EFFECTS OF TWO DIETS REGIME ON EARLY GROWTH PERFORMANCE AND GROWTH TRAITS IN FULANI ECOTYPE CHICKENS

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Abstract

Two hundred and six Fulani Ecotype (FE) chickens were used to investigate the effect of feeding Fulani Ecotype chicken on two common diets recommended for pullets (chicks diet) and broiler starter diet by the National Research Council. The broiler starter diet contained 23 % crude protein (CP) and 3000 Kcal/kg metabolizable energy (ME) while the chicks' diet contained 21 % percent crude protein and 2800 Kcal/Kg ME. The growth parameters measured were body weight (BW), feed intake (FI), feed efficiency (FEf), and some linear body measurement such as body length (BL), body girth (BG), wing length (WL), thigh length (TL), drumstick length (DL), keel length (KL), and shank length (SL). The feed intake of FE chicken fed chicks diet and broiler starter were similar ($P > 0.05$) at week 1 and 2. Average body weight of FE chicks fed broiler starter diet were significantly ($P < 0.05$) higher at all ages. FE fed broiler starter diet also exhibited higher value in BL, BG, WL, TL, DL, KL and SL than those on chicks diet and some were significantly ($P < 0.05$) different at specific ages. FEf in Fulani Ecotype chicken fed broiler starter diet was better than those fed with chicks' diet throughout the experimental period while faster growth rate was observed in those fed chicks diet. From this study, FE chicken fed broilers diet performed better than those fed chicks' diets with respects to growth traits, overall body weight and efficiently utilized their feed. Further study to determine the actual dietary requirement of FE chicken will assist in any programme design for their improvement.

Keywords: *Diets, Fulani ecotype chicken, growth performance.*

INTRODUCTION

Poultry meat is one of major protein source in the diet of Nigerian and most developing countries, and to supplement the ever increasing demand for animal protein, production of poultry must be intensified coupled with improvement and development of local or indigenous poultry stocks. One of the advantages of poultry production is the ability to attain maximum growth level within a relatively short period of time; this will make them capable of providing the required animal protein intake which is presently below the recommended level for healthy growth and normal body development in the developing countries. FAO (1992) opined that 20 g of animal protein should be the recommended minimum level for developing nation as against the 75 g optimal daily requirement for normal growth and development.

Low intake of animal protein diminish the capacity for most human activities as manifested in reduced productivity, high infant mortality and susceptibility to various types of devastating diseases which are rampant nationwide (Okubanjo, 1990). However, to meet the demand for cheap animal protein in Nigeria, improved breeds of chicken from developed countries which requires expensive imported inputs dominates the commercial poultry sector and yet, sustainability of this improved exotic breed under poor economy condition and high exchange rate is pushing most farmers away from poultry production, and consequently leading to increase in price of poultry products. Local chickens are chickens with pools of different genetic makeup, and are separated by geographical locations for identification. They are known for their adaptation and superiority in terms of their resistance to endemic diseases and other harsh environmental conditions (Nwakpu *et al*., 1999), but very low in productivity compared to the exotic stocks. They are highly unimproved and raised under little or no input free range extensive system (Oluyemi & Roberts, 1979). Investigating the actual performance of these indigenous poultry under varying environmental and management condition is important as this could reveal their actual production potential (Pederson, 2002). This knowledge will guide researchers to form a solid foundation upon which improvement and development of local chickens stock will be built. Attempt to raise local chickens stock under a controlled environment with specified diet type will not only revealed their potential but will also help to evaluate their growth performance especially when compared to the scavenging village condition.

Fulani Ecotype chicken is one of indigenous chicken in Nigeria, and has been reported to have great potentials for genetic improvement in growth and reproductive performance (Atteh, 1990; Tiamiyu, 1999; Olori, 2000; Fayeye *et al*., 2005; Odetunde, 2007; Sola-Ojo & Ayorinde, 2009). Investigating

Fulani Ecotype chicken (FE) for ability to perform under a defined environmental and management conditions is one way that will help in improvement of this class of chicken for meat and egg production. It is very common to feed all local poultry stock with just any available feed apart from whatever they are able to pick on the range in the scavenging system, thus determination of their nutrient requirement versus intake satisfaction for growth and production performance is difficult. The present study was designed to determine the performance of the Fulani Ecotype chicken fed commercial diet meant for broilers and pullets and are of different Crude protein and Metabolizable energy level.

