirty Fulani ecotype chickens selected at random from intensively raised (deep litter and caged) population of 90 birds from day old to 16 weeks. Blood was collected from the birds at week 11 and 16 and used for haematological analyses. Data generated were subjected to least squares means analysis using SAS 9.2 (Version 2008).Result revealed that the male Fulani ecotype chickens were significantly different ($p<0.05$) for packed cell volume (PCV), red blood cell (RBC), haemoglobin (Hb). Mean cell haemoglobin (MCH) was significantly affected by polydactyly and rearing systems (RS) at 11 weeks of age. Mean cell volume (MCV) was significantly affected by RS at week 11. Erythrocyte sedimentation rate (ES) and RBC were significantly affected by polydactyly RS respectively at 16 weeks of age. This study revealed that sex, polydactyly and rearing system had significant effects on some physiological parameters of Fulani ecotype chickens that could be used for future improvement purposes

Keywords: *Fulani Chickens, Haematology, Sex, Polydactyly, Rearing systems (RS)*

1. Introduction

Indigenous chickens in Nigeria, which are mostly found in rural areas, are good scavengers as well as foragers. They have good maternal qualities, hardier than the exotic breeds and have high survival rates with minimal care and attention (Salako and Ige, 2006). Indigenous chicken production systems can be improved and transformed from subsistence to semi-commercial production systems to increase food security and family income especially among the rural populace and disadvantaged members of the community.

The Fulani ecotype chicken is a native of Fulani tribe in the Middle belt and Northern parts of Nigeria. They are known to be superior in body weight, body length and height at withers compare to any other chicken ecotype in Nigeria (Atteh, 1990). Polydactylys are birds that manifest an additional 1 to 2 digits in the foot among the Fulani ecotype chickens.

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. Aro and Akinmoegu (2012) and Aro *et al.* (2013) reported that haemotological parameters such as red blood cell (RBC), pack cell volume (PCV), haemoglobin (Hb), mean cell volume (MCV), mean cell haemoglobin (MCH), mean cell haemoglobin concentration (MCHC), erythrocyte sedimentation rate (ESR), lymphocytes (LYM), heterophils (HETER), monophils (MONO), basophils (BAS) and eosinophils (EOS) were used in routine screening for the health and physiological status of livestock and humans. The evaluation of blood provides the opportunity to clinically investigate the presence of several metabolites and other constituents in the body and its vital role in the physiological, nutritional and pathological status of the animal (Aderemi, 2004). The purpose of this study is to evaluate the various effects of sex, polydactyly on haematological indices of Fulani ecotype chickens raised in deep litter and cage system of rearing.

2. Materials and Methods

2.1. Location of the Study

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm of Federal University of Technology, Akure, Nigeria. Akure is situated on 350m (1,150ft)above sea level at Latitude 7º37' and 7º 15'N and Longitude 5º 11' E and 5º31'. The vegetation of the area is that of the Rainforest characterized by hot and humid climate. The mean annual rainfall is about 1500m - 2500mm and the rain pattern is bimodal with short break in August with average mean annual relative humidity of 75% to 85% and average temperature of 22ºC - 34ºC.

2.2. Experimental / Management of Birds

This study was conducted with ninety day old chicks of Fulani eco-type chickens collected from a reputable farm, brooded and managed under intensive care for sixteen weeks. The birds were sexed and assigned at random into 2 management systems (cage and deep litter) containing mixed sexes and polydactyl of 45 birds each and each treatment was replicated 5 times with 9 birds per replicates in completely randomized design at 8 weeks. The birds were fed properly with the best commercial feed from day old to 16 weeks. The birds were given chick starter mash from day old to 8 weeks then growers mash from 8 weeks to 16 weeks. All necessary medication and vaccines were given to the birds using vaccination schedule for pullet. Fresh water was also provided adequately. Biosecurity was also maintained. At 11^{th} week, thirty (30) Fulani ecotype chickens comprising 15 males and 15 females of polydactyly and non-polydactyly (15 polydactyly and 15 non-polydactyly) were selected at random from the 90 Fulani ecotype chicken's population raised in both deep litter and caged systems for 16 weeks and were subjected to 12 hours fasting prior to blood collection. Blood was aspirated from the jugular vein using a sterile syringe and needle via wing veins into a blue top bottle containing K3-EDTA for haematological analysis. The haematological indices (Red blood cell, packed cell volume, haemoglobin, mean cell volume, mean cell haemoglobin, mean cell haemoglobin concentration, erythrocyte sedimentation rate, lymphocytes, heterophils, monophils, basophils and eosinophils) on EDTA sample were determined on the day of collection by Shenzhen mind ray Auto Haematology Analyzer (Model Bc-3200, Shenzhen Mind ray Biomedical Electronics Co. Hamburg 20537, Germany). Same procedure was repeated at 16 weeks. The haematological indices was carried out twice in this experiment in order to ascertain the health status of the birds and have 2 different database for purpose of comparison at different stages of growth.

