GROWTH PERFORMANCE AND GHRELIN GENOTYPES OF THREE YORUBA ECOTYPE CHICKEN STRAINS

Bolarinwa M.O.[1] , Adeyemo, G.O., Awodele O.A.[1] & Popoola M.A.[1]
[1]Federal College of Animal Health and Production Tech., Moor Plantation, Ibadan.
Department of Animal Science, University of Ibadan, Ibadan, Oyo State, Nigeria
**Corresponding author: polymeragro@gmail.com.*

ABSTRACT
Growth performance and haemoglobin polymorphisms in relation to the Ghrelin Genotypes present in three Yoruba ecotype chicken strains were evaluated. Blood sample was collected from 45 Yoruba Ecotype chicken strains: Frizzled Feathered (FF), Naked Neck (NN) and Normal Feathered (NF) for ghrelin genotyping via electrophoresis using standard procedures. Growth performance data were generated for 18 weeks: Initial and Final Body Weight, Body weight gain, Feed Intake, Feed conversion Ratio (FCR) and the mortality rate. Data were subjected to ANOVA and means were separated using the Duncan Multiple Range Test. Ghrelin genotyping of the three Yoruba ecotype chicken strains for 18 weeks showed that genotypes AA and AB were observed, while genotype BB was absent among the chicken strains. Results revealed that ghrelin genotypes had significant effects ($p<0.05$) on Final Weight, Body weight gain, Feed Intake, FCR and the mortality rate. The highest final body weight was recorded in the NN genotype (888.08±0.12g), while the lowest final weight gain was recorded in the NF genotype with (805.10±0.12g). The highest body weight gain was also recorded in the NN genotype with (858.61±0.14g) and the least body weight gain was recorded in the NF genotype (775.67±0.14g).The lowest feed intake was recorded in the NN genotype (5538.46±7.09g) while the highest feed intake was recorded in the NF genotype (5752.46±7.09g).The highest FCR was recorded in the NF genotype (7.42±0.01g) while the lowest FCR was recorded in the NN genotype (6.45±0.01g). The picture of the ghrelin genotypes during electrophoresis showed the genotypes A and B. The base pairs (bp) of 300 and 400 indicated the genotype AA while the base pairs (bp) of 300,400,500,700,900 up to 1000 indicated the BBgenotypes. It was concluded that Naked Neck chicken with the ghrelin genotypes AA and AB had the lowest feed intake and FCR, which indicated that Naked Neck ghrelin genotypes AA and AB favoured better growth performance.

INTRODUCTION
The indigenous chickens or native chicken populations was about 103 million in Nigeria (RIM, 1992), with the largest percentage in the Northern part. These birds among others inherent advantages over their exotic counterparts are hardy can adapt to rural environment, survive on little inputs and is better in both fertility and hatchability of egg (Ige *et al*., 2012). Nevertheless, these birds are important reservoirs of useful (major) genes and possess a number of adaptive traits. Among the major genes that have been found potentially useful to the tropical environment are Naked neck (*Na*) and Frizzle (*f*) genes. These genes have been associated with heat stress (Horst, 1989). Thus, they serve as a good pool for genetic improvements (Mengesha and Tsega, 2011).

Variation in haemoglobin has been reported to cause depression in percentage egg production in mutant haemoglobin type compared with normal or heterozygous haemoglobin (Lowe and Washburn, 2007).

Haemoglobin polymorphism is a term used in genetics to describe the multiple forms of a single gene that exists in an individual or among a group of individuals. (Williams *et al*.,1990).

In animal industry, growth traits of animals are always of primary concern during breeding for its determinant economic value (Zhang *et al.,* 2008).

The growth traits are complex traits involving multiple genes, loci and interactions (Hua *et al.,* 2009).

Ghrelin is a circulatory hormone produced by the entero endocrine cell of the gastro intestinal tract especially the stomach and it is often called a "Hunger Hormone" because it increases food intake. (kojima *et al.,* 1999). Ghrelin is a 28- amino acid peptide in a monogastric species (Dickin*et al.,* 2004).

It is primarily produced by oxyntic cells in the stomach or abomasum with smaller amounts produced by the intestine and pancreas (Hosoda *et al.,* 2006). Ghrelin stimulates the secretion of GH, increases

food intake and in turn produces gain in weight (Solomis *et al.*, 2014) . Ghrelin is the only known peripherally produced and centrally active orexigenic hormone that is considered to be an important gut-brain signal for appetite control and energy balance (Solomis *et al.*, 2014).

