

COMPARISON OF PERFORMANCE AND CARCASS CHARACTERISTICS OF TWO BREEDS OF BROILER CHICKENS REARED ON DIFFERENT HOUSING SYSTEMS

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Abstract

A total of one hundred and eighty unsexed one day-old Arbor Acre and Marshall breeds of broiler chickens were used to compare the performance and carcass characteristics of two breeds of broiler chickens reared on different housing systems. The birds were brooded for 3 weeks and thereafter acclimatized for one week in their respective housing systems (deep litter and outdoor run). Each of the housing systems was allotted 90 chicks per breed with three replicates of 15 birds each. Data were collected weekly on weight gain and feed intake, while feed conversion ratio was calculated. At the end of the study, 2 birds of representative weight in each replicate were selected for carcass evaluation. The experiment was arranged in a 2 x 2 factorial layout in a completely randomized design. The experiment lasted for 28 days (finishing phase). The results of performance of broiler chickens showed significantly ($p < 0.05$) higher final weight (2012.06g/b), weight gain (48.45g/b/d) and feed intake (151.74g/b/d) in Arbor Acre breed compared with the final weight (1890.15g/b), weight gain (45.82g/b/d) and feed intake (144.60g/b/d) obtained in Marshall breed. Also, significantly ($p < 0.05$) higher weight gain and better feed conversion ratio was observed in broiler chickens reared on deep litter system while those reared on outdoor run had 49.11g/b/d and 3.01 for weight gain and feed conversion ratio, respectively. There was no significant ($p > 0.05$) effect of breed on carcass characteristics. Birds reared on deep litter were superior in cut-up parts compared to those kept on outdoor run. In conclusion, Arbor Acre breed was better in terms of growth performance and carcass characteristics. However, the two breeds of broiler chickens reared on deep litter housing system had better performance and carcass characteristics compared to those on outdoor run.

Keywords: Breeds, broiler chickens, carcass characteristics, comparison, housing systems, performance

Introduction

Poultry remains relatively affordable source of animal protein with high biological value in human diets. Broiler chickens are the result of selection programs for rapid growth and body conformation (Scheuermann *et al.*, 2003), and they are bred and raised specifically for meat production. However, one of the major production constraints bedeviling the poultry industry is in the area of housing. Regardless of how birds are managed in the intensive system, birds might compromise important comfort movements. This deprivation in turn poses a serious problem on caged birds and meat-type poultry thereby resulting in worse performance as a result of reduction in feed intake (Brenes *et al.*, 2003) compared to the alternative housing system. In order to arrest this trend, emphasis directed towards research on different housing systems and technologies for chickens with adoptable recommendations for resource-poor poultry farmers are attracting increasing interest (Sogunle *et al.*, 2013). This study was conducted

to compare the growth performance and carcass characteristics of two breeds of broiler chickens reared on different housing systems.

Materials and Methods

The experiment was carried out at the Directorate of University Farms, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. A total of one hundred and eighty unsexed one day-old Arbor Acre and Marshall breeds of broiler chickens (90 birds per breed) were sourced from a commercial hatchery in Abeokuta, Ogun State. Chicks were floor brooded for 3 weeks using charcoal pot as source of heat, and thereafter acclimatized for one week in their housing systems (deep litter and outdoor run). Each of the housing systems was allotted 90 chicks per breed with three replicates of 15 birds each. The experiment was arranged in a 2 x 2 factorial layout. The deep litter system was constructed as an open-sided house with a dimension of 3m x 3m. Broiler chickens in the outdoor run were managed in fenced yard (5m x 5m) to protect them from

predators and a mini-shelter was provided within the area. Data were collected weekly on weight gain and feed intake while feed conversion ratio was calculated. Routine management and vaccination schedules were adhered to. Same quality and quantity of feed and water were given *ad libitum* throughout the period of the experiment which lasted for 28 days. At the end of the study, 2 birds of representative weight in each replicate were selected and fasted for 12 hours and thereafter slaughtered for carcass evaluation. Data collected were subjected to Completely Randomized Design. Significant ($p < 0.05$) differences among treatment means were separated using Duncan's Multiple Range Test (SAS, 2003).

Results

Main effects (Table 1) showed that Arbor Acre breed had higher final weight (2012.06g/b), weight gain (48.45g/b/d), feed intake (151.74g/b/d) and a better feed conversion ratio (FCR) of 3.13 compared with the final weight (1890.15g/b), weight gain (45.82g/b/d), feed intake (144.60g/b/d) and a poorer FCR (3.16) recorded for Marshall breed. Birds reared on deep litter system recorded significantly ($p < 0.05$) higher weight gain (49.70g/b/d) and a better FCR (2.92), while those managed on outdoor run consumed more feed (147.89g/b/d). In the interaction effects between breed and housing system on the performance of broiler chickens (Table 2), birds reared on deep litter had highest weight gain (50.02g/b/d), while those on outdoor run recorded lowest weight gain (44.88g/b/d). Also, broiler chickens managed on outdoor run consumed more feed than their counterparts on deep litter. Table 3 showed the main effects of breed and housing system on carcass characteristics of broiler chickens. Breed had no significant ($p > 0.05$) influence on carcass parameters measured. However, housing system had significant ($p < 0.05$) effect on cut-up parts and abdominal fat with birds reared on deep litter recording higher values, while those on outdoor run had significant ($p < 0.05$) lower values as presented in Table 4.

