

Research Article

Response of Black and White Plumage Strains of Commercial Cocks to Feed Restriction at Different Ages raised on Deep Litter System

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Abstract: The ever increasing feed cost and the need to produce quality chicken meat with minimal cost has necessitated the adoption of feed restriction which is cost effective and practical. The present study aimed at investigating the response of two strains of commercial cocks to different feed restriction regimen. They are black plumage and white feathered commercial cocks reared principally for meat production. 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 growth characteristics. At 6th week of age, the birds were distributed into four treatments with three replicates for each strain. The treatments are, T₁: control (*ad libitum*), T₂: feed restricted (6th -7th week), T₃: feed restricted (8th -9th week) and T₄: feed restricted (10th -11th week). Analyzed results showed that there was significant (P<0.01) effect of strain on body weight at 6th and 12th week of age, while the two strains recorded similar mean values at 9th and 16th week. The black plumage cocks were superior (P<0.01) to white plumage cocks in terms of body weight at 6th and 12th week. This indicates differences in genetic make-up of the cocks. With regards to the feed restriction effect on birds, the cocks restricted at 6th week of age regardless of strain were better (P<0.01) with superior mean values when compared with those restricted at 8th and 10th week of age. It was observed that the cocks restricted at 10th week recorded the least mean values. The result reveal that birds restricted at younger age performed better in terms of body weight than those restricted at older age. Therefore, black feathered cocks could be raised by farmers to enhance good quality meat production and increased returns on investment. It is also suggested that for profitable, economical and cost effective rearing of cocks, feed restriction strategy could be practised at younger age.

Keywords: Cocks, feed restriction, strain, meat, birds, body weight.

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INTRODUCTION

In most developing countries, and Nigeria in particular, there is short supply of animal proteins leading to acute shortage in animal protein consumption. This inadequate supply and consumption results to malnutrition in children and other vulnerable groups. Poultry meat aside its tenderness and acceptability is cheaper when compared to other sources of meat. There is no taboo against its rearing and consumption, very easy to manage, simple housing and provides employment and quick returns on investment. Previous authors had documented strain differences on growth patterns of domestic chickens. Sahrael and Shariatmadari [1] and Benyi *et al.* [2] found significant strain differences in body weight gain, final body weight, feed intake and feed conversion ratio. In addition, Olawumi *et al.* [3] observed significant strain differences in growth traits of three strains of commercial broilers. And this was in agreement with previous authors [4, 5].

The high cost of producing a kilogram of poultry meat and products coupled with the reduction in profit margin are the major challenges in the industry [6]. It has been documented that feed accounts for 60-70% of the cost involved in poultry production [7]. In an attempt to reduce cost of producing a kilogram of broiler chicken, feed restriction has been suggested as a management tool designed to limit bird's access to feeds during a definite period of time which could be quantitative or qualitative [8]. Previous studies had used the concept of feed restriction in broilers to reduce the incidence of metabolic disorders and high mortality [9]. Previous reports had also shown that feed restriction helped in arterial oxygenation by reducing metabolic demands during critical periods of the life span of a bird [10] and enhanced efficiency of feed utilization, reduced feed cost and mortality rate [11].

There are different methods of feed restriction employed in broiler production in order to improve

efficiency of feed utilization and weight gain, and these include intermittent feeding, skip-a-day feeding [12], and appetite suppression with glycolic acid [13], time of restriction [14], diet dilution [1] and quantitative feed restriction [15]. Olawumi *et al.* [3] reported significant effect of feed restriction on growth traits in broiler chickens. This was consistent with other previous studies [16, 16].

There is insufficient information in literature as regards the effect of feed withdrawal at different ages on growth characteristics of commercial cocks reared on deep litter system. The present investigation was therefore, undertaken to determine the response of two strains of cocks to feed restriction at different ages.

MATERIALS AND METHODS

The study was carried out at the Teaching and Research Farm, Ekiti State University, Ado-Ekiti from September, 2017 to January, 2018. Ado-Ekiti is situated along latitude $7^{\circ}31'$ and $7^{\circ}49'$ North of the Equator and longitude $5^{\circ}71'$ and $5^{\circ}27'$ 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.

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 growth 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*.

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 KcalMEkg⁻¹, 15% CP.

At 6th week of age, the birds were 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 from 6th -7th week

T₃ = both strains in this category were feed restricted from 8th -9th week

T₄ = both strains in this category were feed restricted from 10th -11th week

DATA COLLECTION

Data collected included the following:

- a. Body weight (bw): This was measured in grams for 6th, 9th, 12th and 16th week of age using a digital electronic scale (with maximum calibration of 5,000g). The body weights were measured early in the morning after starving the birds overnight.

All these conformation traits were measured using a tape rule.