The objectives of these investigations were therefore to evaluate the growth performance of three Yoruba ecotype chicken strains in relation to ghrelin genotypes. And also to determine ghrelin haemoglobin polymorphisms among three Yoruba ecotype chicken strains.

MATERIALS AND METHODS

The study was carried out at the Poultry Unit of the Federal College of Animal Health, I.A.R&T, Ibadan, Nigeria and the experiment lasted for 18weeks

Data Collection

From day one, growth performance indices were recorded for the Yoruba ecotype chickens (FF, NN and NF) and at the eighteenth week, 2-5 mLs of blood was sampled through the jugular vein into EDTA bottles. The blood samples were then placed in a cooler containing iced block to maintain the stability of the blood and then taken to Biotechnology Laboratory, Abeokuta, Ogun state for genotyping.

DNA Extraction and Electrophoresis

DNA Extraction is a routine procedure used to isolate DNA from the nucleus of cells. The extraction was carried out using Blood-Plant Animal DNA preparation kit following standard procedures.

Data Analysis

Data were subjected to analysis of variance (ANOVA) according to SAS (2004) and means were separated using Duncan multiple range test.

RESULTS

Table 2: Growth performance and Ghrelin genotypes of three Yoruba ecotype chicken strains at week 18

	Strains			
Parameters	FF	NF	NN	SEM±
Ghrelin Genotypes	(AA, AB)	(AA, AB)	(AA, AB)	
Initial Weight(g/b)	29.38	29.43	29.48	0.05
Final Weight(g/b)	839.42^{b}	805.10^{c}	888.08^{a}	0.12
BWG (g/b)	810.05^{b}	775.67^{c}	858.61^{a}	0.14
Feed Intake (g/b)	5590.44^{b}	5752.06^{a}	5538.46^{c}	7.09
FCR	6.90^{b}	7.42^{a}	6.45^{c}	0.01
Mortality (%)	1.92^{b}	2.25^{a}	1.91^{c}	0.00

^{a,b,c}means along the same row with different superscripts are significantly different ($p<0.05$). Feed intake (FI), Body weight gain (BWG), Feed conversion ratio (FCR).

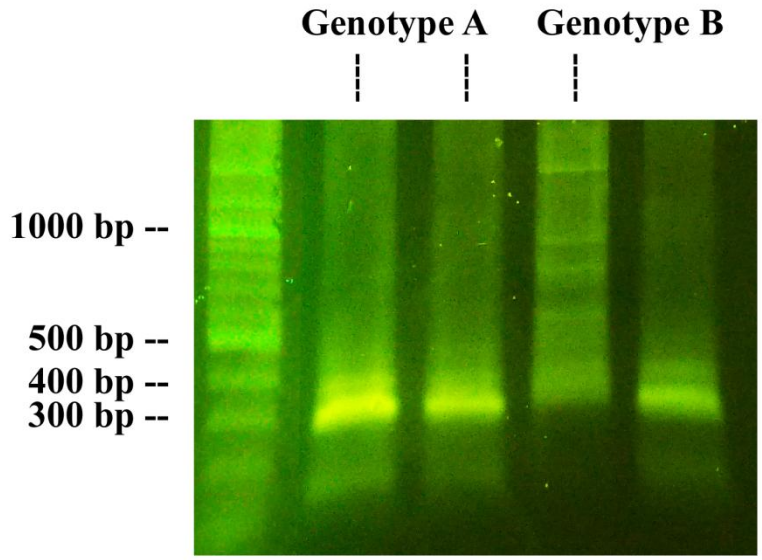

Figure 1: Shows the picture of Ghrelin genotype bands during Electrophoresis. Bp (base pairs)

