



Effects of Strain and Skip-a-day Feed Restriction on Carcass Characteristics of Cocks at 16th Week of Age

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Feed restriction has been described as a management tool to limit birds' access to feed in order to reduce feed cost without compromising their health and meat products. The present study was undertaken to assess the effects of strain of cocks and feed restriction at different ages on carcass characteristics. The study was conducted at Teaching and Research Farm of Ekiti State University, Ado-Ekiti, Nigeria for a period of 16 weeks. A total number of 180 day-old cockerels of two strains comprising Black and White plumage (90 chicks each) were procured to examine and compare their carcass characteristics. At 6th week of age, the birds were randomly distributed into four treatments with three replicates for each strain. The treatments are, T₁: control (*ad libitum*), T₂: feed restricted from 6th -7th week, T₃: feed restricted from 8th -9th week and T₄: feed restricted from 10th -11th week. Data collected at 16th week of age include live body weight, bled weight, dressed weight, eviscerated weight, breast weight, back muscle weight, drumstick and thigh weights. Analyzed results showed that live weight and carcass weights were not significantly ($P > 0.05$) affected by strain. Both strains recorded similar mean values. With regard to feed restriction, no significant ($P > 0.05$) effect was found for live weight and most traits with the exception of bled weight, breast muscle weight and thigh weight. However, the control and 6th week restricted birds

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recorded superior mean values in such cases. The study indicates that the two strains are good for increased meat production and revenue generation, while the 6th week feed restriction is suggested for maximum productivity and profit.

Keywords: Feed restriction; carcass; cock; live weight; strain.

1. INTRODUCTION

Recent technological breakthrough in livestock industry has led to some improvements in quality meat production. The research efforts to improve genetic potentials of broilers for increased growth rate according to Zubair and Leeson [1] has led to increased body fat deposition, high mortality and high incidence of metabolic diseases and skeletal disorders. To minimize these negative effects of genetic selection associated with fast growing broilers that consume feed *ad libitum*, the concept of feed restriction was introduced in order to grow the industry and satisfy the animal protein requirements of the citizenry. Yu et al. [2] observed that feed restriction has significant effect on body fat of broilers. Also, broilers fed diluted diets were found to be significantly affected in performance [3]. According to Fanooci and Torki [4], feed restriction in Ross 308 broilers in term of diet dilution had significant effect on body weight, body weight gain, feed conversion ratio, gizzard, fat pad and spleen. Similarly, Sahrael and Shariatmadari [3] observed significant effect of diet dilution on live weight, carcass weight, abdominal fat percent, breast and thigh percentages. In agreement with previous study, Azarnik et al. [5] found significant effect of feed restriction on body weight gain, carcass, breast and abdominal fat weights.

However, previous study posited that prolonged feed restriction depressed relative weight of breast muscle [6]. However, there are many options of feed restriction available to farmers and these include intermittent feeding, skip-a-day feeding, diet dilution, time of restriction and quantitative feed restriction [3,7,8,9]. And all these different ways are meant to improve efficiency of feed utilization and weight gain and reduction in mortality rate. Mahmood et al. [10] observed that feed constituted 70-75% of the total cost of production in a broiler enterprise, and whatever method to reduce this high input component should be considered for the good of the farmers and overall interest of the industry. Zubair and Leeson [1] asserted that feed restriction in broilers can help improve feed

efficiency, reduce feed cost and mortality in addition to producing chicken meat at affordable price. On the negative side, feed restricted birds are hyperactive; exhibit increased pacing before the expected feeding time and increased drinking and pecking at non-food objects when compared with *ad libitum* fed birds [11,12,20].

Significant differences between breeds and strains for carcass traits were reported by some workers [13]. In addition, Habeb [13] and Enaiat et al. [14] observed significant strain differences in small intestine length. Olawumi and Fagbuaro [15] found significant strain differences in breast and leg muscle meat in Marshall, Arbor Acre and Hubbard broiler chickens. Musa et al. [16] also found significant breed differences in most carcass traits evaluated while, Jaturasitha et al. [17] observed no significant effect of genotype on dressing percentage.

There is no information in literature as regards the performance of strains of cocks reared under feed withdrawal regimen in our environment. It is good for farmers and researchers to know the strain of cocks that can survive under feed withdrawal conditions. In view of the contrasting reports on the effect of feed restriction on chicken carcass characteristics, the present study was undertaken to examine the effect of quantitative feed restriction at different ages on live weight and carcass traits of two strains of commercial cocks reared in the derived savannah zone of Nigeria.

