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Carcass characteristics and cost benefits of two broiler strains as affected by duration of feed withdrawal at finisher phase

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ABSTRACT

The present study was undertaken to examine the before and post-slaughter characteristics of two broiler strains under feed withdrawal regime during the hot weather conditions. 180 day-old broiler chicks comprising 90 chicks each of Arbor Acre and Ross 308 were procured from reputable hatchery, and were raised for four weeks before being distributed randomly to three groups of feed withdrawal regime. The treatments are: T₁ = *ad libitum* (control), T₂ = 8-12noon feeding (morning) and T₃ = 12noon-4pm feeding (afternoon). Each treatment was replicated thrice with 10 birds per replicate. At 49th day, three birds per treatment were randomly taken after starving them overnight for carcass evaluation. Analysed data showed that there was no significant effect of strain on live weight, carcass and non-carcass traits regardless of feed restriction employed. But Arbor Acre recorded higher net profit than Ross 308 in terms of cost of production on strain basis. With regard to duration of feed withdrawal, dressed weight, eviscerated weight, carcass weight and back weight were significantly affected by the feeding regime imposed on the birds. Birds on *ad libitum* and afternoon feeding groups had higher and superior mean values to morning group. This implies that feeding birds in the afternoon under favourable conditions and improved management practices is beneficial and economically viable and profitable.

KEYWORDS: Strain, feed withdrawal, Arbor Acre, Ross 308, carcass, broiler.

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INTRODUCTION

The tropical region is always characterized with high humidity and elevated temperature throughout the year, and Nigeria in particular is affected by these harsh weather conditions which have direct and indirect impacts on our poultry subsector. Worldwide, the demand for poultry meat and products has increased appreciably in recent time due to health concerns arising from red meat consumption. The success of poultry production and especially broiler chickens has been attributed to the improvements in growth performance and carcass yields and composition. These improvements were in the area of producing good quality meat having no fat deposition within a short period.

Broiler chickens are more susceptible to heat during the last three weeks of their growing period, and males are affected more than the females [1]. Some of the symptoms commonly observed in birds during hot weather conditions include panting, prostration, restlessness and sudden death. To ameliorate

the negative impacts of heat on birds' performance, various management practices had been suggested, and these include the use of cooling devices such as installation of industrial fan, head wetting, immersion in water and mist spray [2]. Regular medications with multivitamins and ant-stress products are also essential for use to lessen the effects of heat load on the birds during hot weather.

In order to lessen the effects of heat on birds' performance, various management practices had been suggested, and these include feed restriction [3] and short-term feed withdrawal during the hottest hours of the day [4].

There is huge increase in demand and production of broiler chicken for human consumption [5]. Also, in order to reduce burden on family finances, many customers now demand for chicken parts [6]. Previous authors had documented differences in carcass weight among strains of chickens and strain and sex effects on carcass traits [7,8,10,11].

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The high cost of production and reduction in profit margin had been major challenges in the past [12]. It has been documented that feed accounts for 60-70% of the cost involved in poultry production [13]. 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 [14]. Previous studies had used the concept of feed restriction in broilers to reduce the incidence of metabolic disorders and high mortality [15]. 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 [16] and enhanced efficiency of feed utilization, reduced feed cost and mortality rate [17].

There is insufficient information in literature as regards the impact of duration of feed withdrawal on carcass characteristics of broiler chickens. The present investigation was therefore, undertaken to determine the effects of strain and duration of feed withdrawal on carcass characteristics of two strains of broiler chickens.

MATERIALS AND METHODS

This study was carried out at the Poultry Unit, Teaching and Research farm, Department of Animal Production, Kogi State University, Anyigba. Anyigba is located in the Derived Savannah zone of Nigeria on latitude 7°15 and 7°29N of the equator and longitude 7°11 and 7°32E of the Greenwich meridian with an average altitude of 420metres above sea level. The zone is characterized by 6-7 months of annual rainfall ranging from 1400-1500mm and daily temperature range of 25°C-35°C with highest temperature being in June-July [18].

This study has been conducted as per standards of University Ethics on Animal Experiments. The rearing and slaughter procedures conformed to the standard regulations of the University.

