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**PJBS**

ISSN 1028-8880

# **Pakistan Journal of Biological Sciences**

**ANSI***net*

Asian Network for Scientific Information  
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

## Comparison of the Performance, Carcass Characteristics and Haematological Parameters of Broiler Chicks Reared in Cage and Floor

O.M. Sogunle, L.T. Egbeyale, T.T. Bajomo, O.V. Bamigboje and A.O. Fanimio  
Department of Animal Production and Health, University of Agriculture,  
P.M.B. 2240, Abeokuta, Nigeria

**Abstract:** This study was conducted to determine the effect of housing systems on the performance, carcass characteristics and the haematology of 150 four-week old Anak titan strains of broiler chicks in a completely randomized design. The birds were allocated randomly into two treatment (cage and floor) groups of three replications containing 25 birds per replicate. They were maintained for a period of 4 weeks and data were collected on; final body weight, weight gain, feed intake, feed:gain and mortality. At the 56th week, carcass yield, cut-up parts and organs weights as well as some parameters were measured. The results showed that feed intake and feed:gain were significantly ( $p < 0.05$ ) higher in the cage system. Dressing percentage and breast weight were higher ( $p < 0.05$ ) in the floor housing system while drumstick and lung weight were higher in the cage system. No significant ( $p > 0.05$ ) difference was obtained in the haematology. It was then concluded that an improvement in the floor system could result into a better performance and an increased carcass yield.

**Key words:** Anak titan chicks, housing systems, haematology, carcass yield

### INTRODUCTION

Changes in technology such as the use of automated management system in poultry industry have been an important stimulus to the poultry industry world wide. Hence, innovative management techniques especially in the case of housing in poultry farming had been brought about by the economic stress and effort to strike a balance between the scientific recommendations and profitable farming. This led to the introduction of housing systems (deep litter, battery cage and cage/litter combinations) and other management techniques (Andrew, 1972; Obioha, 1992). The technology developed for feeding, disease control and production management can be used all over the world with relatively little modification. Thus, the technological advances in poultry production have been quickly applied in many parts of the world.

In industrialized countries, most hens kept for egg-laying purposes are housed in cages, which are characterized by very restricted space per bird and lack of environment stimulation. Birds in cages have high probability of having bone fragility, which leads to an increased risk of breaking during the removal of hen from cages. Nesheim *et al.* (1979) reported that up to 7.8% of

hen from cages had broken wings at removal at the slaughter house as compared to a maximum of 0.5% of the hen on floor system. However, cages provide some clear advantages from a management as well as from bird's welfare points of view. The main management benefit is the low production cost at high degree of mechanization, a good control and normally very good production result. As regards bird's welfare, benefits are more related to health and mortality. Even if birds are not beak trimmed, cannibalism is not common because of a stable social order. In a small group and flat individual, pecker cannot get in contact with the whole flock compared to floor housing. The choice of housing system will depend on the market for different categories of birds and the practical experiences with competing model (Andrew and Goodwin, 1973; Tauson, 2005). However, regional minimum welfare directives on measures like beak trimming and use of certain medical or disinfectant treatments e.g., against parasites are both examples of methods which, in the long run, may prove crucial for obtaining acceptable results from management as well as bird welfare points of view. Hence, the present study sought to compare the performance, carcass characteristics and haematology of broiler chicks reared in cage and floor housing systems.

## MATERIALS AND METHODS

**Site of the experiment:** The experiment was carried out between February and April, 2006 at the poultry unit of the Teaching Farm Management Committee (TEFAMAC), University of Agriculture, Abeokuta, Ogun State, Nigeria.

**Experimental birds and management:** A total number of 150 day-old Anak titan broiler chicks were purchased from a commercial hatchery. The chicks were brooded for four weeks using coal pot as a source of heat. Thereafter, the birds were allotted randomly into two treatment groups each having 75 birds. They were further divided into three replications of 25 birds each. The vaccination schedules for the birds were strictly adhered to during the experiment.