MATERIALS AND METHODS

Origin and Management of Experimental Animals

A total of two hundred and six (206) FE day old chicks obtained through incubation and hatching of Fulani Ecotypes eggs from three different Fulani Kraals in Ilorin South Local Government area Kwara state (Oke-Ode, Oke-Ose, and Molete Kraals) were housed and raised intensively the Animal Pavillion of the Department of Animal Production University of Ilorin. All necessary vaccination and medication were given to birds accordingly; feed and water were supply to the birds *ad libtum.*

Experimental diet

Two commercial diets meant for broilers and pullet and confirmed from products labeled to conform with Nutrient requirement table of the NRC (1994) were purchased from a reputable animal feed producer in Ilorin (Feed Masters Ltd.), and were subjected to proximate analysis according to method of AOAC (1992), while the metabolizable energy (ME) was determined using the Bomb calorimeter. The results of the proximate composition and ME of the feed are presented in Table 1.

Data Collection

***Body Weight (BW)*:** Body weight in gram (g) units recorded to two decimal places was taken by use of a sensitive Scout II electronic weighing scale.

***Body Length (BL)*:** Body length was taken as the nostril to pygostyle distance measured in centimetre (cm) units when a tape measure is stretched from a bird's nasal opening, along its gently stretched neck, and along its back, to the tip of its pygostyle.

***Body Girth (BG)*:** Body girth was taken as the distance in centimetre (cm) units covered when a tape measure is looped round the region of the breast, taking care to run the tape under (rather than over) the wing.

***Shank Length (SL)*:** The shank length was taken as the distance in centimeters (cm) between the foot pad and the hock joint, measured by use of a set of Vernier caliper.

Shank Diameter (SD): The shank diameter was measured using a pair of Vernier calliper at the middle of the left shank of each bird.

***Thigh Length (TL)*:** Thigh length was taken as the distance between the tip of the tarsus and the ball joint, measured in centimeter (cm) units by use of a tape rule.

***Wing Length (WL)*:** Wing length was taken as the distance from the humerus-coracoid junction to the distal tip of the phalanges digits, measured in centimeter (cm) units by use of a tape rule.

Feed Efficiency (FE): Feed efficiency was measured as the amount weight gain over a period of time divided by feed intake over the same period express in percentage.

***Growth Rate*:** For body weight (g), growth rate/potential for 1 to 4 week and 5 to 8 week periods were determined by use of an adapted version of the formula of Maciejowski and Zięba (1982),

$I = [(T2 - T1) / (T2 + T1)/2] \times 100$ …… Equation 1

Where:

I= Growth rate per unit period (%).

T1= Average initial reading for the stated period (g)

T2= Average final reading for the stated period (g)

The model used in statistical analysis of data obtained:

$Y_{ij} = \mu_i + a_i + e_{ij}$…… Equation 2

Where Y_{ij} = body weight measurements

μ= overall mean

a_i = effect of i^{th} diet

e_{ij}= random residual error.

Table 1: Proximate composition and Metabolizable Energy of the Diets

Composition	Chicks diets (%)	Broiler diets (%)
Moisture Content	7.20	6.25
Dry Matter	92.80	93.75
Crude Protein	21.12	23.45
Crude Fibre	4.85	3.97
Ether Extract	3.15	4.02
Total ash	5.67	5.92
Metabolizable Energy	2800 Kcal/kg	3000 Kcal/kg

RESULTS AND DISCUSSION

At week 1, significant ($P < 0.05$) differences existed in body weight and feed intake of Fulani ecotype chicken placed on broiler starter diet and those on chicks' diet. FE fed broiler starter diet was 27.59 % bigger in weight and consumed twice as those on chicks diet. Similar results was observed in week 2 for feed intake, but there was no significant ($P > 0.05$) differences in the body weight of FE fed chicks diet and broiler starter (67.69 vs. 69.42) Table 2. From week 3 to 8, FE chicken fed with broiler starter diet was significantly ($P < 0.05$) heavier than those fed with chicks diet despite the fact that no significant differences ($P > 0.05$) existed in the quantity of feed they consume. At weeks three, four, five, six, seven and eight FE chicks fed broiler starter was significantly ($P < 0.05$) heavier with 20.22, 16.36, 26.04, 17.85 16.42 and 7.56 %, respectively than those fed with chicks diet (Table 2).

