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COMPARATIVE SERUM METABOLITE VALUES OF NOILERS PULLETS AND TWO OTHER COMMERCIAL STRAINS

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Abstract

Blood parameters of chicken are significance to reflect inherent genetic differences amongst the breeds. This experiment was conducted to compare the serum profile of Isa brown, nera black and noiler pullets. A total of 300 chicks comprising 100 noiler, Isa brown and nera black each were allotted into three (3) treatments with four (4) replicates of 25birds each. Blood collection was done at 8th week for chick phase and 16th week for grower phase. Blood samples (3ml) were collected from wing vein and analyzed for serum metabolites. The parameters measured were total serum protein and its components, alanine amino transferase, aspartate amino transferase, alkaline phosphatase, glucose, uric acid, sodium, cholesterol, high density cholesterol, creatinine and triglyceride. Values obtained for all the parameters were not significantly different ($p > 0.05$) except creatinine and sodium at grower stage. Noiler recorded the highest value of creatinine ($0.73\mu\text{mol/l}$) and significant to values of. Isa brown and Nera black that had $0.65\mu\text{mol/l}$ and $0.70\mu\text{mol/l}$, respectively. Sodium was affected ($p < 0.05$). Nera black recorded the highest value of 604.75mmol/l which was significantly higher ($p < 0.05$) than those of Isa brown and noiler (579.50mmol/l and 499.75mmol/l , respectively). The ranges for total serum protein, alanine amino transferase, aspartate amino transferase and triglyceride at chicks and growing were as follows $4.00 - 4.85$ and $6.03 - 6.30\text{g/dl}$; $187.50 - 189.5$ and $205.75 - 214.75\text{iu/L}$; $24.00 - 33.25$ and $23.25 - 26.25\text{iu/L}$; $67.75 - 105.25$ and $72.75 - 91.25\text{mmol/L}$, respectively. Conclusively, serum metabolites of different strains of pullet considered were not affected by strain effects.

Key words: Noiler, Isa brown, Nera black, Pullets and Serum

Introduction

Blood parameters of chicken are significance to reflect inherent genetic differences amongst the breeds of chicken (Agaie and Uko, 1998). The variation in the haematological parameters between strains in some situation might be due to strains and genotype differences (Adejumo (2004). El-Safty *et al.* (2006) reported the superiority of the naked neck gene in PCV compared to that of the fully feathered. The author further stated that this could be a boost to the growth and productive life of the former. Haematological and serum biochemical values could be utilized in cross breeding programmes in order to produce individuals that are fit and more productive (Ladokun *et al.*, 2008).

The black and brown plumage (feather colour) layer strains varied in their productive capability and livability in this hot climate. Olawumi (2007) reported that parents of black layer strain had lower mortality rate and more adaptable to hot weather than parents of brown layer strain. However, nera black chickens are primarily an egg-producing breed of domestic chicken in Nigeria. They are one of the most popular breeds of layers in Nigeria because of their high level of production (between 80% and 85% throughout their laying period) and the high market value of the old-layers compares with the local chickens (Adene and Oguntade, 2006). Isa brown is a hybrid developed from Rode Island Red and Rode Island Whites in France containing genes from a wide range of breeds. It is known for its high egg production of approximately 300 eggs per hens with the weight of 2kg. (www.hendrixgenetics.com)

The Noiler chicken is a hybrid of broiler and cockerel which lays about 150 – 200 eggs per annum with average weight of 2 – 3.5kg which produces more meat than the exotic breeds. This chicken was produced by Amo Farms of Nigeria but was first developed by KLegg Farms, a company based in Gurgon, India and has been known for its pioneering efforts to improve conditions and provide nutritional security through household poultry keeping (Harth, 2011). The experiment was conducted using three strains; Isa brown, Nera black and Noiler to compare their serum profile.

Materials and methods

The experiment was carried out at the Poultry Unit of Teaching and Research Farm of Oyo State College of Agriculture and Technology, Igboora. A total of 300 chicks comprising 100 noiler, isa brown and nera black strains each were purchased from two reputable commercial hatcheries in Oyo State. Noiler and isa brown were purchased from one hatchery while nera black was purchased from another hatchery. The birds were brooded and raised till two (2) weeks of age before they were allotted into three (3) treatments with four (4) replicates of 25birds each. The three stains formed the three treatments. All the birds were fed with commercial feed from first day till 16th week and they were supplied with fresh, clean and cool water throughout the period of the experiment. At the growing phase, the birds were fed on commercial grower feed (8-18 weeks). All management practices were observed during the experimental period and all necessary vaccinations and medications were applied.

