EFFECTS OF LOCATIONS ON PHENOTYPIC CHARACTERISTICS OF FULANI CHICKEN ECOTYPES

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Abstract

The experiment was conducted using 250 matured birds from 5 different locations in 2 phases. The first phase was carried out using fifty birds each from the five randomly selected locations. The birds were used to determine body linear measurements such as body length, shank length, wing length, beak length and breast girth. However, for the second phase, fifty (50) hens and five cocks were purchased from each location. This comprised of ten hens and 1 cock from each locality and bred using a mating ratio of 1 cock to 10 hens. Data collected on all the parameters of body linear measurement, egg production and egg quality characteristics were analyzed using analysis of variance (ANOVA) and correlation procedure of SPSS Statistical software (2011).

The result obtained indicated that location had significant ($P \leq 0.05$) effects on body weight, body linear measurements, egg production and correlations among these parameters. However, location had no significant ($P > 0.05$) effects on external and internal egg quality characteristics except for egg weight and egg shell weight. HDEP was consistently higher than HHEP across location. Correlations between body weight and body linear measurements were generally high, positive and non significant. From the findings of this research it was recommended that selection of Fulani chicken should be location driven. Also, shank length and breast girth should be used to determine body weight of Fulani chickens than any other body measurements.

Keywords: body linear measurement, hen-day egg production, hen-housed egg production,

Introduction

The ever increasing human population in African especially Nigeria has led to high demand for the available but insufficient animal and poultry products in the country. Poultry particularly chicken are very important genetics resources among the avian species ((Pimm and Lawton,

1988). Native chicken production is vital in the livelihood of many house-hold members in the country, especially as a source of resources for rural farmers providing nutrition for the family (good source of protein), a small cash flow reserve for times of celebrations or need and in some areas contribute to religious ceremonies and recreation (Gwaza *et al.,* 2015). Fulani chicken ecotype is one of the best preserved local chickens in Nigeria because of the cultural lifestyle of the Fulani poultry keepers. A comparism of the Fulani chicken ecotype within and between locations could provide useful information on

superior performance and physical characteristics. The objective of the study was to investigate the effects of locations on phenotypic characteristics of Fulani chicken ecotypes.

Materials and Methods

The experiment was carried out at the Livestock Teaching and Research Farm of the Faculty of Agriculture, Shabu-Lafia Campus Nasarawa State University, Nasarawa State. The experiment was conducted in 2 phases. The first phase was linear body measurement while the second phase was the egg production and egg quality characteristics. For the first phase, fifty birds comprising of 25 cocks and 25 hens) were randomly selected from 5 location (Lafia, Akurba, Adogi, Asakio and Namu) making a total of 250 birds. Body linear measurements such as body length, shank length, wing length, beak length, tail length and breast girth were measured from the birds using measuring tape. However, for the second phase, fifty (50) hens and 5 cocks were purchased from each location. This was comprised of ten hens and 1 cock from each randomly selected locality. The birds were housed separately according to location and allowed to breed at a mating ratio of 1 cock to 10 hens. The birds were allowed to lay eggs for a period of three months to monitor their egg production. First 5 eggs laid in each month were collected base on location and used to determine external and internal egg quality characteristics. The external egg quality characteristics such as egg length and egg width were determined using venial caliper, shell weight were determined using sensitive electronic scale while shell thickness was determined using micrometer screw gauge. The internal egg quality characteristics were determined using destructive techniques method. By this method, eggs were gently broken and poured on a flat container. Vernial caliper was used to determined albumen length, albumin height, york height and york width. Egg shape index and york index were determine by a formular. The part time egg production lasted for three months. During this period, birds were fed formulated layers marsh.

The following measures of egg production were determined.