- Breast girth (BRW) was measured across the keel bones from the left armpit to the right armpit.
- Thigh length (THL) was taken from the hock joint to the hinge joint.
- The tarso-meta tarsus (shank length) (SHL) was obtained by measuring from the hock joint to the base of the three toes.
- Wing length (WNL) was measured from the shoulder joint to the extremity of terminal phalanx.
- Others include body length and beak length

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].

The appropriate statistical model used was:

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

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

RESULTS AND DISCUSSION

Table 1 shows the least squares means regarding the strain effect on body weight and linear measurements of the commercial cocks at different ages regardless of the treatment employed. There was significant (P<0.01) effect of strain on body weight at 6th and 12th week of age, while the two strains recorded similar mean values at 9th and 16th week. The black plumage cocks are superior (P<0.01) to white plumage cocks in terms of body weight at 6th and 12th week. This indicates differences in genetic make-up of the cocks, and that the black feathered cocks have superior genetic constitution than their white mates. Therefore, black feathered cocks could be raised by farmers to enhance good quality meat production and increased returns on

investment. Pertaining to wing length, the two strains recorded similar mean values, that is, no significant ($P>0.05$) differences between them. With regards to body length, significant ($P<0.01$) differences were observed between the two strains. The black feathered had higher mean values than the white cocks at all age groups. The obtained results were in agreement with the findings of Amao *et al.* who reported significant strain differences in body weight of broiler chickens at different age groups. Also, Ajayi and Ejiofor [4] and Olawumi *et al.* [5] observed significant differences in body weight of broiler chickens when measured at different ages.

The present data also reveal significant ($P<0.01$) strain differences between the two genotypes in other linear measurements such as breast girth, shank length, thigh length and beak length (Table 1). The black cocks had superior mean values than white cocks in all these morphometric traits. This implies that more meat could be obtained from raising the former than the latter. In addition, raising black cocks on commercial scale will no doubt increase the revenue of the farmers and improve their wellbeing and social status. These results were consistent with the findings of Amao *et al.* and Olawumi *et al.* [5] who reported significant strain differences in breast girth and shank length of broiler chickens.

Table-1: Least squares means showing the effect of Strain on Growth traits of Black and White feathered Cocks at different ages

Traits	6 th week		9 th week		12 th week		16 th week	
	Black	White	Black	White	Black	White	Black	White
Body weight	317.52 ^a ±6.48	296.08 ^b ±6.48	535.96 ±11.59	504.06 ±11.59	789.06 ^a ±10.40	709.38 ^b ±10.40	1114.19 ±19.87	1076.10 ±19.87
Wing length	11.98 ±0.11	11.78 ±0.11	16.14 ±0.26	16.00 ±0.26	18.60 ±0.39	18.49 ±0.39	19.80 ±0.21	19.60 ±0.21
Breast girth	10.27 ^a ±0.09	9.96 ^b ±0.09	11.80 ±0.14	11.67 ±0.14	13.04 ^a ±0.10	12.33 ^b ±0.10	14.46 ±0.09	14.54 ±0.09
Shank length	5.04 ±0.05	4.91 ±0.05	6.24 ^a ±0.05	5.94 ^b ±0.05	7.29 ^a ±0.05	6.80 ^b ±0.05	8.18 ^a ±0.08	7.91 ^b ±0.08
Body length	30.13 ^a ±0.34	28.73 ^b ±0.34	38.10 ^a ±0.21	35.65 ^b ±0.21	48.95 ^a ±0.30	43.12 ^b ±0.30	50.95 ^a ±0.39	48.12 ^b ±0.39
Thigh length	11.62 ^a ±0.16	10.99 ^b ±0.16	13.95 ^a ±0.16	13.15 ^b ±0.16	16.45 ^a ±0.15	14.89 ^b ±0.15	18.45 ^a ±0.17	16.89 ^b ±0.17
Beak length	1.49 ±0.02	1.44 ±0.02	1.72 ^a ±0.02	1.60 ^b ±0.02	2.09 ^a ±0.02	1.92 ^b ±0.02	2.21 ^a ±0.03	2.07 ^b ±0.03

Ab-means with different superscripts along rows are significantly different ($P<0.01$)

In Table 2, there was significant ($P<0.01$) effect of feed restriction on body weight of cocks regardless of the strain. At 6th, 9th, 12th and 16th week of age, the control birds had higher mean values compared to all feed restricted birds. With regards to the feed restricted birds, the cocks restricted at 6th week of age regardless of strain were better ($P<0.01$) with superior mean values when compared with those restricted at 8th and 10th week of age at all different age groups when measurements were carried out. It was observed that the cocks restricted at 10th week recorded the least mean values. The result reveal that birds restricted at younger age performed better in terms of body weight than those restricted at older age. This implies that regardless of the strain of cocks, it is better that cocks be restricted when they are still young in order for them to attain an appreciable weight and to obtain maximum meat and profit from them. In addition, it was observed that only the cocks restricted at 6th week attained 'catch-up' growth status, and were at the same weight level with those under control at 16th week.