3. Results and Discussion

3.1. Results

Least squares means revealed that sex had significant effects ($p<0.05$) on haematological parameters such as PCV, RBC and Hb, MCH was significantly affected by Polydactyly at week 11. Rearing system significantly ($P<0.05$) influenced MCH and MCV at week 11 (Table 1). Polydactyly and non- polydactyly state had effect ($p<0.05$) on ESR while Rearing system had a significance effect ($p<0.05$) on RBC at week 16 (Table 2). However the means squares for the effects of sex, polydactyly and rearing system indicated that sex significantly ($p<0.05$) influenced PCV, RBC, Hb, MCHC, LYM and MONO values, Polydactyly had significant effect on MCHC, MCH and LYM. Rearing system had significant influence on MCHC, MCH, MCV and LYM. Interaction between rearing and polydactyly significantly affected PCV, Hb, MCHC and BAS, interaction between sex and polydactyly was significant for ESR, MCHC, BAS and MONO, interaction among sex, polydactyly and rearing system were significant ($p<0.05$) for PCV, RBC, MCH and LYM at week 11 (Table 3). Means squares for the effects of sex, polydactyly and rearing systems revealed that polydactyly had significant ($p<0.05$) effect on ESR, RBC was significantly influenced by rearing systems while interaction between rearing system and polydactyly; sex and rearing system; sex and polydactyly; sex, rearing system and polydactyly had no effect on all haematological parameters determined at week 16 (Table 4).

3.2. Discussion

The sex effect on packed cell volume, red blood cell and haemoglobin at 11 weeks haematological indices was significant. However hematological values were similar for sexes at 16 weeks. The 11 weeks haematological values were in agreement with the report from the study by Pampori and Iqbal (2007) who reported that the values of haemoglobin, packed cell volume, red blood cell and erythrocyte count were different among male and female native chicken of Kashmir.

The values of the haemotological parameters evaluated in this study corroborated with the result of Olabanji *et al*. (2007); Togun *et al*. (2007) and Etim *et al*. (2014) who confirmed that the observed values for haematological parameters in their study fell within the normal range for healthybirds reported by Mitruka and Rawnsley (1977).

Mitruka and Rawnsley (1977) reported that packed cell volume from 24.9 - 45.2 %, haemoglobin from 7.40 - 13.10 %/ml, red blood cell from 3.7 - $7.5x10^6$cbmm were normal range for healthy birds. Aro *et al* (2013) also reported that red blood cell ranges from 2.0 to 4.0 were normal for healthy birds. This study revealed that the values of male and female Fulani eco type chickens for packed cell volume ranged from 20.47 - 23.53 %, 29.80 - 33.40 %, red blood cell from 2 .00 to $2.16x10^6$ cbmm, 2.40 - $3.58x10^6$ cbmm, haemoglobin from 7.00 - 7.85 %/ml, 9.01 - 11.13 %/ml at 11^{th} and 16^{th} week respectively which indicated that the birds were healthy throughout the study and that Fulani eco type chicken had better resistance to diseases and are adaptable to the local environment of this study.