Source of Experimental Birds and Feed

A total of 180 day-old broiler chicks of two strains comprising of Arbor Acre and Ross 308 (90 chicks each) were procured to examine and compare carcass characteristics the strains subjected to different feed withdrawal periods. The poultry environment was cleaned and free from weed, the brooding room and pens were washed and well fumigated and disinfected and 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*. Cost of production of birds on strain basis was calculated to know which strain of broilers is profitable and tolerant to feed withdrawal regimen.

The chicks were brooded for 4 weeks and were fed *ad libitum* using starter feeds having 3000 KcalMEkg⁻¹, 22% CP. Vaccination

and other routine medications were carried out as and when due. At the fourth to seventh week, the birds were given finisher feeds having 3100 KcalMEkg⁻¹, 19.5% CP. The brooded birds were distributed into three treatments with three replicates for each strain.

The treatments applied are as follows:

T₁ = both strains in this category were fed *ad-libitum* from the fourth to seventh week of the experiment

T₂ = both strains in this category were fed from 8am – 12noon.

T₃ = both strains in this category were fed from 12noon – 4pm.

Carcass Evaluation

At 49th day of age, one bird per replicate, that is, three birds per treatment on strain basis was 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 defeathering, the carcasses were eviscerated manually. Data collected at 49th day of age included live body weight, slaughter weight, dressing weight, eviscerated weight, carcass weight, breast weight, back muscle weight, drumstick and thigh weights, neck and head weights, wing and intestinal weight, liver, lung, heart and gizzard.

Statistical 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 [19].

RESULTS AND DISCUSSION

As shown below (Table 1), there was no significant (P>0.05) effect of duration of feed withdrawal on live weight of broiler

Table 1: Least square means (±SE) showing the effect of Feed withdrawal on carcass traits of broiler chickens.

Traits (g)	<i>Ad-libitum</i> (T ₁)	Morning feeding (T ₂)	Afternoon feeding (T ₃)
Live weight	1581.17±77.93	1327.83±77.93	1552.33±77.93
Bled weight	1547.33±79.36	1304.17±79.36	1529.67±79.36
Dressed weight	1440.83±65.99 ^{ab}	1240.00±65.99 ^b	1466.33±65.99 ^a
Eviscerated weight	1268.33±63.21 ^a	1045.33±63.21 ^b	1211.83±63.21 ^{ab}
Carcass weight	1079.83±55.83 ^a	874.17±55.83 ^b	1015.50±55.83 ^{ab}
Breast weight	319.17±19.66	264.83±19.66	313.83±19.66
Back weight	273.00±16.51 ^a	210.83±16.51 ^b	240.83±16.51 ^{ab}
Thigh weight	168.83±10.64	136.33±10.64	164.00±10.64
Drumstick weight	171.50±7.86	146.00±7.86	166.67±7.86
Leg weight	73.00±3.55 ^a	59.17±3.55 ^b	70.67±3.55 ^a
Gizzard weight	35.17±2.46	35.33±2.46	38.33±2.46
Liver weight	32.00±3.40	30.50±3.40	38.33±3.40
Intestine weight	95.33±9.07	87.17±9.07	114.47±9.07
Head weight	49.00±3.36	42.17±3.36	49.83±3.36
Wing weight	143.83±5.14 ^a	113.33±5.14 ^b	126.00±5.14 ^b

a, b means with different superscripts along rows are significantly different (P<0.05)

birds regardless of strain of broiler chickens. In addition, bled weight, breast weight, thigh weight, drumstick weight and head weight were not significantly ($P > 0.05$) affected by the duration of feed withdrawal regimen. This means that birds on control, morning and afternoon feeding regimen recorded similar mean values. It implies that with good management practices coupled with well-fortified feeds and regular intake of multivitamins in water, changes in diurnal temperature during the rearing period has no negative effect on birds' productivity. The result contradicted the findings of Hamidu et al. [20] who reported that feed withdrawal has significant effect on live weight and dressed weight in broiler chickens. The differences between the present study and the past authors may be due to differences in the strains of birds used, type of feeds, location and treatment applied.

In the current study (Table 1), dressed weight, eviscerated weight and carcass weight were significantly ($P < 0.01$) affected by the treatment applied. Birds on full feeding and afternoon group recorded superior mean values when compared with birds fed in the morning period. It means that birds under the former group had little feathers on their bodies and higher carcass value than the latter. Also discovered in this study was the fact that non-carcass traits such as leg and wing portions were significantly ($P < 0.05$) better with full and afternoon fed birds than the morning group. However, giblets measured such as gizzard, liver and intestine were not significantly ($P > 0.05$) affected by the duration of feed withdrawal regimen.