2. MATERIALS AND METHODS

2.1 Experimental Site

The study was carried out at the Teaching and Research Farm, Ekiti State University, Ado-Ekiti, Nigeria from September, 2017 to November, 2017. Ado-Ekiti is situated along latitude 7°31' and 7°49' North of the Equator and longitude 5°71' and 5°27' East of the Greenwich meridian. The city falls under Derived Savannah zone. The city enjoys two separate seasonal periods namely, Rainy (May-October) and Dry (November-April) seasons.

2.2 Source of Experimental Birds and Feeding System

A total number of 180 day-old cockerels of two strains comprising of Black and White plumage (90 chicks each) were procured to examine and compare their carcass characteristics. The poultry environment was cleaned and free from weed, the brooding room and pens were washed and fumigated. Also the feeders and drinkers were washed and disinfected. The birds were raised on deep litter with the floor covered with wood shavings partitioned into two different units where both strains were raised separately in the brooding room. They were kept under the same management conditions like space, light, temperature, ventilation and relative humidity. Fresh and clean water was available *ad libitum*. Periodic vaccinations given included Gomboro, Newcastle disease and Fowl pox vaccines, while piperazine dewormers was administered to the birds during the experiment.

The chicks were brooded for 4 weeks and were fed *ad libitum* with starter feeds having 3000 Kcal MEkg⁻¹, 22% CP. Vaccination and other routine medications were carried out as and when due. From 8th – 16th week, the birds were given grower mash having 2500 Kcal MEkg⁻¹, 15% CP.

At 6th week of age, the birds were randomly distributed into four treatments with three replicates for each strain.

The treatments applied are as follows:

- T₁=both strains in this category were fed *ad-libitum* throughout the experiment
- T₂=both strains in this category were feed restricted (Skip-a-day) from 6th-7th week
- T₃=both strains in this category were feed restricted (Skip-a-day) from 8th-9th week
- T₄= both strains in this category were feed restricted (Skip-a-day) from 10th-11th week

2.3 Data Collection

At 16th week of age, one bird per replicate, that is, three birds per treatment on strain basis were randomly selected after starving them overnight for carcass evaluation. The birds were numbered and weighed individually to obtain live body weight and thereafter, slaughtered, bled, scalded and plucked. After the removal of feathers, the carcasses were eviscerated and dissected manually into various parts such as breast muscle, back muscle, drumstick and thigh

muscle. The different parts were weighed using sensitive scale (min.=0.01 cm) and were expressed in grams.

Data collected at 16th week of age include live body weight, bled weight, dressed weight, eviscerated weight, breast weight, back muscle weight, drumstick and thigh weights.

2.4 Data Analysis

The data collected were analysed by the analysis of variance technique in completely randomized design, while the differences between means were separated by Duncan New Multiple Range Test as per SAS [18,19].

The appropriate statistical model used was:

$$Y_{ijk} = \mu + G_i + R_j + \epsilon_{ijk}$$

Y_{ijk} = observation on kth population, of ith strain and jth feed restriction
 μ = common mean
 G_i = fixed effect of strain (i=2)
 R_j = fixed effect of feed withdrawal (j=4)
 ε_{ijk} = error term

3. RESULTS AND DISCUSSION

3.1 Effect of Strain of Cocks on Live Body Weight and Carcass Characteristics

The effect of strain on carcass traits of cocks was presented in Table 1. There was no significant (*P* > 0.05) effect of strain on live body weight at 16th week. Both black and white feathered cocks recorded similar mean values regardless of the treatment imposed on them. It means that the two strains have similar genetic background, and utilized the feed given efficiently and converted same to meat accordingly. Therefore, either of the two strains could be raised for meat production and revenue generation. The obtained result contradicts the findings of Habeb [13] and Enaiat et al. [14] who reported significant strain differences in live weight of broiler chickens. The difference between the present result and previous findings may be due to type or specie of chickens used, geographical location, treatment applied and age of slaughter of experimental birds.

