

The Nigerian local chicken hormonal functional status as influenced by age and sex factors

*Gunn, H. H., Oleforuh-Okoleh, V. U. and †Jubril, A. E.

Department of Animal Science, Rivers State University Nkpulu-Oroworukwo, Port Harcourt, Rivers State



Department of Animal Science, University of Abuja, FCT, Nigeria

*Corresponding author: gunn.hollinshead@ust.edu.ng

Abstract

A study was conducted to investigate the effect of age and sex on the hormonal status of the Nigerian Local Chicken raised in the Teaching and Research Farm of the Rivers State University Nkpulu-Oroworukwo, Port Harcourt. A total of forty (40) heterogeneous population of the Nigerian Local Chickens were used in a Completely Randomized Block Design (CRBD). Blood samples were collected from 10 males and 10 females from two different age groups (21 and 72 weeks). Hormonal assay was conducted to ascertain the values of some growth and reproductive hormones. These includes; thyroxin (T4), Triiodothyroxine (T3), Thyroid stimulating hormone (TSH), Prolactin (PRL), testosterone (TET), estrogen (E), luteinizing hormone (LH), follicle stimulating hormone (FSH) and progesterone (PROG). PRL, FSH, PROG and TET were significantly ($p < 0.05$) affected by age while others were not significant ($p < 0.05$). Prolactin had higher value for birds under the ages of 21 weeks than 72 weeks of age with a corresponding value of 28.35ng/mL and 8.64ng/mL respectively. Sex effect on hormones showed that, all hormones studied were significant except Tri-iodothyronine (T3). Testosterone as observed in this study was also influenced by age. Male birds unlike their female counterparts at 72 weeks of age recorded higher means value of 4.14 ± 0.52 than those of 21 weeks of age (1.11 ± 0.07). Therefore, the study was able to demonstrate the influence of age and sex on the status of hormones in the Nigerian Local Chicken.

Keywords: Local chicken, age, sex, growth hormones, reproductive hormones

Introduction

Domestic fowl was found to have originated from the wild ancestor of jungle fowl *Gallus domesticus* from the Southeastern Asia around year (2000-3000 BC). During this period, four species of jungle fowl are found which includes red jungle fowl (*Gallus gallus*), Ceylonese Jungle fowl (*Gallus lafayetti*), gray jungle fowl (*Gallus sonnerati*) and the black or green jungle fowl (*Gallus varius*), and they are still in existence (Atteh, 2004). Adeleke *et al.* (2011) reported that the Nigerian local chicken is characterized phenotypically using their body structure (naked neck) plumage color (black, white etc.) and feathering pattern (normal, and frizzle feather). The Nigerian local chicken often

possess single comb and are usually self-reliant and capable of withstanding harsh environmental condition, minimal management and inadequate nutrition. They live largely on weed seeds, insects and feeds that would otherwise be a waste (Vetmeyer, 1991; Apuno and Ibrahim 2011). Also, the local male chicken (cockerels and cocks) are bigger in size than the hens (Ajayi and Agaviezor, 2009). The Nigerian local chicken is one of the major sources of protein to the Nigerian people even though it has been reported to be small in size and grows slowly but possesses good potential for egg and meat production (Omeje, 1983; 1985; Ogbonna *et al.*, 2002). Sex, age, nutrition, housing, stress and other environmental factors have been identified

The Nigerian local chicken hormonal functional status as influenced by age and sex factors

as factors affecting the hematological and biochemical parameters of animal (Balikei, 2007; Peters *et al.*, 2011).

However, detailed information about Nigerian local chicken on hormones status and its functionality on growth performance and reproductive indices is still unclear. Therefore, this study was aimed at investigating the hormonal status of the local chicken with a view of establishing its functionality with growth and reproduction.

Materials and methods

This study was carried out at the Poultry Breeding Unit of Teaching and Research Farm of the Department of Animal Science, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt. Port Harcourt lies between latitude 7°00" and 7°53"N and longitude of 4°35" and 4°51" (Uko and Tamunoberwton-Ari, 2013). A total of forty heterogeneous Nigerian local chickens were used for the experiment, comprising of ten males and ten females each from two different treatment age groups of twenty-one (21) weeks of age and seventy-two (72) weeks of age. The birds were raised in the Poultry Breeding Unit of the Department of Animal Science under intensive system where feeding rations were provided from commercial dealer and both the feed as well as water were given *ad libitum*. Blood samples were collected from 10 males and 10 females each from age groups of twenty-one (21) weeks and seventy-two (72) weeks of age. Blood collected was harvested into heparinized plastic tubes and the tubes were labeled accordingly. Hormones assay was done for thyroxin (T4), triiodothyroxine (T3), thyroid stimulating hormone (TSH), prolactin (PRL). Others include; testosterone (TET), estrogen (E), luteinizing hormone (LH), follicle stimulating hormone (FSH), progesterone (PROG). These were determined by enzyme immunoassay method, using

commercial kits Stratus (DADE International Incorporation in immune fluorescence apparatus BAXTER STRATUS II). The experiment was a complete randomized block design (CRBD) in a 2x2 factorial arrangement. All data obtained were subjected to Analysis of variance (ANOVA), using the multivariate analysis in General Linear Models (GLM) of SPSS version 18. 2002