Sources of variation	NO	ESR (mm)	PCV (%)	RBC ($x10^6$cbmm)	HB (%/ml)	MCHC (g/%)	MCH (pg)	MCV (cbmm)	LYM (%)	HETER (%)	MONO (%)	BAS (%)	EOS (%)
Sex													
F	15	4.33±0.69	23.53±0.91^a	2.00±16.05^a	7.85±031^a	33.33±0.03	47.03±3.27	137.53±7.31	62.13±0.27	20.40±0.67	13.27±0.65	3.00±0.14	1.20±0.11
M	15	4.93±0.96	18.93±1.62^b	2.00±16.56^b	6.31±0.54^b	31.13±2.22	50.81±4.63	150.37±15.07	58.00±4.16	19.80±1.56	11.67±1.04	2.80±0.24	1.10±0.12
Polydactyly													
N	15	4.68±0.71	20.47±0.97	2.00±15.17	6.97±0.32	33.31±0.03	53.84±3.09^a	152.71±9.33	62.16±033	20.84±0.54	12.90±0.50	3.00±0.13	1.11±0.07
P	15	4.54±1.10	21.73±2.26	2.16±21.68	7.25±0.75	30.36±3.04	40.42±4.60^b	128.84±15.49	56.46±5.65	18.82±2.09	11.73±1.47	2.73±0.30	1.18±0.18
Rearing system													
D	15	3.60±0.55	20.73±0.93	2.00±13.97	6.91±0.31	33.35±0.04	54.81±3.17^a	162.14±9.14^a	62.93±0.23	20.60±0.52	12.53±0.57	2.87±0.17	1.07±0.07
C	15	5.67±0.98	21.73±1.82	2.15±20.16	7.25±0.61	31.11±2.22	43.03±4.19^b	125.77±12.48^b	57.20±4.10	19.60±1.61	12.40±1.12	2.93±0.23	1.20±0.14
Over all mean	30	4.63±0.83	21.19±1.42	2.05±1.65	7.09±0.47	32.10±1.26	48.32±3.83	142.89±11.47	59.81±2.46	20.01±1.17	12.42±0.89	2.89±0.20	1.14±0.12

Table 1: Least squares means and standard error for the effects of sex, polydactyly and rearing system on haematological indices at 11 weeks

Means with different letters on same column are significantly different ($p<0.05$).
M= male, F= femaleP= polydactyly, N= non-polydactyly, D= deep litter system, C= caged system, NO= number of observations (birds) used, ERS= erythrocyte sedimentation rate, PCV= packed cell volume, RBC= red blood cell, HB= haemoglobin concentration, MCHC = mean cell haemoglobin, MCH=mean cell haemoglobin concentration, MCV= mean cell volume, LYM = Lymphocyte, HETER= heterophils, MONO = Monocytes, BAS= Basophil, EOS = Eosinophil.

Sources of variation	NO	ESR (mm)	PCV (%)	RBC ($x10^6$cbmm)	HB (%/ml)	MCHC (g/%)	MCH (pg)	MCV (cbmm)	LYM (%)	HETER (%)	MONO (%)	BAS (%)	EOS (%)
Sex													
M	15	3.20±0.52	30.67±2.28	3.00±3.57	10.21±0.76	31.03±0.41	30.69±2.45	85.51±8.99	56.20±4.03	22.67±1.71	11.33±0.96	2.27±0.21	1.27±0.15
F	15	3.20±0.49	29.80±2.19	2.98±2.50	9.93±0.73	31.10±2.22	31.64±2.43	81.15±10.08	56.53±4.05	21.40±1.69	11.80±1.11	2.53±0.22	1.07±0.12
Polydactyly													
N	15	3.74±0.48[a]	30.16±1.77	2.83±2.70	10.04±0.59	31.52±1.75	32.61±2.04	81.84±9.30	57.37±3.20	22.21±1.37	11.58±0.83	2.42±0.18	1.16±0.12
P	15	2.27±0.46[b]	30.36±3.07	3.25±3.53	10.13±1.02	30.28±3.03	28.67±2.98	85.89±8.91	54.64±5.48	21.18±2.26	11.55±1.41	2.36±0.28	1.18±0.18
Rearing system													
C	15	2.67±0.27	33.40±0.45	3.58±1.35[a]	11.13±0.15	33.30±0.02	31.54±0.80	94.50±2.40	58.87±0.31	23.80±0.63	12.40±0.64	2.60±0.13	1.33±0.13
D	15	3.73±0.63	27.07±2.90	2.40±3.50[b]	9.01±0.96	28.83±3.02	30.79±3.36	72.15±12.63	52.87±5.55	19.87±2.20	10.73±1.29	2.20±0.26	1.00±0.14
Overall mean	30	3.14±0.48	30.24±2.11	3.01±2.86	10.08±0.70	31.01±1.74	30.99±2.34	83.51±8.71	56.08±3.77	21.86±1.64	11.57±1.04	2.40±0.21	1.17±0.14

Table 2: Least squares means and standard error for the effects of sex, polydactyly and rearing system on haematological Indices at 16 weeks

Means with different letters on same column are significantly different ($p<0.05$).
M= male, F= femaleP= polydactyly, N= non-polydactyly, D= deep litter system, C= caged system, NO= number of observations (birds) used, ERS= erythrocyte sedimentation rate, PCV= packed cell volume, RBC= red blood cell, HB= haemoglobin concentration, MCHC = mean cell haemoglobin, MCH=mean cell haemoglobin concentration, MCV= mean cell volume, LYM = Lymphocyte, HETER= heterophils, MONO = Monocytes, BAS= Basophil, EOS = Eosinophil.