Table 2: Effects of Two Diets Regime on Body weight, Feed Intake and Feed Conversion Ratio from day old to Eight weeks of age

Parameters	BW (g/bird/week)		FI (g/bird/week)	
Age(weeks)	Chicks Diet	Broiler Diet	Chicks Diet	Broiler Diet
1	37.81±0.028^{b}	52.22± 0.055^{a}	16.05±0.339^{b}	36.79±0.068^{a}
2	67.69±0.043^{b}	69.42± 0.059^{a}	36.79±0.514^{b}	70.48±0.095^{a}
3	86.29±0.065^{b}	108.17± 0.068^{a}	114.14±0.091^{a}	115.24±1.219^{a}
4	123.84±0.072^{b}	148.08±0.109^{a}	139.61±0.103^{a}	140.95±1.349^{a}
5	148.64±0.089^{b}	200.99±0.082^{a}	170.74±0.110^{a}	172.39±1.492^{a}
6	214.48±0.098^{b}	261.10±0.089^{a}	188.70±0.090^{a}	190.49±1.568^{a}
7	274.90±0.072^{b}	328.94±0.102^{a}	190.49±1.169^{a}	193.45±1.580^{a}
8	387.77±0.104^{b}	419.49±0.130^{a}	198.10±1.19^{a}	199.90±1.606^{a}

BW = Body weight; **FI =** Feed Intake

Table 3: Effects of two Diets Regime on Performance Characteristics of Fulani Ecotype Chicken

Parameters	1-4 (Weeks)	5-8 (Weeks)
FEf (%) Chicks diet	24.19	37.90
FEf (%) Broiler starter diet	50.50	38.60
GR (%) Chicks diet	26.62	22.28
GR (%) Broiler starter diet	23.93	17.60

FEf = Feed Efficiency;
GR = Growth Rate

The percentage differences in their body weight with respects to broiler based diet feed showed no definite pattern from week 3 to 8, but decrease from week 6 to 8 and by week 8, (the age at which the FE chicks will complete their early feeding requirement) the percentage differences in their body weight was below 10 %. This showed that as the birds advance in age, their rates of feed consumption were not different and little differences existed in their body weight values. FE fed broiler starter diet had higher percentage feed efficiency of 50.50 % from week 1-4 than those on chicks diet with 24.19 %, from week 5 to 8 the difference in their percentage feed efficiency was 0.7 % (Table 3), this observation corresponds with our early finding as shown in Table 2, where FE fed both diet had similar feed intake with significantly but decreasing differences in body weight from week 5 to 8 (26.04 to 7.56 %) as the two group of birds with the same genotypes advances in age. This results also showed that FE fed broiler starter diet efficiently utilized their feed from week 1 to 4, and this could also be responsible for their higher body weight than those fed chicks diets at later ages. From Table 3, it was observed that growth velocity was slightly higher with 2.69 and 4.68 in FE fed chicks diet than those on broiler starter diet from week 1 to 4 and week 5 to 8, respectively, from this observation it could be said that FE fed with broiler starter diet had higher body weight, while those on chicks diet had faster growth rate that are directly proportional to age of FE chicken. Significant and non significant differences were observed in the body parts measured in FE fed different diet based. At week one, No significant ($P > 0.05$) differences was recorded in BL and SD, but significant ($P < 0.05$) differences existed in other body parts measured, at week 2, WL and SD were not significantly ($P > 0.05$) different, at week 3 all body parts measured were significantly ($P < 0.05$) different, while at week 4 and 5, WL, TL, SL and SD were not significantly ($P > 0.05$) different. At week 6, BG, TL, and SL were similar ($P > 0.05$), but at week 7, TL and SL were not significantly ($P > 0.05$) different, while SD was not significantly ($P > 0.05$) different in FE fed different based diet at week 8. Significant differences existed in body parts measured for FE fed different diet based, with those on broiler diets having higher values than those fed with chicks' diet (Tables 4 and 5).

