EFFECTS OF SEX AND STRAINS ON WELFARE INDICATORS OF YORUBA ECOTYPE CHICKEN

T. A. OLANIYI[1], M. A. POPOOLA[1] AND A. O. OLANIYI[2]
[1]*Federal College of Animal health and production technology, Moor Plantation, Ibadan*
[2]*Centre for Degree Programmes (CEDEP) Federal College of Education Abeokuta, Ogun State*
Correspondence: herbyolar@gmail.com

ABSTRACT
The study was conducted to evaluate effects of sex and strain on welfare condition in Yoruba ecotype chicken. A total number of 200 Yoruba ecotype chickens of three strains were used for the project. Data were collected on welfare indicators (tonic immobility, plumage condition and aggressiveness) in the chicken. Data collected were subjected to analysis of variance in a 2 ×3 factorial design .There was no significant effects of sex on the welfare indicators; sex had significant effects on tonic immobility and aggressiveness of the chicken. However, there were no significant effects of strain of the plumage condition of the chicken. The interaction effects of sex and strain significantly ($p<0.05$) affected the welfare conditions of the chicken. Based on the results of this study, normal feather cock were the most fearless among the strains, the normal feather cock had the best plumage cover and naked neck cock were the most aggressive chicken among the strains.
Keywords: Aggressiveness, plumage, tonic immobility, strain, welfare.

INTRODUCTION
The Nigeria indigenous chicken is a dual purpose bird that is used for both meat and egg production in the rural and peri-urban areas of the country. They are found in large numbers distributed across different agroecological categories under a traditional family based scavenging system (Sonaiya and Olori, 1990). Most of the birds are kept in small flocks under a scavenging system with inadequate feed resources. There are various ecotype of the local chicken in different agroecological zones in Nigeria as reported by different Authors: Olori (1992) noted two ecotypes characterized as forest and savannah or Yoruba and Fulani ecotypes, respectively Nwosu (2000) identified three main strains in ecotype named Nsukka, Owerri Awgu types at the south Eastern state of Nigeria; Hill and Modebe (1961) and Oluyemi *et al.* (1982) also reported the variation in many traits of the indigenous chicken from the southern region of Nigeria which they found to be different from other parts of the country. Based on feathers or plumage structure, indigenous chicken can characterized as normal, frizzle or naked neck. The frequency distribution of the normal feathered chicken was about 91.8% while that of frizzled and naked neck were 5.2 and 3.0%, respectively (Ajayi and Agaviezor, 2009). The concept of animal welfare refers to an animal's overall state of well-being. Animal welfare is accomplished if there are lack of hunger and thirst, lack of discomfort, lack of pain, injury or sickness, freedom for normal behavior and lack of fear, anxiety and depression (Jensen and Toates, 1997). It is also important that animals are able to express behaviours that are priorities in a captive environment (Weeks and Nicol, 2006) and that they should not suffer from unpleasant mental states such as pain, fear and distress. Apart from physical health, which is the cornerstone of all good welfare, the most important additional component of poultry welfare is psychological health or 'contentment', which can be most reliably accessed through the birds' own choice behaviour (Dawkins, 1999). In order to assess the welfare of poultry, a lot of welfare indicators have been considered in previous studies: Mormède *et al.*, (2007) reported measurement of circulating levels of corticosterone as a standard way of assessing stress; the number of heterophils has been shown to increase and the number of lymphocytes to decrease in response to a number of different stressors (Davis *et al.*, 2008); scoring of feather cover is widely used as an indicator of welfare (Freire and Cowling, 2013); observing behaviour of animals is one way of assessing welfare that can offer a large range of information regarding the animals' needs,

preferences and internal states (Olsson *et al.*, 2011). Due to the complexity of stress responses, resulting in both behavioural and physiological responses when adapting to environmental challenges, it is generally recommended that more than one variable be investigated in order to understand the context (Cook *et al.*, 2000). Thus, this study sought to assess the effects of sex and strains of Yoruba Ecotype chicken on some welfare indicators such as tonic immobility, plumage condition and aggressiveness of the chicken.

MATERIALS AND METHODS

The experiment was conducted at randomly selected households raising Yoruba indigenous chicken in Ibadan, Oyo State, Nigeria. A total number of 200 Yoruba indigenous chickens were used for the experiment consisting of three different strains (Frizzled feather, naked neck and Normal feather) and both sexes (cock and hen). The study lasted for twenty weeks (5 months). Data were collected on tonic immobility, plumage condition and aggressiveness as welfare indicators. Tonic immobility was induced as described by Gudev *et al.*, (2011), the chicken was inverted on its side and lateral manual restraint was applied until the chicken stops struggling. Tonic immobility duration was recorded from the moment the chicken became immobile until the bird righted itself this shows how fearful or fearless the bird is. The plumage Condition was determined through observation and by scoring the feather cover of the chicken: 1 was used to denote good plumage condition and 2 was used for bad plumage condition. Also, aggressiveness was determined through observation by scoring the agonistic behaviours of the chicken as 1- not aggressive and 2 – aggressive. Data were subjected to analysis of variance in a 2 ×3 factorial design.