In addition, there was no significant (*P* > 0.05) effect of strain of cocks on bled weight, dressed weight, eviscerated weight, breast muscle and back muscle weight. Both thigh muscle and drumstick weight were also not significantly affected (*P* > 0.05). This means that the two

strains recorded similar mean values in all these traits, and either of them can be raised for meat production and revenue generation. The obtained results on carcass data were in agreement with the findings of Jaturasitha et al. [17] who found non-significant breed differences in dressing percentage, but contradicted those of Musa et al. [16] who observed significant effect of strain of broiler chickens on most carcass traits evaluated.

3.2 Effect of feed restriction on live weight and carcass characteristics

Table 2 presents the effect of feed restriction on carcass traits of cocks. There was no significant ($P > 0.05$) effect of feed restriction on live weight of cocks regardless of strain. The control, 6th, 8th, and 10th week restricted birds recorded similar

mean values. This implies that feed restriction has no adverse or negative effect on live weight of cocks. This is in agreement with the findings of Olawumi et al. [19] who found no significant effect of feed withdrawal on live weight of broiler chickens. In the same vein, dressed weight, eviscerated weight, back muscle and drumstick weight were not significantly ($P > 0.05$) affected by feed restriction regime. The control and feed restricted birds recorded similar mean values. In contrast, Olawumi et al. [20,21] observed significant effect of feed withdrawal on back muscle weight, eviscerated weight and dressed weight. However, bled weight, breast muscle weight and thigh muscle weight were significantly ($P < 0.01$) affected by feed restriction. The control and 6th week restricted birds had higher mean values in all cases than 8th and 10th week restricted birds. Contrary

Table 1. Least squares means showing the effect of strain on carcass characteristics of cocks at 16th week

| Traits | Strains | | ±SE |
|--------------------------|---------|---------|-------|
| | Black | White | |
| Live weight (g) | 1119.67 | 1130 | 32.42 |
| Bled weight (g) | 1063.42 | 1085.83 | 27.97 |
| Dressed weight (g) | 981.17 | 999.5 | 28.35 |
| Eviscerated weight (g) | 827.42 | 828.42 | 30.32 |
| Breast muscle weight (g) | 155.83 | 153.08 | 3.83 |
| Back muscle weight (g) | 153.17 | 156.33 | 6.82 |
| Thigh weight (g) | 109.17 | 109.33 | 3.94 |
| Drumstick weight (g) | 111.83 | 115.08 | 4.89 |

Means along rows with similar superscripts are not significantly different ($P > 0.05$)

Table 2. Least squares means showing the effect of feed withdrawal on carcass characteristics of cocks at 16th week

| Traits | Feed withdrawal | | | | ±SE |
|--------------------------|-----------------------|----------------------|----------------------|-----------------------|-------|
| | Control | 6 th week | 8 th week | 10 th week | |
| Live weight (g) | 1172.83 | 1190.5 | 1044.17 | 1091.83 | 48.85 |
| Bled weight (g) | 1105.67 ^{ab} | 1138 ^a | 1004 ^b | 1050.83 ^{ab} | 39.55 |
| Dressed weight (g) | 1019 | 1042.83 | 925.33 | 974.17 | 40.1 |
| Eviscerated weight (g) | 833.33 | 897.5 | 771 | 809.83 | 42.88 |
| Breast muscle weight (g) | 158 ^{ab} | 167 ^a | 142.83 ^b | 150 ^{ab} | 5.42 |
| Back muscle weight (g) | 157.67 | 168.33 | 144.5 | 148.5 | 9.64 |
| Thigh weight (g) | 120 ^a | 114.83 ^{ab} | 100.5 ^b | 101.67 ^b | 5.58 |
| Drumstick weight (g) | 110.5 | 127.33 | 108.5 | 107.5 | 6.91 |

ab: Means along rows with different superscripts are significantly different ($P < 0.05$)

results were obtained on breast weight by Olawumi et al. [21] who reported no significant effect of feed withdrawal on breast muscle weight. The difference in the result obtained in the present study and previous work may not be unconnected with the species of birds used, location, management and treatment applied.

4. CONCLUSION

The present study revealed that strain of cocks did not significantly affect the live weight of cocks regardless of treatment imposed on them. In the same vein, all the carcass characteristics evaluated were not affected by the strain. However, some carcass traits were significantly affected by feed restriction. This includes bleed weight, breast muscle and thigh weight. This study indicates that either of the strain of cocks can be reared for meat production and revenue generation. It is also suggested that feed restriction be carried out at younger age for increased meat production.

ETHICAL APPROVAL

As per international standard written ethical permission has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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