The results of this findings corresponds with the facts that growth is a trait that is influenced by genetics and management, especially nutrition and health and the ability of an animal to grow depends upon its breed, sex and most important level of nutrition as reported by Chambers (1990). From this study it was clearly noted that increment in weight is accompanied by continuing changes in body composition and appearances, and this is largely aided by nutrition as reflected in the two different diets given to the same chicken ecotype in this experiment. The response of the FE chicken to utilization of the nutrient in the diet showed that broiler diet are better utilized and could lead to a better growth rate than the chicks diet in FE chicken. The non significant feed intake and some linear body measurement are in agreement with the findings of Moran & Orr (1989), who found no significant differences in life body weight within breeds of broilers. The results of this findings also showed that body weight and linear body measurement were significantly ($P < 0.05$) affected by the differences in the diet fed to chicks during the first eight weeks of age. Shank length have been said to be an indicator of leg development Maciejowski & Zieba (1982). It was noticed that shank length develops faster in FE fed with chicks' diet which indicates tallness in those categories of FE and could also be attributed to faster growth rate as recorded. Values obtained for FE chicken fed broiler diet were lower than those reported for exotic broiler fed same diet type by Adeniji & Ayorinde (1990) where bodyweight of broiler was reported to range from 36.70 g to 1334 g from day old to eight weeks of age, this showed that the growth potential, feed efficiency and nutrient utilization of this indigenous chicken is very low compared to that of their exotic counterparts.

Table 4: Effects of Two Diets Regime on Body Length, Body Girth, Wing Length and Keel Length of the Fulani Ecotype Chicken

Age (wks)	Chicks Diet	Broiler Starter Diet	Chicks Diet	Broiler Starter Diet	Chicks Diet	Broiler Starter Diet	Chicks Diet	Broiler Starter Diet
	BL		BG		WL		KL	
1	11.81±1.32^{a}	12.46±2.14^{a}	7.86±1.43^{b}	8.62±1.22^{a}	3.87±0.59^{b}	4.47±0.20^{a}	1.90±0.20^{b}	3.60±1.41^{a}
2	13.83±1.55^{b}	15.11±2.26^{a}	9.13±1.18^{b}	9.50±1.45^{a}	5.09±1.08^{a}	5.34±0.44^{a}	2.88±0.44^{b}	4.03±1.15^{a}
3	16.31±1.98^{b}	18.03±2.72^{a}	10.24±1.09^{b}	10.96±1.49^{a}	5.89±1.15^{b}	6.53±0.53^{a}	3.98±0.53^{b}	4.54±1.41^{a}
4	18.31±1.64^{b}	19.70±2.72^{a}	12.37±1.95^{b}	12.87±1.21^{a}	7.32±1.17^{a}	7.40±0.72^{a}	4.52±0.72^{b}	5.03±1.51^{a}
5	20.16±1.64^{b}	22.97±2.46^{a}	13.64±1.54^{b}	14.57±1.48^{a}	8.13±1.39^{a}	9.12±0.91^{a}	5.26±0.91^{b}	5.80±1.62^{a}
6	23.65±2.36^{b}	24.23±2.56^{a}	14.66±1.48^{a}	14.79±1.53^{a}	9.23±1.48^{b}	10.51±0.77^{a}	6.12±0.77^{b}	6.56±1.71^{a}
7	24.85±2.30^{b}	26.04±2.56^{a}	15.16±1.72^{b}	16.48±1.69^{a}	12.01±1.80^{b}	14.40±0.63^{a}	6.63±0.63^{b}	7.32±1.95^{a}
8	27.18±3.20^{b}	28.56±2.79^{a}	17.45±1.88^{b}	17.78±1.88^{a}	14.48±1.53^{b}	16.66±0.77^{a}	6.68±0.77^{b}	8.47±2.16^{a}