**Description of the cage:** The cage used in the experiment was a portable colony cage made up of wooden material. The cage was 4.58 m long, 2.25 m wide and 1.40 m high. For ease of cleaning and durability, the cage was floored with thick wire gauze. The cage was then partitioned into three to give an area of 1.53 by 0.75 m for a stocking density of 0.05 m<sup>2</sup> per bird. The same stocking density was used for birds on the floor.

**Experimental diet:** Broiler finisher (Table 1) was formulated for the birds as from week four. Feed and water were given *ad libitum*.

**Carcass evaluation:** At the 56th day, 3 birds from each replicate were selected for carcass evaluation making a total of 18 birds. These birds were euthanized and then

sacrificed by cervical dislocation, defeathered after immersing them in boiled water, plucked and eviscerated. After evisceration, the dressed weight was recorded. The body parts and organs were cut and weighed as a criterion for the assessment of growth performance. The weights obtained were expressed as a percentage of the live weights.

**Haematological analysis:** Blood samples (2 mL each) were collected from each of 3 birds used for carcass evaluation into Ethylene Diamine Tetra-Acetate (EDTA) bottles for biochemical and haematological analyses. Packed Cell Volume (PCV), Haemoglobin (Hb) concentration and Red Blood Cell (RBC) were determined using Wintrobe's microhaematocrit, colorimetry cyanomethaemoglobin method and improved Neubauer haemocytometer, respectively (Swenson, 1977; Coles, 1986). Serum total protein, albumin and globulin were analyzed colorimetrically using diagnostic reagent kit (Reanal Diagnosztikai Reagents, Keszlet, Hungary).

**Statistical analysis:** The data generated were subjected to one-way Analysis of Variance (ANOVA) at a significant level of 0.5% (SAS, 1999). Significant means were separated using Duncan's Multiple Range Test (Duncan, 1955).

## RESULTS AND DISCUSSION

The results shown in Table 2 revealed significant ( $p < 0.05$ ) increase in the feed intake and feed:gain in birds reared on cage. A higher feed intake of 134.31 g day<sup>-1</sup> was obtained in birds reared in cage while a lower value of 116.98 g day<sup>-1</sup> was recorded in birds on floor. However, values obtained were within the range recommended by NRC (1994) and recorded by Oluyemi and Roberts (2000). The best feed:gain of 3.28 was recorded in birds on floor. In addition, birds reared on the floor had a lower mortality of 4% compared to 8% recorded for birds in cage. This could be attributed to the ability of the birds to perform

Table 1: Percentage composition (%) of the diet

Ingredients	Composition (%)
Maize	55.50
Soybean meal	16.00
Wheat offal	15.00
Fish meal	2.50
Groundnut cake meal	6.00
Bone meal	3.00
Oyster shell	7.00
Vitamin premix*	0.25
Salt	0.25
Methionine	0.25
Lysine	0.25
Total	100.00
<b>Calculated analysis</b>	
Energy (MJ kg <sup>-1</sup> )	11.90
Crude protein (%)	19.20
Crude fibre (%)	3.73
Calcium (%)	1.64
Phosphorous (%)	0.59

\*: Premix contained the following: (Univit. 15 Roche) 1500 I.U., Vit. A, 1500 I.U., Vit. D: 3000 I.U., Vit. E, 3.0 g; Vit. B<sub>2</sub>, 0.3 g; Vit. B<sub>6</sub>, 8.0 mg; Vit. B<sub>12</sub>, 8.0 g; Nicotinic acid, 3.0 g; Ca-Pantothenate; 5.0 mg; Fe, 10.00 g; Al, 0.2 g; Cu, 3.5 mg; Zn, 0.15 mg; I, 0.02 g; Co, 0.01 g; Se

Table 2: Performance characteristics of broiler finisher on floor and cage housing systems (75 birds/treatment)