(a) Percent part-lay Hen Housed egg production (% HHP): This will be expressed as:

$$\% \text{ HHP} = \frac{Total\ egg\ laid}{No.of\ birds\ housed \times No\ of\ days\ since\ housed} \times \frac{100}{1}$$

(b) Percent Hen day egg production (% HDP)

$$\% \text{ HDP} = \frac{Total\ egg\ laid}{No.of\ birds\ alive \times No\ of\ days\ since\ hen\ laid} \times \frac{100}{1}$$

Experimental Design and Data Analysis

The design of the experiment was Completely Randomized Design (CRD). Data collected on all the parameters were analyzed using analysis of variance (ANOVA) and correlation procedure of SPSS Statistical software (2011).

Result and Discussion

This research has demonstrated that location had significant effects body weight and body linear measurements of Fulani chicken ecotype (table 1). The observed significant effects

of location on body parameters measured except body weight and breast girth strongly agrees with the report of (Gwaza *et al.*, 2015) who observed that there are variations within and between chicken ecotypes. The mean value observed in this research for matured body weight strongly agree with 1375g and range of 1310g to 1760g reported by Ayorinde *et al.* (2012) and Ukwu *et al.* (2017). Body length observed in this study is higher than 23.97cm with a range of 22.66cm to 25.85cm reported by Mbap and Zakar (2000) as body length for indigenous chicken in Yobe State. Okon *et al* (1997) reported 25.00±0.21cm for mean body length of local chicken in Calabar. Mancha (2004) also reported 17.95±0.18cm as mean body length for chicken in Jos Plateau. Badubi *et al.* (2006) observed that the average body length of male and female chicken in Botswana as 18.1±2.3cm and 20.2±2.9cm respectively. The significant effects of location on shank length in this study disagree with the report of Halima (2007) who reported a non significant effect of location on shank length. However, the mean value obtained in this study for shank length strongly agree with the value of 8.58±0.12cm and 10.31±0.16cm reported by Ukwu *et al.* (2017) for North Central Nigerian chicken. Halima (2007) reported a lower value of 7.50cm for Ethiopian chicken (male and female). Badubi *et al.* (2006) reported the shank length of the Tswana indigenous females and males as 7cm and 8.5cm respectively. Wing length value of 27.15±0.86cm to 31.14±0.53cm is far higher than 14.20±0.21 and 16.36±0.25cm reported by Ukwu *et al.* (2017). The significant variation in tail length observed in this study strongly agree with the report of Badubi *et al.* (2006) who reported that tail length was significantly ($p \leq 0.05$) different among three location of Botswana. The tail length obtained in this study is very similar to 17.9±8.7cm, 12.7±10.1cm and 22.1±9.2cm for males but higher than 13.3±3.9cm, 11.4±5.6cm and 14.3±2.2cm for females as reported for Central, Moun and Western regions of Botswana (Badubi *et al.*, (2006).

Table 1: Effect of Location on Body Weight and Body Linear Measurement of Fulani Chicken Ecotype

L	BWT	BL	SL	BG	WL	BKL	TL
1	1390.90±82.38	46.54±1.78^{b}	8.30±0.40^{b}	12.20±0.39	27.15±0.86^{b}	2.89±0.11^{b}	15.02±0.92^{b}
2	1527.27±73.97	52.09±1.47^{a}	9.59±0.33^{a}	12.68±0.39	29.45±0.72^{a}	3.15±0.08^{ab}	18.00±1.00^{ab}
3	1550.91±62.31	51.73±1.29^{a}	9.36±0.33^{a}	12.73±0.38	29.73±0.86^{a}	3.14±0.98^{ab}	17.41±0.47^{ab}
4	1600.00±58.39	51.73±1.47^{a}	9.55±0.32^{a}	12.77±0.16	31.09±0.71^{a}	3.24±0.78^{a}	18.50±1.48^{a}
5	1627.27±94.48	52.09±1.28^{a}	9.50±0.23^{a}	12.73±0.43	31.14±0.53^{a}	3.21±0.8^{a}	16.91±0.81^{ab}

LOS	**NS**	*	*	**NS**	*	*	*

LOS = level of significant, * = significant at 5 percent probability, L = location, BWT = body weight, BL = body length, SL = shank length, WL = wing length, BG = breast girth, BKT = beak length and TL = tail length.