Sources of variation	DF	ESR(mm)	PCV (%)	RBC ($x10^6$cbmm)	HB (%)	MCHC (%)	MCH (%)	MCV (cbmm)	LYM (%)	HETER (%)	MONO (%)	BAS (%)	EOS (%)
Sex	1	0.06^{ns}	191.44*	23128.63*	21.27*	113.65*	0.21^{ns}	27.80^{ns}	379.79*	8.38^{ns}	63.02*	1.62^{ns}	0.21^{ns}
Polydactyly	1	0.09^{ns}	2.33^{ns}	457.53^{ns}	0.23^{ns}	110.40*	1144.10*	4019.27^{ns}	394.93*	45.45^{ns}	20.04^{ns}	0.79^{ns}	0.01^{ns}
Rearing system	1	14.63^{ns}	5.38^{ns}	1365.04^{ns}	0.60^{ns}	115.02*	1006.82*	11056.52*	544.50*	23.01^{ns}	12.06^{ns}	0.27^{ns}	0.01^{ns}
Rearing sy*Polydactyly	1	4.03^{ns}	114.84*	9742.08^{ns}	12.64*	112.83*	17.56^{ns}	2279.39^{ns}	336.15^{ns}	42.62^{ns}	25.76^{ns}	2.60*	0.25^{ns}
Sex*Rearing system	1	10.14^{ns}	109.41*	12466.04^{ns}	12.50*	118.91*	29.11^{ns}	5261.94^{ns}	420.82*	24.90^{ns}	24.47^{ns}	0.51^{ns}	0.79*
Sex*Polydactyly	1	45.02*	15.21^{ns}	886.05^{ns}	1.74^{ns}	116.96*	305.91^{ns}	1186.18^{ns}	336.15^{ns}	1.36^{ns}	108.96***	2.96*	0.16^{ns}
Sex*Rearing sy*Polydactyly	1	0.53^{ns}	105.42*	13938.64*	11.70*	114.48*	29.11^{ns}	168.60^{ns}	394.93*	79.21^{ns}	5.38^{ns}	0.02^{ns}	0.68^{ns}
Error	22	9.23	20.21	3309.58	2.25	25.22	195.27	1676.816	88.44	20.23	6.91	0.47	0.17

Table 3: Means squares and significancefor the effects of sex, polydactyly and rearing system on haematological indices at 11 weeks
=Significant ($p<0.05$). *= highly significant ($p<0.001$), ns= Not significant,*

PCV = packed cell volume, RBC = red blood cell, HB = haemoglobin concentration, MCHC = mean cell haemoglobin, MCH = mean cell haemoglobin concentration, MCV= mean cell volume, LYM = Lymphocyte, HETER= Heterophils, MONO = Monocytes, BAS= Basophil, EOS = Eosinophil.

Sources of variation	DF	ESR (mm)	PCV (%)	RBC($x10^6$cbmm)	HB (%)	MCHC (%)	MCH (%)	MCV (cbmm)	LYM (%)	HETER (%)	MONO (%)	BAS (%)	EOS (%)
Sex	1	0.22^{ns}	0.18^{ns}	33.72^{ns}	0.02^{ns}	9.29^{ns}	30.58^{ns}	7.01^{ns}	38.27^{ns}	0.32^{ns}	7.19^{ns}	0.63^{ns}	0.30^{ns}
Polydactyly	1	13.98*	0.97^{ns}	11740.91^{ns}	0.14^{ns}	7.75^{ns}	96.76^{ns}	85.33^{ns}	35.93^{ns}	6.96^{ns}	0.04^{ns}	0.05^{ns}	0.01^{ns}
Rearing system	1	3.86^{ns}	226.30^{ns}	67028.14*	25.41^{ns}	129.82^{ns}	16.24^{ns}	2570.64^{ns}	332.63^{ns}	96.41^{ns}	17.81^{ns}	1.10^{ns}	0.75^{ns}
Rearing sy*Polydactyly	1	7.36^{ns}	4.03^{ns}	16856.10^{ns}	0.41^{ns}	7.75^{ns}	119.42^{ns}	41.84^{ns}	33.66^{ns}	1.62^{ns}	12.81^{ns}	0.12^{ns}	0.01^{ns}
Sex*rearing system	1	0.18^{ns}	7.48^{ns}	6274.00^{ns}	0.88^{ns}	8.15^{ns}	3.52^{ns}	61.07^{ns}	25.97^{ns}	1.31^{ns}	16.22^{ns}	0.01^{ns}	0.30^{ns}
Sex*Polydactyly	1	2.43^{ns}	100.87^{ns}	2390.89^{ns}	11.21^{ns}	132.61^{ns}	172.82^{ns}	2768.01^{ns}	416.89^{ns}	27.75^{ns}	59.01^{ns}	0.36^{ns}	0.05^{ns}
Sex*Rearing sy*Polydactyly	1	0.29^{ns}	134.14^{ns}	7354.38^{ns}	14.81^{ns}	126.77^{ns}	100.10^{ns}	1933.39^{ns}	490.56^{ns}	70.70^{ns}	9.80^{ns}	0.53^{ns}	0.05^{ns}
Error	22	3.28	70.81	11746.12	7.86	73.82	82.21	1324.96	246.99	43.88	15.19	0.74^{ns}	0.29