DISCUSSION

The Growth performance and Ghrelin genotypes of the three Yoruba Ecotype chicken strains at 18 weeks showed that the Naked Neck with Ghrelin genotypes AA and AB had highest value for body weight gain (858.61±0.14g) with the lowest feed intake (5538.46±7.09g) and the lowest Feed conversion ratio (6.45±0.01g). This corroborates the findings of Nakazeto *et al.,* 2001, which states that Ghrelin influences energy metabolism and body composition. The result of the Ghrelin haemoglobin polymorphisms of the three Yoruba ecotype chicken strains showed that there was remarkable variation in the Yoruba ecotype chicken as two haemoglobin variants AA and AB alleles were identified with corresponding detectable genotype HbAA and HbAB. This showed that the population of this Yoruba ecotype chicken is Homozygous. This does not agree with the findings of (Ibe, 1990) who observed three haemoglobin variants AA, AB and BB alleles with corresponding detectable genotypes HbAA, HbAB and HbBB which showed that the population of the indigenous chicken is Heterozygous, which may be as a result of crossbreeding of indigenous chicken with the exotic strains or may be due to the larger sample size used. The report of (Washburn *et al.,* 1971) showed that chicken of the homozygous haemoglobin genotypes as observed in this study are approximately 20% less susceptible to Marek's disease. The Homozygous genotypes observed in this study could be an added advantage in conferring resistance to this disease. The picture of the Ghrelin Genotype bands during Electrophoresis showed the Genotypes A and B. The first band which is the ladder serves as a guide to measure the Ghrelin levels and Genotypes. Genotype AA had a base pair of 300 and 400 while genotype AB had the base pair of 300,400,500,700,900 up to 1000. The more the bands, the more the variations among the ghrelin genotypes which is an indication of wider heterozygosity. From the results of this study, chicken strains with the Ghrelin genotypes A and B are more distant from one another as a result of variation among the population samples

CONCLUSION AND RECOMMENDATION

It is concluded that Naked neck strains with ghrelin genotypes AA and AB had a better Feed Conversion Ratio with a consequential enhanced growth performance.

It is also concluded that proper evaluation of ghrelin genotypes and other genes in chicken genome as they affect feed intake, weight gains and overall animal protein food security is important.

RECOMMENDATION

Also, since the Naked Neck strain has the highest final and body weight gains, therefore naked neck chicken should be selected and improved upon for their growth performance as this will contribute to availability and affordability of meat and its products for the masses**,** particularly in the rural communities.

REFERENCES

Dickin, J. C., Thue, T. D., Buchanan, F. C. (2004).An alternative splice site in ghrelin is missing in ruminants. *Anim. Genet.* 35, 411–412.

Horst, P. (1989). Native fowls as reservoir for genomes and major genes with direct and indirect effect on adaptability and their potential for tropically oriented breeding plans.Arch. Geflugel 53(3):93-101.

Hosoda, H., Kojima, M., Kangawa, K. (2006). Biological, physiological and pharmacological aspects of ghrelin. *Sci,*100(5): 398-410.

Hua, G. H., S. L. Chen, J. N. Yu, K. L. Cai and C. J. Wu et al., (2009). Polymorphism of the growth hormone gene and its association with growth traits in Boer goat bucks. *Meat Sci.,* 81: 391-395.

Ibe, S. N. (1993). Growth performances of normal, frizzle and naked neck chicken in a tropical environment. *Nigerian Journal of Animal Production* 20(1- 2): 25-29.

Ige, A. O., Salako, A. E., Yakubu, A., Ojedapo, L. O., Adedeji, T. A. and Adeoti, T. M. (2012).Comparison and prediction of morphological characteristics of frizzled feathered and naked neck chicken in Derived Savannah zone. *Production Agriculture and Technology*8(2):68-75.

Kojima, M., Hosoda, H., Date, Y., Nakazeto, Matsuo, H., Kangawa, K. (1999). "Ghrelin is a growth hormone releasing acylated peptide from the stomach" Nature.402(6762): 656-60.

Lowe, R.H. and Washburn, K.W. (2007). A pleitropic effect of a mutant haemoglobin type in chicken 1. *British Poultry Science* 12 (2): 235-244.

Mengesha, M. and Tsega, W. (2011).Phenotypic and genotypic characteristics of indigenous chickens in Ethopia: A review. *African Journal of Agricultural Research* 6(24):5398- 5404.

RIM (1992).Nigerian Livestock Resources. II. National Synthetic Annex Publication Resources Inventory Management Ltd.

SAS. (2004). Statistical Analysis Institutes User's Guide. SAS Insti. inc.Car N.C.,10th edition.Pp.100

Solomis, S., Korbonits, M. (2014). The role of ghrelin in weight-regulation disorders: Implications in clinical practice. *Hormones*, 13(4): 458-475.

Williams, J. K., Kubelik A. R., Livak K. J., Rafalski J. A and Tingey S. V. (1990).DNA polymorphisms amplified by arbitrary primers are useful as genetic markers. Nucleic acids Res., 18:6531-6535.

Zhang, W. (2008). Ghrelin, a Gastric Hormone with Diverse Functions, Chemical Biology, Deniz Ekinci (Ed.), ISBN: 978-95351- 0049-2.