Discussion

The higher weight gain and better feed conversion ratio observed in broiler chickens reared on deep litter housing system contradicts the findings of Santos *et al.* (2005) who stated that body weight gain of broiler chickens reared in intensive system was lower than those kept in semi-intensive system. It was observed that birds reared

on outdoor run consumed more feed, but had lower body weight compared to those reared on deep litter system. This is probably due to increased exercises and exposure to fluctuating temperature which made the birds expend more energy and eventually contributed to consumption of more feed. This is not in accordance with the report of Khan *et al.* (2006) which stated that birds with higher rate of consumption have higher body weight and a better conversion ratio. Broiler chickens reared on deep litter housing system were superior in carcass yield than those on outdoor run as a result of their better live weights which in turn resulted in higher degree of carcass meatiness (Bartov, 1998 and Agunbiade, 2000). The accumulation of abdominal fat observed in birds reared on deep litter was as a result of restricted movement in the deep litter housing system.

Conclusion

It was concluded that, Arbor Acre breed was better in terms of growth performance and carcass characteristics. However, the two breeds of broiler chickens reared on deep litter housing system had better performance and carcass characteristics compared to those managed on outdoor run.

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Table 1: Main effects of breed and housing system on performance of broiler chickens

Parameter	Breed			Housing system		
	Marshall	Arbor Acre	SEM	Deep litter	Outdoor run	SEM
Initial weight (g/b)	602.33	610.00	15.82	587.00	580.33	21.64
Final weight (g/b)	1890.15 ^b	2012.06 ^a	20.07	1900.00	1850.16	48.10
Weight gain (g/b/d)	45.82 ^b	48.45 ^a	2.58	49.70 ^a	49.11 ^b	3.44
Feed intake (g/b/d)	144.60 ^b	151.74 ^a	6.17	144.92 ^b	147.89 ^a	7.09
FCR	3.16 ^a	3.13 ^b	0.07	2.92 ^b	3.01 ^a	0.20

^{a,b}: Means on the same row with different superscripts are significantly ($p < 0.05$) different

SEM: Standard Error of Mean

FCR: Feed Conversion Ratio

Table 2: Interaction effects between breed and housing system on performance of broiler chickens

Breed	Marshall		Arbor Acre		SEM
	Deep litter	Outdoor run	Deep litter	Outdoor run	
Parameter					
Initial weight (g/b)	649.00	656.67	660.00	660.00	23.60
Final weight (g/b)	1850.34	1814.33	2083.33	1916.67	51.86
Weight gain (g/b/d)	47.38 ^{ab}	46.55 ^b	50.02 ^a	44.88 ^c	3.89
Feed intake (g/b/d)	144.72 ^b	147.06 ^a	143.26 ^b	145.12 ^{ab}	7.56
FCR	3.05 ^b	3.16 ^{ab}	2.86 ^c	3.23 ^a	0.16

^{a,b,c}: Means on the same row with different superscripts are significantly ($p < 0.05$) different

SEM: Standard Error of Mean

FCR: Feed Conversion Ratio

Table 3: Main effects of breed and housing system on carcass characteristics of broiler chickens

Parameter	Breed			Housing system		
	Marshall	Arbor Acre	SEM	Deep litter	Outdoor run	SEM
Live weight (g)	1884.66	1912.89	41.73	1856.50	1820.67	50.21
Dressing percentage	71.26	71.78	1.98	72.78	71.41	2.91
Cut-up parts ¹						
Thigh	10.68	10.95	0.24	11.05	10.59	0.22
Drumstick	11.81	11.85	0.27	12.33	11.60	0.30
Breast	22.00	22.40	1.02	22.80 ^a	22.52 ^b	1.06
Abdominal fat	0.57	0.60	0.06	2.09 ^a	0.79 ^b	0.09

^{a,b}: Means on the same row with different superscripts are significantly ($p < 0.05$) different

SEM: Standard Error of Mean

^{1,2}: Expressed as percentages of the live weight

Table 4: Interaction effects between breed and housing system on carcass characteristics of broiler chickens

Breed Housing system Parameter	Marshall		Arbor Acre		SEM
	Deep litter	Outdoor run	Deep litter	Outdoor run	
Live weight (g)	1860.26	1840.91	1930.67	1914.88	30.70
Dressing percentage	70.86	70.66	71.13	71.05	3.09
Cut-up parts ¹					
Thigh	10.50 ^{ab}	10.25 ^b	11.02 ^a	10.33 ^b	0.24
Drumstick	11.01 ^{ab}	10.85 ^b	12.11 ^a	11.47 ^b	0.28
Breast	22.95 ^b	22.11 ^c	23.05 ^a	22.65 ^b	1.09
Abdominal fat	1.85 ^a	0.52 ^c	1.96 ^a	1.00 ^b	0.09

^{a, b, c}: Means on the same row with different superscripts are significantly ($p < 0.05$) different

SEM: Standard Error of Mean

^{1, 2}: Expressed as percentages of the live weight