Parameters	Housing systems		
	Floor	Cage	SEM
Initial body weight (g)	437.33	448.00	14.28
Final body weight (g)	1443.33	1426.67	26.38
Weight gain (g bird <sup>-1</sup> day <sup>-1</sup> )	35.93	34.95	1.29
Feed intake (g bird <sup>-1</sup> day <sup>-1</sup> )	116.98 <sup>b</sup>	134.31 <sup>a</sup>	5.81
Feed: gain	3.28 <sup>b</sup>	3.85 <sup>a</sup>	0.28
Mortality (%)	4.00	8.00	4.62

<sup>a,b</sup>: Means in the same row with different superscripts differ significantly ( $p < 0.05$ )

some natural behaviour like dust bathing, scratching of the ground to seek for grains as reported by Tauson and Holm (2002). The non-significance in the final weight showed similarities in gain. However, a marginal increase in final weight and weight gain was obtained in birds on floor. This could be attributed to the access of vitamin B<sub>12</sub> in the litter that enhances livability and thriftiness, though the reason is not clear (Andrew *et al.*, 1975). The mortality rate was not significant ( $p>0.05$ ) across treatments. Hence, the mortality recorded could not be attributed to treatment effects. Figure 1 indicated similarities in the values obtained for the final body weight, weight gain, feed intake and feed/gain in both housing systems described.

The haematological values (PCV, Hb, WBC, RBC, Serum total protein, Serum albumin, Serum globulin, Uric acid and Serum glucose) of birds on both housing systems shown in Table 3 indicated statistical similarities ( $p>0.05$ ) across treatments. The values obtained were within the range reported by Kaneko (1989) and Sogunle *et al.* (2006). The values are presented in Fig. 2 indicating higher values in bird reared on the floor. These values are indications that the birds were at a good condition of health for the period of the study.

The results on the carcass characteristics (Table 4) showed that the dressing percentage ranged between 60% and 65%. A greater value of 63.77% was recorded in birds reared on floor. The results disagree with the finding of Anonymous (1983) who recorded a New York dressing percentage of 75-95% for broiler. Statistical significance ( $p<0.05$ ) were obtained in the live weight, dressing percentage, head, wings, shanks, drumsticks, neck, breast,

back and lungs. The floor system revealed higher values in the dressing percentage (63.77%), head (3.11%), neck (4.30%), breast (15.71%) and back (13.35%). The values obtained were in the range recorded by Garcia *et al.* (1991)

Table 3: Haematological indices of broiler finisher on floor and cage housing systems (9 birds treatment<sup>-1</sup>)

Parameters	Housing systems		
	Floor	Cage	SEM
Packed cell volume (%)	33.67	32.00	1.25
Haemoglobin (g dL <sup>-1</sup> )	11.23	10.77	0.42
White blood cell ( $\times 10^3$ L <sup>-1</sup> )	5.27	5.40	0.15
Red blood cell (g dL <sup>-1</sup> )	3.87	3.67	0.18
Serum total protein (g dL <sup>-1</sup> )	54.00	51.33	2.09
Serum albumin (g dL <sup>-1</sup> )	32.67	31.00	1.38
Serum globulin (g dL <sup>-1</sup> )	21.33	20.33	0.78
Uric acid (mg dL <sup>-1</sup> )	3.10	2.90	0.14
Serum glucose (g dL <sup>-1</sup> )	63.33	65.00	2.36

Means in the same row with no superscripts did not differ significantly ( $p>0.05$ )