Table 5: Effects of Two Diets Regime on Thigh Length, Shank Length, Shank Diameter and Drumstick Length of the Fulani Ecotype Chicken

Age (wks)	Chicks Diet	Broiler Starter Diet	Chicks Diet	Broiler Starter Diet	Chicks Diet	Broiler Starter Diet	Chicks Diet	Broiler Starter Diet
	TL		SL		SD		DL	
1	2.19±0.47^{b}	2.98±0.90^{a}	1.98±0.25^{b}	2.95±0.47^{a}	0.40±0.14^{a}	0.32±0.15^{a}	3.38±0.37^{b}	5.30±2.12^{a}
2	3.12±0.47^{b}	3.38±0.53^{a}	3.60±0.87^{b}	3.41±0.47^{a}	0.58±0.13^{a}	0.41±0.13^{a}	4.20±0.73^{b}	5.96±1.53^{a}
3	3.94±0.51^{b}	4.18±0.90^{a}	3.92±0.43^{b}	3.69±0.52^{a}	0.65±0.09^{a}	0.49±0.15^{b}	5.12±0.58^{b}	7.26±2.12^{a}
4	4.74±0.92^{a}	4.24±0.52^{a}	4.76±0.59^{a}	4.08±0.66^{a}	0.74±0.18^{a}	0.67±0.17^{a}	7.84±0.71^{b}	8.30±2.48^{a}
5	5.05±0.54^{a}	4.71±0.54^{a}	5.46±0.77^{a}	4.57±0.86^{a}	0.76±0.26^{a}	0.74±0.16^{a}	8.54±1.02^{b}	10.12±2.37^{a}
6	6.33±0.80^{a}	5.30±0.65^{a}	5.88±0.99^{a}	4.96±0.64^{a}	0.84±0.22^{b}	0.89±0.18^{a}	9.29±0.87^{b}	12.26±2.72^{a}
7	6.82±1.03^{a}	5.93±0.66^{a}	6.26±0.85^{a}	5.58±0.64^{a}	0.85±0.26^{b}	0.94±0.18^{a}	9.74±0.88^{b}	14.13±2.82^{a}
8	7.00±1.15^{b}	6.54±0.63^{a}	6.62±1.10^{b}	6.22±0.64^{a}	0.89±0.27^{a}	0.94±0.15^{a}	9.85±0.89^{b}	15.79±3.51^{a}

Feed resources has an important impact on village chickens survival and production as indicated in this study and exploitation of the growth potential of local chicken will not be fully possible under scavenging or free range condition due to inadequate feed because contribution of feeding management was about 30 % of their growth potential as stated by Gondwe *et al*. (2002). Since it has become possible to predict the body weight of chicken from some other qualitative body measurement, which include keel length, body length and shank length though the use of correlations equations as suggested by Maciejowski & Zieba (1982) the method employed and results of linear body measurement will be of help in further studies related to improvement of Fulani Ecotype chicken. Lyod *et al*. (1978) was of the opinion that body weight with other measurements such as height is often better than using body weight alone in judging the overall performance of an animal, and the live weight changes are more valid reflections of growth in young than matured animals, this is clearly shown here from the results obtained in feed efficiency and growth rate of the FE chicken used in this experiment, because the influence of diet utilization is clearly shown from week 1 to 4 age where FE fed broiler diet recorded above 50 % Feed efficiency and slight differences was recorded in the growth rate of the two group. If the judgment of analysis of results obtained here is based on body weight alone, one will prefer to feed Fulani Ecotype chicken with broiler diet of 23 % CP and 3000 Kcal/kg ME for heavier body weight at early stage of growth.

The results of this findings will be useful to explain the overall body development of FE chicken when fed two basic diets regime, but which if observed singly will hide the facts on dietary effects and the reality on the fact that diets will lead to higher body weight and faster growth rate in FE chicken. Furthermore, the results of this study is suggesting that it will be better to investigate the actual nutrition requirement of this chicken Ecotype through further studies on different levels of protein and energy.

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