Table 4: Means squares and significance for the effects of sex, polydactyly and rearing system on haematological indices at 16 weeks.
**= Significant ($p<0.05$), ns= Not significant ($p>0.05$)*

PCV = packed cell volume, RBC = red blood cell, HB = haemoglobin concentration, MCHC = mean cell haemoglobin, MCH = mean cell haemoglobin concentration,MCV= mean cell volume, LYM = Lymphocyte, HETER= Heterophils, MONO = Monocytes, BAS= Basophil, EOS = Eosinophil.

4. Conclusions

The effects of sex, polydactyly and rearing system on haematological parameter of Fulani ecotype chickens were determined which could serve as baseline information for comparisons of physiology and health status of indigenous chickens for future selections and cross breeding programmes.

5. References

i. Aderemi, F.A. (2004). Effects of replacement of wheat bran with cassava root sieviate supplemented or unsupplemented with enzyme on the haematology and serum biochemistry of pullet chicks. Tropical Journal of Animal Science. 7:147-153.

ii. Aro, S.O. & Akinmoegun, M.B. (2012). Haematology and red blood cell osmotic stability of pig fed graded levels of fermented cassava peel based diets. Proceeding of 17th Annual Conference of Animal Science Association of Nigeria (ASAN), Pg. 152-153

iii. Aro, S.O., Ogunwale, F.F & Falade, O. A. (2013). Blood viscosity of finisher cockerel fed dietary inclusions of fermented Cassava tuber wastes in broilers chicken feeding. Proceedings of the 18th Annual conference of Animal Science Association of Nigeria, pg.74-77

iv. Atteh, J.O. (1990). Rural poultry production in western middle belt region of Nigeria. In: Proceedings international poultry workshop on rural poultry in Africa (Ed, Sonaiaya, E .B) November. 13-16, Ile- Ife Nigeria: 211-220

v. Etim, N.A., Enynihi, G.E., Akpabio, U. & Offiong, E.A. (2014). Effect of nutrition on haematology of rabbit: A review. European Scientific Journal. 10, No.3

vi. Kral, I. & Suchy, P. (2000). Haematological studies in adolescent breeding cocks. Acta Veterinaria.Brno. 69: 189- 194

vii. Mitruka, B.M. & Rawnsley, H.M. (1977). Clinical biochemical and haematological reference value in normal experimental animals. Masson Publishing, USA. Pg. 88-90.

viii. Olabanji, R.O., Fartinu, G.O., Akinlade, J.A. & Ojebiyi, O.O (2007). Growth performance and haematological characteristics of weaners rabbits fed different levels of wild sunflower (Tithonta diversifolia Hems L A. Gray) leaf blood meal mixture. Proceedings of 32 Annual Conference of Nigeria Society for Animal Production. Pg. 207 – 209.

ix. Pampori, Z.A. & Iqbal, S. (2007). Haematology, serum chemistry and electro cardiographic evaluation in native chicken of Kashmir. International Journal of Poultry Science. 6:578-582.

x. Salako, A.E & Ige, A.O. (2006). Haemoglobin polymorphism in the Nigerian indigenous chickens. Journal of Animal Veterinary Advance.5: 897 – 900.

xi. Togun, V.A., Oseni, B.S.A., Ogundipe, J.A., Arewa, T.R., Hammed, A.A., Ajonijebu, D.C., Oyeniran, A., Nwosisi, I. and Mustapha, F. (2007). Effect of chronic lead administration on the haematological parameter of rabbit – a preliminary study. Proceedings. of the 41st Conference of Agricultural Society of Nigeria. Pg. 34