RESULTS AND DISCUSSION

Table 1 shows the descriptive statistics of welfare condition such as tonic immobility, plumage condition and aggressiveness. Low coefficient of variation for the welfare conditions was obtained for the chickens, the relative low coefficient of variation obtained implies the accuracy and small error in the result as reported (Acourene *et al.*, 2001). The effect of sex on welfare condition of the chicken is presented in Table 2. There was no significant ($p<0.05$) effect of sex on welfare condition of Yoruba ecotype chicken. However, hen were more fearful than cock because they spent less time to right themselves when restrained, also, cock were more aggressive than hen. The plumage condition of the chicken was not significantly ($p>0.05$) affected by sex of the chicken. The result of this study disagreed with findings of Moreira *et al.* (2006) who reported significant effects of sex on plumage condition of broiler chicken. Table 3 shows the effects of strain of the chicken on their welfare indicators. There was significant ($p<0.05$) effect of strain on welfare indicator of Yoruba ecotype chicken, normal feather chicken were least fearful amongst the chicken strain while the frizzle feather chicken were the most fearful chicken amongst the strains being the strain that spent the least time to right itself when restrained unlike normal feather chicken that spent longer time before it righted itself when restrained on its side. Sex of the chicken significantly ($p<0.05$) affected aggressiveness of the chicken with naked neck ranked as the most aggressive among the strains of the chicken. Campo *et al.*, (2009) reported significant differences among breeds of chicken for relative social aggressiveness

Table 4 shows the interaction effects of strains and sex of Yoruba ecotype chicken on their welfare indicators. The result shows that there was significant ($p<0.05$) interaction effects of sex and strain on welfare indicator of Yoruba ecotype chicken. Normal feather (cock and hen) and naked neck cock were the least fearful of the chicken having spent least time before it righted itself when restrained on its back while Naked neck and frizzle feather Hen were the most fearful strain, this strain spent the least period before it righted itself when restrained. There were also significant ($p<0.05$) interaction effects of sex and strains on the plumage condition of the chicken. Normal feather cock had the best plumage condition among the strain of the chicken. Moreira *et al.* (2006) in his work on broiler chicken reported that females had better feathering in comparison to males; Son, (2010) also reported that when male and female broilers are reared together, sex ratio influence welfare index. Aggressiveness of the chicken was significantly ($p<0.05$) affected by both sex and

strain of the chicken with naked neck cock ranked as the most aggressive Yoruba ecotype chicken among the strains of the chicken.

CONCLUSION

Conclusively, normal feather cocks were the most fearless, normal feather cock had the best plumage cover and naked neck cock were the most aggressive. Thus, this implies that male Yoruba ecotype chicken possess ability to cope more with the potential threat to homeostasis than hen

REFERENCES

Acourene, S., Belguedj, M., Tam, M. and Taleb, B. (2001). Caractérisation, évaluation de la qualité de datte et identification des cultivars de palmier dattier de la région des Zibans. La Recherche

Agronomique, INRA Algérie no 8: 19–39.In: Nafti M., Khaldi Z. and Haddad B. (2014). Multivariate characterization of morphological traits in local Tunisian oases goats. *Anim. Gen. Res.*55: 29-38

Ajayi, F.O. and B.O. Agaviezor, 2009. Phenotypic characteristics of indigenous chicken in selected local government areas in Bayelsa state, Nigeria. *Proceedings of the 3rd Nigeria International Poultry Summit*, Feb. 22-26, Abeokuta, pp: 75-78.

Campo J.L., Prieto M.T. and Dávila S.G. (2009). Relationships between fluctuating asymmetry and sexual maturity, social aggressiveness and comb size in chickens. *Arch.Geflügelk., 73 (3). S. 193- 200*

Cook, C. J., Mellor, D. J., Harris, P. J., Ingram, J. R. & Matthews, L. R. (2000). Hands-on and hands-off measurement of stress. In: Moberg, G., P. & Mench, J. A. (Eds) *The biology of animal stress*. pp 123–146. Oxon: CABI Publishing. ISBN 0-85199-359-1.

Davis, A. K., Maney, D. L. & Maerz, J. C. (2008). The use of leukocyte profiles to measure stress in vertebrates: a review for ecologists. *Functional Ecology*, 22(5), pp 760–772.

Dawkins M.S. (1999). The role of behaviour in the assessment of poultry welfare. *World's Poultry Science Journal*, Vol. 55. Pp 295-303.

Freire, R. and Cowling, A. (2013). The welfare of laying hens in conventional cages and alternative systems: first steps towards a quantitative comparison. *Animal Welfare*, 22(1), pp 57–65.