The least squares means showing the effect of strain on carcass traits was presented in Table 2. There was no significant ($P > 0.05$) effect of strain of broilers on live weight, bled weight, dressed weight, carcass weight and all other traits measured regardless of the treatment applied. Also, all the other non-carcass traits and giblets evaluated were not significantly ($P > 0.05$) affected by the strain of broilers. This implies that the two strains are tolerant to the feed withdrawal imposed on them, and anyone can be procured and managed profitably under feed restriction programme provided all other management practices are favourable to their performance. It can also be inferred that the two strains share similar genetic background, since their performance was the same under feed restricted environment. The result was however, in contrast to the observation of previous authors who found significant effect of strain of broilers on live weight and other carcass traits [6,7].

The present data was inconsistent with the earlier findings which documented that strain of broilers did have significant effect on live weight and some carcass characteristics [21,22]. The differences observed between the present results and previous ones might be due to differences in geographical location where the study took place, strain of birds used, treatment applied and management practices adopted.

The net profit per broiler on strain basis was \$2.21 and \$1.94 for Arbor Acre and Ross308, respectively (Table 3). The result showed that Arbor Acre recorded higher net profit under feed withdrawal scheme than Ross 308. It is therefore, suggested that Arbor Acre be given priority over Ross308 when considering

Table 2: Least square means (\pm SE) showing the effect of Strain on carcass traits of broiler chickens

Traits (g)	Strains	
	Arbor Acre	Ross 308
Live weight	1507.44 \pm 63.63	1466.77 \pm 63.63
Bled weight	1495.00 \pm 64.80	1425.95 \pm 64.80
Dressed weight	1429.00 \pm 53.88	1335.78 \pm 53.88
Eviscerated weight	1187.33 \pm 51.61	1163.00 \pm 51.61
Carcass weight	992.44 \pm 45.58	987.22 \pm 45.58
Breast weight	311.00 \pm 16.05	287.56 \pm 16.05
Back weight	234.33 \pm 13.48	248.78 \pm 13.48
Thigh weight	159.44 \pm 8.68	153.33 \pm 8.68
Drumstick weight	162.11 \pm 6.42	160.67 \pm 6.42
Leg weight	66.89 \pm 2.90	68.33 \pm 2.90
Gizzard weight	38.33 \pm 2.01	34.22 \pm 2.01
Liver weight	35.89 \pm 2.77	31.33 \pm 2.77
Intestine weight	104.44 \pm 7.41	93.33 \pm 7.41
Head weight	43.56 \pm 2.75	50.44 \pm 2.75
Wing weight	124.67 \pm 4.20	130.78 \pm 4.20

Means with no superscripts along rows are not significantly different ($P > 0.05$)

Table 3: Economics of Production of broiler chickens under feed withdrawal regimen

Parameters	Arbor Acre	Ross308
Cost of day-old (\$)	2.50	2.50
Cost of feed consumed (\$)	3.86	3.86
Cost of medication (\$)	0.76	0.76
Cost of labour (\$)	0.13	0.13
Miscellaneous (\$)	1.87	1.87
Total cost of production (\$)	9.12	9.12
Average live weight (kg)	1.51	1.47
Cost per kg (\$)	7.5	7.5
Total revenue (\$)	11.33	11.03
Net revenue (\$)	2.21	1.94

Note- values are calculated on per broiler basis 1\$= ₦160 (Nigerian currency)

the strain of broilers to raise for profitable and economical enterprise.

CONCLUSION

In this study, strain of broiler chickens raised under feed withdrawal regime did not have significant effect on live body weight and all the carcass, non-carcass traits and giblets measured. But, feed withdrawal duration significantly influenced some chicken parts such as dressed, eviscerated, carcass, back, leg and wing weights, while others were not affected. The study indicates that afternoon feeding gives better result than morning feeding, and therefore can be suggested for good and improved broiler meat production.

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Authors' Contributions

Olawumi, S. conceived, designed and supervised the research. Oyewole B., Okpe, A. and Amana, C. provided all logistics and support for the successful experimentation. Osagiri, G. was a project assistant.

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