Blood samples collection and analysis.

Blood collection was done at 8th week for chick phase and 16th week for grower phase. Blood samples (3ml) were collected from wing vein with the use of sterile hypothermic needles and syringes. A sample of 3ml was drawn into plain bottles and left to coagulate in slanting form. Blood obtained from experimental birds was analyzed for serum metabolites. The parameters measured during chicks and growing phase were total serum protein and its components, alanine amino transferase, aspartate amino transferase, alkaline phosphatase, glucose, uric acid, sodium, cholesterol, high density cholesterol, creatinine and triglyceride.

Statistical analysis

Data obtained from the study were subjected to Analysis of Variance (ANOVA) and where difference exists between means, Duncan Multiple Range Test was used to separate the means at 5% probability level (Duncan, 1955).

Results

Table 1 and 2 showed the serum metabolites of the three strains at chick stage and growing stage, respectively. Values obtained for all the parameters were not significantly different ($p > 0.05$) except creatinines and sodium at grower stage. Creatinine values were significantly different at grower stage ($p > 0.05$). Noiler recorded the highest value (0.73 μ mol/l) and significant to values of. isa brown and nera black that had 0.65 μ mol/ and 0.70 μ mol/, respectively. There was strain effect on the values of sodium on the three strains ($p < 0.05$). Nera black recorded the highest value of 604.75mmol/l which was significantly higher ($p < 0.05$) than those of Isa brown and noiler (579.50mmol/l and 499.75mmol/l, respectively). Values recorded for other parameters varied across the strains. The ranges for total serum protein, alanine amino transferase, aspartate amino transferase, alkaline phosphatase, uric acid, glucose, cholesterol and triglyceride at chicks and growing were as follows 4.00 – 4.85 and 6.03 – 6.30g/dl; 187.50 – 189.5 and 205.75 – 214.75 iu/L; 24.00 -33.25 and 23.25 – 26.25 iu/L; 328.00 – 356.25 and 147.50 -152.75iu/L; 3.50 – 4.00 and 5.25 – 5.50mg/dl; 290.50 -295.00 and 335.50 – 360.25 mmol/L; 154.00 -168.25 and 126.25 – 127.25 mmol/L; 67.75 – 105.25 and 72.75 – 91.25mmol/L, respectively.

Discussion

The values obtained for total serum protein, albumin and globulin for chick fall within normal range of blood chemistry indices of domestic fowl (Kaneko, 1989). The early higher values noticed for total protein, albumin and globulin at chick stage is a well – known process, being strongly associated with the somatic growth (mainly muscle tissue hyperthrophic growth), and this confirmed the finding of Jozsef *et al.* (2006).

In the lipid metabolites of chicks, cholesterol level of isa brown was higher while the other two strains showed nearly same values. However, the higher total cholesterol might be related to genetics and ad-libitum feeding as described by Flores *et al.* (2013) and Imasuen and Otoikhian (2012). During the growing phase, there was a marked decrease in the total cholesterol within the three strains, sharing a nearly the same values, this confirmed the result presented by Jozsef *et al.* (2006), although the dual purpose strain had the higher value which was not significantly differ to the other values. The growing stage values goes along with the result of Adejumo *et al.* (2017) in 18 weeks laying hens, Triglycerides level were basically not different among nera black and noiler strains during the chick and growing phase. Marked decrease in triglyceride level was noticed in the noiler strain and nera black at the growing phase and this confirmed the result obtained by Jozsef *et al.* (2006), although there was slight increase in the value obtained for Isa brown during growing stage.

The heavy body size strain had the highest value of creatinine concentration during the two stages, while the other two strains had the same value during the chick phase and almost the same values for the growing stage although, Isa brown had the least value at the growing stage, this confirmed the work of Jozsef *et al.* (2006). The values obtained for serum creatinine concentration were somewhat below the normal values of creatinine and also contradicted the work of Olabode (2015) who reported 0.95g/dl for 19-week bachelor brown laying hens. These lowered values may be due to environmental factors as described by Jozsef *et al.* (2006) and may also be related to low degradation of muscle phosphocreatinine to form creatinine.