Location had no significant effects on both external and internal egg parameters except egg weight and egg shell weight (table 2). The mean egg weight in the present study strongly agrees with the value of 41.6 g reported by (Msoffe *et al*, 2001). The mean egg length obtained in the present study fairly agrees with the value (5.15) reported by Momoh (2005) in Nigerian local chicken but lower than 4.83cm reported for Bangladesh indigenous chicken (Islam and Nishibori, 2009). The mean value of egg width obtained in this study is slightly lower than the value (4.10±0.01) reported by Halima (2007). Egg shape index in this study is slightly higher than 72.60% reported by Momoh (2005) for normal feathered indigenous chickens in Nigeria. Egg shape index is an indicator of external egg quality. Egg shell weight obtained in this study fairly agree with the value of 5.82 ± 0.16 reported by Halima (2007). The slightly lower shell weight recorded in this study could probably be due to the efficacy of the weighing scale used, weight of the eggs and/or the method/period of drying of the shell. Shell thickness in this current study is higher than the value reported by Momoh *et al.* (2007). The albumen height in the current study strongly agrees with the value of 0.651cm reported by Badubi *et al.* (2006). However, the mean value of albumen width in this current study is slightly lower than the value (6.25) reported by Badubi *et al.* (2006) for egg quality characteristics of three phenotypes of local chickens in Adamawa state. Variation in internal characteristics of egg could be due to the freshness of the eggs and the type of feed given.

Table 2: Effect of location on external and internal egg characteristics on fulani chicken ecotype

LOCATION	**1**	**2**	**3**	**4**	**5**	**LOS**
EWT (g)	42.67±0.32^{c}	42.29±0.55^{c}	45.73±0.85^{b}	45.43±0.80^{b}	49.30±0.63^{a}	*
EL (cm)	5.24±0.02	8.63±2.37	5.35±0.39	5.45±0.08	5.36±0.05	NS
EW (cm)	3.93±0.02	3.96±0.05	4.05±0.05	3.99±0.06	4.07±0.02	NS
ESI (%)	75.62±0.61	75.95±1.13	75.82±1.09	73.61±1.60	75.97±0.64	NS
ESW (g)	5.00±0.16bc	4.71±0.15c	5.20±0.14ab	5.14±0.12^{ab}	5.50±0.11^{a}	*
EST (mm)	30.11±0.66	30.36±0.51	29.80±0.45	30.79±0.52	30.20±0.60	NS
AL (cm)	7.49±0.19	7.56±0.16	7.54±0.15	7.61±0.17	7.59±0.19	NS
AH (cm)	0.68±0.39	0.68±0.03	0.67±0.03	0.67±0.03	0.67±0.04	NS

AW (cm)	5.66±0.17	5.60±0.13	5.75±0.13	5.67±0.14	5.70±0.16	NS
YH (cm)	1.57±0.02	1.55±0.02	1.55±0.01	1.55±0.02	1.55±0.02	NS
YW (cm)	3.82±0.02	3.82±0.02	3.83±0.02	3.83±0.02	3.83±0.02	NS
YI (%)	41.16±0.60	40.78±0.60	40.65±0.48	40.71±0.61	40.64±0.65	NS

LOS = level of significant, * = significant at 5 percent probability, NS = non significant, L = location, EWT = egg weight, EL = egg length, EW = egg width, ESI = egg shape index, ESW = egg shell weight, EST egg shell thickness, AL = albumen length, AH = albumen height, AW = albumen width, YH = York height, YW = York width and YI = York index.

Egg production

Location had significant effects on the entire egg production parameters studied (table 3). The hen day egg production (HDEP) was consistently higher than the hen housed egg production (HHEP) across locations. The result obtained for HDEP and HHEP is lesser than average of 38.56 eggs reported by Momoh *et al.* (2007) as the short-term egg number of the light ecotype chicken for the short term (90 days from first lay) egg production. The egg production of the local chicken is a result of many genes acting on a large number of biochemical processes, which in turn control a range of anatomical and physiological traits.