Gudev D., Moneva P., S. Popova- Ralcheva S., and Sredkova V. (2011). Tonic immobility and ardrenal response in chickens fed supplemental tryptophan. *Bulgarian Journal of Agricultural Science*, 17 (No 4).560-566

Hill, D.H. and Modebe A.N.A, (1961). Poultry production at university college, Ibadan: 1950-1958. *Technical Bull.* No. 2, Faculty of Agriculture.

Jensen, P. and Toates F.M. (1997). Stress as a state of motivational system. Appl.Animal behavior science, 53:145-146

Moreira, J., Mendes, A. A., Garcia, R. G., Garcia, E. A., Roca, R. O., Nass. A., Dalanazi, J. A. and Pelcia, K. (2006). Evaluation of strain, dietary energy level and stocking density broiler feathering. Brazillian. *Journal of poultry Science*., 8:15-22.

Mormède, P., Andanson, S., Aupérin, B., Beerda, B., Guémené, D., Malmkvist, J., Manteca, X., Manteuffel, G., Prunet, P., van Reenen, C. G., Richard, S. & Veissier, I. (2007). Exploration of the hypothalamic–pituitary–adrenal function as a tool to evaluate animal welfare. *Physiology & Behavior*, 92(3), pp 317–339.

Nwosu, G.T. (2000). Effect of naked neck gene on broiler performance of two populations in tropical climate. *Proceedings of the 6th World Poultry Summit*

Olori, V.E., 1992. An evaluation of two ecotypes of the Nigerian Indigenous chicken. M.Sc. Thesis, OAU Ile Ife.

Olsson, I. A. S., Würbel, H. & Mench, J. A. (2011). Behaviour. In: Appleby, M. C., Mench, J. A., Olsson, I. A. S., & Hughes, B. O. (Eds) Animal Welfare. 2nd Edition. pp 138–154. Oxfordshire: CABI Publishing. ISBN 978-1-84593-659-4.

Oluyemi, J.A., G.O. Longe and T. Sunga, (1982). Requirement of the Nigerian indigenous fowl for protein and amino acids. Ife J. Agric., 4: 105-110.

SAS, (2004). Statistical Analysis System User Guide Statistic (release 8.03). SAS Institute Cary Northern Carolina USA.

Son, J.H., (2010). Influence of sex ratio on behaviour and welfare indexes in broiler chickens. Korean J. Poult. Sci., 37,43-49.

Sonaiya, E.B and Olori, V.E. (1990): Village Poultry Production in Southern Western Nigeria. In: Proceedings of an Int. Workshop on Rural Poultry Dev. In Africa held at O.A.U. Ile Ife, 13-16 Nov. 1989: 243-247.Horst, R Native Pool as Resources for Genome and Major Gene with Direct and Indirect Effect on Productive Adaptability. Proceedings XVIII World Poultry Congress, Nagoya, Japan, 1998

Weeks, C.A. and Nicol, C.J. (2006). Preferences of laying hens. World's Poultry Science Journal, 62: 296–307.

Table 1. Descriptive statistics of welfare conditions for Yoruba Ecotype chicken

Variable	Mean	Standard deviation	Variance	Range	Coefficient of variation
Tonic Immobility	1.50	0.50	0.25	1.00	3.35
Plumage	1.10	0.31	0.09	1.60	3.35
Aggressive	1.50	0.50	0.25	1.00	3.33

Table 1 Effects of sex on welfare conditions for Yoruba Ecotype chicken

Variables	Hen	Cock	SEM (±)
Tonic immobility	1.48	1.52	0.05
Plumage condition	1.11	1.10	0.03
aggressiveness	1.49	1.52	0.05

Table 3. Effect of strain on welfare condition and morphological traits

Variables	Naked neck	Frizzle feather	Normal feather	SEM (±)
Tonic immobility	1.44^{b}	1.36^{b}	1.56^{a}	0.05
Plumage condition	1.08	1.24	1.06	0.03
aggressiveness	1.68^{a}	1.40^{b}	1.47^{b}	0.05

^{a,b,c} means different superscripts along the same row are significantly different ($p<0.05$)

Table 4. Effects of strain and sex on welfare indicators of Yoruba Ecotype chicken

Variables	Cock			Hen			
	Naked neck	Normal feather	Frizzle feather	Naked neck	Normal feather	Frizzle feather	SEM (±)
Tonic immobility	1.54^{a}	1.57^{a}	1.40^{ab}	1.33^{b}	1.56^{a}	1.33^{b}	0.13
Plumage condition	1.08^{b}	1.05^{c}	1.30^{a}	1.08^{b}	1.07^{b}	1.20^{a}	0.11
Aggressiveness	1.85^{a}	1.48^{b}	1.20^{c}	1.50^{b}	1.47^{b}	1.53^{b}	0.13

^{a,b,c} means different superscripts along the same row are significantly different ($p<0.05$)