Results and discussion

The hormone values of the Nigerian Local Chicken as affected by age are presents in Table 1. The result showed that triiodothyronine (T3), thyroxin (T4), thyroid stimulating hormone (TSH) were not statistically significantly ($p > 0.05$). Among the hormones studied, only prolactin (PRL) and follicle stimulating hormone (FSH) were statistically significant ($p < 0.05$). It was noted that prolactin value was higher for birds under the ages of 21 weeks of age than 72 weeks of age birds with corresponding values of 28.35 and 8.64, respectively. Also, the same trend was noticed for FSH at 21 weeks of age birds had higher values than 72 weeks of age birds, with corresponding values of 15.09 and 8.51, respectively. Results from this study replicate the possible impact of age as a factor on the survival and general performance of the Nigerian local chicken especially its reproductive capacities. This study confirmed earlier investigation by Hall *et al.* (1985) on the normal range of prolactin hormones (10-40ng/mL).

The hormone values of the Nigerian Local Chicken as affected by sex as presents in Table 2 revealed that, all hormones studied were significant ($p < 0.05$) except for triiodothyronine (T3). From the means analyses table, thyroxin (T4) was observed to be significant ($p < 0.05$) whereas prolactin (PRL) was highly significant ($p < 0.01$). Very highly significant variation ($p < 0.001$)

Table 1. Least square means ± SEM for hormones as affected by age in the Nigerian local chicken

PARAMETERS (nmol/l)	AGE		± SEM	SL
	21 weeks	72 weeks		
Tri-iodothyronine (T3)	0.56	0.64	0.04	NS
Thyroxin (T4)	1.11	1.15	0.02	NS
Thyroid Stimulating Hormone TSH)	18.08	16.13	2.62	NS
Prolactin (PRL)	28.35 ^a	8.64 ^b	6.38	*
Follicle Stimulating Hormone FSH)	15.09 ^a	8.51 ^b	0.97	***
Luteinizing Hormone (LH)	17.12	18.01	4.54	NS

Means in the row having different superscript are significantly different (p<0.05) ; NS = Non -significant; SEM = standard error of mean; SL= significant level; *P <0.05; *** P< 0.001

Table 2. Influence of sex on some hormones in the Nigerian local chicken

Parameters	SEX		±SEM	SL
	MALE	FEMALE		
Tri-iodothyronine (T3)	0.65	0.542	0.04	NS
Thyroxin (T4)	1.17 ^a	1.09 ^b	0.02	*
Thyroid Stimulating Hormone (TSH)	25.3 ^a	8.89 ^b	2.62	***
Prolactin (PRL)	30.48 ^a	6.50 ^b	6.38	**
Follicle Stimulating Hormone (FSH)	17.06 ^a	6.55 ^b	0.97	***
Luteinizing Hormone	32.82 ^a	2.32 ^b	4.54	***

Means in the column having different superscript are significantly different (p<0.05)

NS = Non-significant; *P <0.05; **P<0.01; *** P< 0.001

was observed for thyroid stimulating hormone (TSH), follicle stimulating hormone (FSH) and luteinizing hormone. The result also recorded male birds having higher values than their female as showed in the Table below. The categories of hormones studied (growth and reproductive hormones), male birds which were steadfastly noticed with higher values across the hormones studied, speaks no doubt about the possibly gender factors attributed to governing differential physiological activities and status in higher animals. This result agreed with several authors reports on haematological indices and assay of the indigenous chicken Chineke *et al.* (2006) and Adass *et al.* (2012). Kral and Suchy (2004), attributed male's higher values to gonadal and spermatogenetic development which occur during the period of sexual maturation and at the onset of reproductive activity in breeder cocks.

The results of effect of age on the female sex hormone values of the Nigerian local chicken as presented on Table 3 revealed

that, progesterone was highly significant (p<0.01). Progesterone value was noted to be higher (0.34) at 21weeks of age than those of 72 weeks of age (0.29). Estrogen, though the values were noted to be higher in birds at 72 weeks than those of 21 weeks of age but statistically were not significant (p>0.05). The results of effect of age on the male sex hormone (testosterone) value of the Nigerian Local Chicken presented also in Table 3 revealed that testosterone was very highly significant (p<0.001). Male birds of 72 weeks recorded higher means value of 4.14 ± 0.52 than those of 21 weeks of age (1.11 ± 0.07). The effects of age on female reproductive hormone (progesterone and oestrogen) has also established that birds of the early age (21week of age) express greater values than those of 72 weeks of age for progesterone hormones in the Nigerian Local chickens as observed in this study. The result was in tandem with other authors (Onagbesan *et al.*, 1999; Onagbesan *et al.*, 2006; Tonderai *et al.*, 2018) who noted that, birds that attain puberty and early stage of sexual maturity

The Nigerian local chicken hormonal functional status as influenced by age and sex factors

tend to have high reproductive hormones following the onset of follicular development and laying period, older bird

on the other hand, hormone production decreases following reduced reproductive activities.