Table 3: Effects of Location on Hen Day Egg Production and Hen House Egg Production

LOCATION	HDP	HHP
1	19.27±1.91^{ab}	19.04±1.50^{a}
2	18.22±1.79^{ab}	16.02±0.68^{bc}
3	21.08±1.70^{a}	18.80±0.58^{a}
4	16.11±0.60^{b}	14.94±0.06c
5	17.67±0.19^{ab}	17.61±0.06ab
LOS	*	*

LOS = level of significant, * = significant at 5 percent probability, EGNO = egg number, HDP = hen day production, HHP = hen house production

Correlation of different egg quality parameters

The correlations between body weight and body linear parameters were generally non significant, positive and high (table 4). Relationships between body weight and body linear measurement varied across locations as similarly reported Ukwu *et al.* (2017). The mostly positive correlation obtain in this study is similar to the report of Alabi *et al.* (2012) for three indigenous chicken breeds of South Africa and Ukwu *et al.* (2017) for matured female local chickens in Benue State of Nigeria. The implication of this correlation is that increases in body weight will results to concomitant increase in body linear measurements

of local chicken. Thus any selection programme aimed at improving body weight will lead to corresponding improvement in linear body measurements of birds.

Table 4: Phenotypic, correlation between body weight and body linear measurement on Fulani local chicken ecotype base on location.

	BWT	BL	SL	BG	WL	BKL
Location 1 BL	0.329					
SL	0.652**	0.662**				
BG	0.410	0.294	0.101			
WL	0.559	0.883**	0.652**	0.305		
BKL	0.292*	0.685**	0.814**	0.164	0.527*	
TL	0.574**	0.631**	0.556*	0.205	0.759**	0.379
Location 2 BL	0.573**					
SL	0.550**	0.881**				
BG	0.629**	0.664**	0.722**			
WL	0.567**	0.814**	0.848**	0.420		
BKL	0.138	0.042	0.033	0.420	-0.044	
TL	0.310	0.861**	0.744**	0.563**	0.568**	-0.241
Location 3 BL	0.184					
SL	0.322	0.570**				
BG	0.355	-0.107	-0.313			
WL	0.298	0.262	0.741**	-0.160		
BKL	0.299	0.479*	0.644**	0.074	0.375	
TL	0.346	0.621**	0.335	0.139	0.468*	0.485*
Location 4 BL	0.069					
SL	0.463*	0.702**				
BG	0.349	-0.107	-0.070			

WL	0.499*	0.697**	0.650**	-0.104		
BKL	-0.150	0.272	-0.208	0.218	-0.105	
TL	0.000	0.818**	0.646**	-0.483*	0.632**	0.051
Location 5 BL	0.888**					
SL	0.494*	0.458*				
BG	0.962**	0.920**	0.454*			
WL	0.468*	0.575**	0.604**	0.516*		
BKL	0.298	0.294	0.391	0.308	0.129	
TL	0.373	0.249	-0.085	0.230	-0.273	0.194

LOS = level of significant, * = significant at 5 percent probability, ** = significant at 1 percent probability, BWT = body weight, BL = body length, SL = shank length, WL = wing length, BG = breast girth, BKT = beak length and TL = tail length.

Conclusion and Recommendation

The study revealed that location had significant (P≤0.05) effects on body weight, body linear measurements, egg production and correlations among these parameters. However, location had no significant (P>0.05) effects on external and internal egg quality characteristics except for egg weight and egg shell weight. HDEP was consistently higher than HHEP across locations. Correlations between body weight and body linear measurements were generally non significant, positive and high. From finding of this research work, it is recommended that, selection of Fulani chicken should be location driven. Shank length and breast girth should be used to select body weight of indigenous chickens than any other body measurements. This becomes necessary due to the fact that these parameters had the highest relationship with body weight.

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