The results of linear measurements (Table 2) showed that the traits were significantly ($P<0.01$) affected by feed restriction strategies applied. Both body length, wing length and thigh length were all influenced by quantitative feed restriction at different age groups when measurements were carried out. The control and 6th week restricted cocks were better and gave higher mean values in terms of meat parts than 8th and 10th week restricted cocks. This implies that restricting feed at younger age for cocks regardless of strain is economical, cost effective and practical. On the other hand, restricting feed at later ages impacted negatively on their body weight and meat proportions, and therefore, should not be practised if our objective is to increase meat production and maximize profit. The obtained results were consistent with the findings of Olawumi *et al.* [3] who reported significant differences in linear measurements of broiler chickens subjected to feed restriction at different age groups.

Table-2: Least squares means showing the effect of Feed withdrawal at different ages on Growth traits of Black and White feathered Cocks at different ages

Age (week)	Treatment	Body weight	Wing length	Breast girth	Shank length	Body length	Thigh length	Beak length
6 th week	T ₁	316.25a ±9.16	11.72b ±0.15	10.06b ±0.13	4.96 ±0.07	28.62b ±0.48	11.29 ±0.22	1.49 ±0.03
	T ₂	259.58b ±9.16	11.81b ±0.15	9.64c ±0.13	4.84 ±0.07	27.94b ±0.48	11.06 ±0.22	1.40 ±0.03
	T ₃	311.42a ±9.16	11.71b ±0.15	10.08b ±0.13	5.06 ±0.07	30.1a ±0.48	11.39 ±0.22	1.47 ±0.03
	T ₄	339.95a ±9.16	12.27a ±0.15	10.67a ±0.13	5.04 ±0.07	31.06a ±0.48	11.48 ±0.22	1.49 ±0.03
9 th week	T ₁	550.04a ±16.39	27.40a ±0.36	11.70 ±0.20	5.98b ±0.07	28.30a ±0.30	13.49ab ±0.22	1.67 ±0.02
	T ₂	540.63a ±16.39	26.64a ±0.36	11.43 ±0.20	6.02b ±0.07	27.31b ±0.30	13.32b ±0.22	1.65 ±0.02
	T ₃	477.08b ±16.39	25.40b ±0.36	11.75 ±0.20	6.05b ±0.07	26.52b ±0.30	13.34b ±0.22	1.65 ±0.02
	T ₄	512.29ab ±16.39	26.38ab ±0.36	12.07 ±0.20	6.32a ±0.07	25.39c ±0.30	14.06a ±0.22	1.68 ±0.02
12 th week	T ₁	768.75a ±14.71	32.11ab ±30.88	12.59b ±0.14	7.25a ±0.07	32.02a ±0.43	16.15a ±0.21	2.04a ±0.02
	T ₂	777.08a ±14.71	33.56a ±30.88	13.09a ±0.14	7.23a ±0.07	31.50a ±0.43	16.13a ±0.21	2.02ab ±0.02
	T ₃	744.79ab ±14.71	31.25b ±30.88	12.40b ±0.14	6.82b ±0.07	29.81b ±0.43	15.34b ±0.21	2.00ab ±0.02
	T ₄	706.25b ±14.71	30.88b ±30.88	12.68ab ±0.14	6.87b ±0.07	30.79ab ±0.43	15.09b ±0.21	1.96b ±0.02
16 th week	T ₁	1145.67a ±28.10	23.45c ±0.30	14.50 ±0.13	7.93b ±0.12	24.19b ±0.55	12.63b ±0.24	2.20a ±0.04
	T ₂	1120.75ab ±28.10	26.81a ±0.30	14.54 ±0.13	8.30a ±0.12	26.04a ±0.55	14.20a ±0.24	2.15ab ±0.04
	T ₃	1065.79ab ±28.10	25.63b ±0.30	14.63 ±0.13	8.10ab ±0.12	25.94a ±0.55	14.09a ±0.24	2.13ab ±0.04
	T ₄	1048.35b ±28.10	25.65b ±0.30	14.33 ±0.13	7.85b ±0.12	25.56ab ±0.55	13.77a ±0.24	2.07b ±0.04

Ab-means with different superscripts along columns are significantly different ($P < 0.01$), T₁ –Control (*ad libitum*), T₂- Restricted (6th week), T₃- Restricted (8th week), T₄- Restricted (10th week)

CONCLUSION

The present investigation reveals significant differences in growth traits of two strains of commercial cocks. The black plumage cocks were superior to their white counterparts in body weight regardless of feed restriction strategies employed. In addition, significant strain differences were also observed with respect to body linear measurements. Pertaining to cocks performance subjected to feed restriction, birds restricted at 6th week of age recorded higher mean values than those restricted at 8th and 10th week. The control birds and those restricted at 6th week of age were superior in terms of body weight and body linear measurements. It is therefore, suggested that for profitable, economical and cost effective rearing of cocks, feed restriction strategy could be practised at younger age.

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