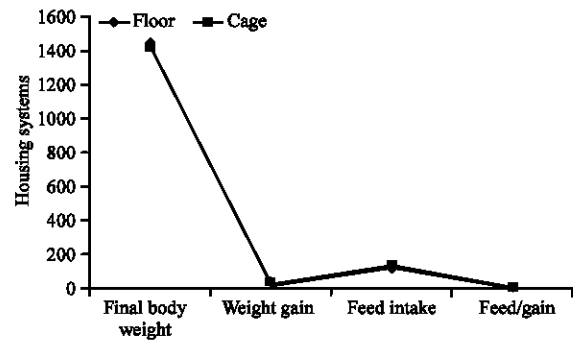


Fig. 1: Comparison of performance of broiler chicks reared on floor and cage

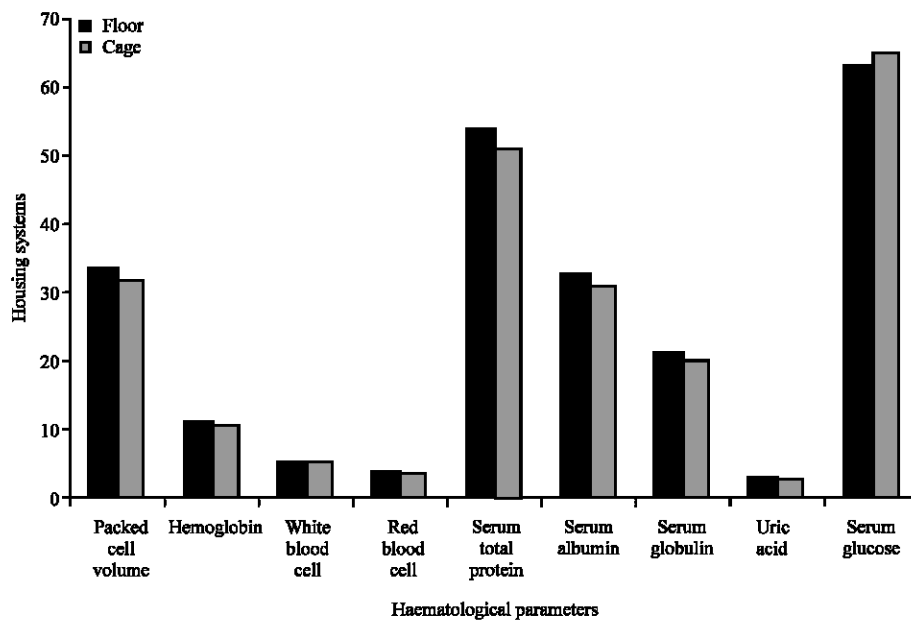


Fig. 2: Comparison of the haematological indices of broiler chicks reared on floor and cage

Table 4: Carcass evaluation of broilers reared on floor and cage housing system (9 birds treatment<sup>-1</sup>)

Parameters	Housing systems		SEM
	Floor	Cage	
<b>Carcass yield</b>			
Live weight	1510.00 <sup>b</sup>	1610.00 <sup>a</sup>	67.29
Dressing percentage	63.77 <sup>a</sup>	60.94 <sup>b</sup>	0.69
<b>Cut-up parts<sup>1</sup></b>			
Head	3.11 <sup>a</sup>	2.73 <sup>b</sup>	0.16
Wings	7.59 <sup>b</sup>	8.33 <sup>a</sup>	0.67
Shanks	4.89 <sup>b</sup>	5.02 <sup>a</sup>	0.15
Thighs	10.13	10.27	0.19
Drumstick	10.36 <sup>b</sup>	12.85 <sup>a</sup>	1.85
Neck	4.30 <sup>a</sup>	3.81 <sup>b</sup>	0.16
Breast	15.71 <sup>a</sup>	13.78 <sup>b</sup>	0.88
Back	13.35 <sup>a</sup>	12.41 <sup>b</sup>	0.73
<b>Organs<sup>2</sup></b>			
Heart	0.35	0.50	0.02
Liver	2.03	1.96	0.13
Kidney	0.13	0.12	0.00
Gizzard	2.51	2.45	0.16
Lungs	0.37 <sup>b</sup>	0.52 <sup>a</sup>	0.05

<sup>1,2</sup>: Values expressed as percentage of live weight; <sup>a, b</sup>: Means in the same row with different superscripts differ significantly (p<0.05)

and Skinner *et al.* (1992). The experiment revealed a better performance of birds reared on floor than those reared in cage. Hence, an improvement in the floor system could result into an enhanced performance and an increased carcass yield of the birds.

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