Table 3: Least square means \pm SEM for Female hormones as affected by Age in the Nigerian indigenous chicken

Parameters	AGE		SL
	21 Weeks of age	72 weeks of age	
PROG	0.34 \pm 0.01 ^a	0.29 \pm 0.01 ^b	**
Estrogen	33.44 \pm 4.30	49.86 \pm 8.22	SN
Testosterone	1.11 \pm 0.07 ^b	4.14 \pm 0.52 ^a	***

Means in the column having different superscript are significantly different ($p < 0.05$)

NS = Non-significant; ** $P < 0.01$

Conclusion and recommendations

From several investigations, it can be concluded that the production potential of domestic fowl is controlled by several parameters, including those related to their reproductive potential. Production of table and hatching eggs is crucial for poultry producers. The process in which egg number and egg components are formed, the rate of lay, egg fertility and hatchability are dependent on a multitude of synchronized metabolic and physiological processes. The study therefore was able to demonstrate the influence of age and sex on the status of hormones particularly those studied in the Nigerian Local Chicken investigated. However, more hormonal research should be conducted in wider scope, probably in the molecular architectural levels.

References

Addass, P. A., David, D. L., Edward, A., Zira, K. E. and Midau A. 2012. Effect of Age, Sex and Management System on Some Haematological Parameters of Intensively and Semi-Intensively Kept Chicken in Mubi, Adamawa State, Nigeria. *Iranian Journal of Applied Animal Science* 2(3), 277-282

Adeleke, M. A., Peters, S. O., Ozoje, M. O., Ikeobi, C. O. N., Bamgbose,

A. M. and Adebambo, O. A. 2010. Growth performance of Nigerian local chickens in crosses involving an exotic broiler breeder. *Tropical animal health and production.* DOI 10. 1007/S 11250-010-9747-3.

Ajayi, F. O. 2010. Nigerian Indigenous Chicken: A value Genetic Resources for Meat and Egg Production. *Asian Journal of Poultry Science.* 4: 164-172.

Apuno, A. A., Mbap, S. T. and Ibrahim, T. 2011. Characterization of local chickens (*Gallus gallus domesticus*) in Shelleng and Song Local Government Areas of Adamawa State, Nigeria. *Agriculture and Biology Journal of North America.* 2(1): 6-14.

Balikei, E., yildiz., A., Gurdogan, F. 2007. blood metabolite concentrations during pregnancy and post partum in Akkaraman ewes, small Rum, Res 67,247-251.

Chineke, C. A., Ologun, A. G. and Ikeobi, C. O. N. 2006. Haematological Parameters in Rabbit Breeds and Crosses in Humid Tropics. *Pakistan Journal of Biological Sciences,* 9: 2102-2106.

Hall, T. R., Harvey, S. and Chadwick, A. 1986. Control of Prolactin Secretion In Birds: A Review.

- General and Comparative Endocrinology*. 62, 171-184
- Kral, I. and Suchy 2000.** Haematological studies in adolescent breeding cocks. *ACTA Vet. Brno*. 69:189-194
- Onagbesan, O. M., Metayer, 1 S., Tona, K. Williams, J., Decuypere, E. and Bruggeman, V. 2006.** Effects of Genotype and Feed Allowance on Plasma Luteinizing Hormones, Follicle-Stimulating Hormones, Progesterone, Estradiol Levels, Follicle Differentiation, and Egg Production Rates of Broiler Breeder Hens. A Review: *In Poultry Science* 85:1245–1258
- Peters, S. O., Gunn, H. H., Imumorin, I. G., Agaviezor, B. O. and Ikeobi, C. O. N. 2011.** Haematological studies on frizzled and naked neck genotypes of Nigerian native chickens. *Tropical Animal Health and Production*, 43(3), 631–638. <https://doi.org/10.1007/S11250-010-9743-7>
- Tonderai, M., Michael C. and Tinyiko, E. H. 2018.** Effects of strain and sex on the behaviour of free-range slow-growing chickens raised in a hot environment. *Journal of Applied Animal Research*. 46 (1), 224–231
- Uko, E. D. and Tamunobereton-Ari, I. 2013.** Variability of climate parameters in port Harcourt, *Nigeria Journal of Emerging Trends in Engineering and Applied sciences (JETEAS)*. 4: 727-730)
- Vietmeyer, N. D. 1991.** Micro livestock: Little-known Small Animals with a Promising Economic Future. National Academy Press, Washington, D. C. Mbap, S. T. and Z a k a r , H . (2 0 0 0) . Characterization of local chickens in Yobe state, Nigeria. In: The Role of Agriculture in poultry in poverty Alleviation. Abubakar, M. M., Adegbola, T. A. and Butswat, I. S. R. (Ed). *Proceedings of the 34th Annual Conference of Agricultural society of Nigeria*. 15-19 Oct, Bauchi, pp: 126-131.

Received: 11th June, 2019

Accepted: 17th December, 2019