Serum glucose level of nera black strain was higher during the chick and growing stages with the values which are not significantly different to the other two strains' values. However, Isa brown strain had the lowest values throughout the experimental period but the values were not significantly different from the noiler strain values. The values obtained for the three strains during chick stage were not lowered at the 8 weeks, these values were lower than values obtained by Ibrahim *et al.* (2012).

Aspartate amino transferase (AST) values obtained for all the three strains for chicks were not different between genotypes during the chick phase with the nera black having the higher value but not significant to the other values. Although, the values exceeded the values obtained by Daramola (2017) and Ogunlade and Egbunike (2013). The values also contradicted the report by Ekpeyoung and Biobaku (1986), that aspartate amino transferase are normally low in blood but become high when the plane of nutrition is low or when there is occurrence for liver damage.

Alkaline amino transferase was high during chick stage with the Isa brown strains proving the between – genotype superiority with highest values during both stages, the isa brown and nera black strain had similar value while the larger body size strain possessed the lowest value. The decrease seen during growing stage might be associated to age and slowing – down in the secondary ossification. The early peak and the latter reduction activities confirmed the result of Szabo *et al.* (2005).

The values obtained for sodium during chick stage proved the between – genotype superiority with nera black having the higher values at the two stages (chick and grower). The reduction trend seen during growing stage and the increase during chick stage can be associated with age as well as its relationship with the increasing dry matter content of the body as described by Szabo *et al.* (2005) and Vasicek *et al.* (1991).

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Table 2: Serum biochemistry of the three experimental strain chicks

Metabolites	Isa brown	Nera black	Noiler	SEM
Total serum protein (g/dl)	4.00	4.40	4.85	0.38
Albumin (g/dl)	0.77	1.00	1.43	0.19
Globulin (g/dl)	3.05	3.38	3.43	0.14
Albumin globulin ratio	0.28	0.25	0.30	0.07
Astartate amino transferase (iμ/l)	188.75	189.50	187.50	4.77
Alanine amino transferase (iμ/l)	24.00	33.25	24.75	4.36
Alkaline phosphatase (iμ/l)	356.25	340.25	328.00	26.57
Uric acid (mg/dl)	3.50	4.50	4.00	0.67
Creatinines (μmol/l)	0.50	0.50	0.58	0.02
Glucose (mmol/l)	290.50	300.50	295.00	9.37
Cholesterol (mmol/l)	168.25	154.00	156.25	15.08
Triglyceride (mmol/l)	67.75	104.75	105.25	17.32
High density cholesterol (mmol/l)	115.00	95.50	111.50	10.42
Sodium (mmol/l)	489.50	707.00	609.75	66.62

Table 3: Serum biochemistry of the three experimental pullet growers

Metabolites	Isa brown	Nera black	Noiler	SEM
Total serum protein (g/dl)	6.03	6.28	6.30	1.07
Albumin (g/dl)	1.30	1.50	1.63	0.49
Globulin (g/dl)	4.58	4.78	4.68	0.58
Albumin globulin ratio	0.23	0.28	0.30	0.07
Aspartate amino transferase (iμ/l)	214.25	204.75	205.50	14.06
Alanine amino transferase (iμ/l)	25.75	23.25	26.25	4.02
Alkaline phosphatase (iμ/l)	152.75	150.75	147.50	5.95
Uric acid (mg/dl)	5.25	5.25	5.5	0.37
Creatinines (μmol/l)	0.65 ^b	0.70 ^b	0.73 ^a	0.03
Glucose (mmol/l)	333.50	360.25	341.75	36.25
Cholesterol (mmol/l)	126.25	126.25	127.25	6.72
Triglyceride (mmol/l)	72.75	91.25	90.75	11.30
High density cholesterol (mmol/l)	76.50	73.00	75.50	12.29
Sodium (mmol/l)	579.50 ^b	604.75 ^a	499.75 ^{ab}	8.49

^{a,b,c} means on the same row but different value