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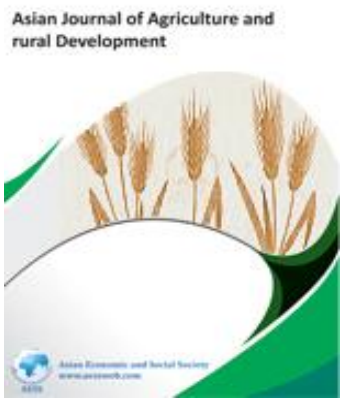

Response of Broilers to Two Management Systems of Housing in Etche Local Government Area of Rivers State, Nigeria

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Abstract

A study was conducted to investigate the performance of broiler chickens under the intensive and semi- intensive systems of poultry production in Etche Local Government Area of Rivers State. Results of the study revealed significant ($P < 0.05$) differences in all the parameters investigated between the broilers produced in the two management systems. Birds managed under the intensive systems showed superior performances in average final weight (1,372.25g/bird) as compared to those managed in the semi-intensive system (1,161.25g/bird). The daily weight gains of the birds were also significantly ($P < 0.05$) different, with the birds in the intensive group showing better performance. The superiority in final weight observed in the intensively managed broilers further reflected in their dressing percentage and primal cuts. In contrast, broilers managed under the semi-intensive system possessed superior internal organs on account of the exposure of the birds to varying environmental condition and feeds they utilized as they scavenge. Hence with the current trend in super market revolution, where the availability of primal cuts of broilers and internal organs are a major means of sales of the chicken in Nigeria, better management of the birds to bring about better production of primal parts and internal organs is advocated.

Keywords: Broiler, Management Systems, Performance, Carcass and Organ Characteristics

Introduction

For the past decade, poultry (domestic fowl) keeping has advanced from total extensive (free range) to more complex and prolific methods which takes care of all necessary conditions needed by birds for efficient feed conversion (Okujagu and Kalio, 2006).

The domestic fowls commonly raised by poultry farmers in Nigeria are the broilers, cockerels and layers. The main reasons of managing these classes of fowls are to produce animal products that can increase the protein supplies with a high biological value to enhance the protein requirement of its consumers.

Three management systems: the intensive, semi-intensive and extensive systems can be distinguished in poultry production (Oluyemi and Roberts, 2000). Reports reveal that chickens managed under the extensive and semi-intensive systems account for more than 75% of all poultry in rural villages (van Eekeren, et al. 2006). Interestingly poultry farmers raise chickens all around the world under widely varying circumstances of housing and management and their main objectives may be generally the same, usually to maximize production via minimum costs and with minimum risks. Reports through personal interviews and observations reveal that in Etche Local Government Area of Rivers State two main systems of keeping domestic fowls predominate: the small-scale subsistence farming using semi-intensive management systems and the commercial poultry management system, where chickens are housed intensively and produced in large scale.

There is paucity of information as regards the performance of chickens especially the broilers in this area by farmers adopting these management systems. Therefore the objectives of this study were to investigate the response of broiler chickens via animal performance, carcass and organ characteristics under the intensive and semi-intensive systems of managing broilers.

Materials and Methods

Experimental site

The study was an on-farm experiment conducted at a privately owned poultry farm located at Akwukabi village in Etche Local Government Area of Rivers State, Nigeria.

Birds and Allotment to treatment groups

A total of one hundred and thirty (130) Anak day old broiler chicks were collectively brooded for 4 weeks at the first instant. Two management and housing systems were then designed: the intensive system of housing and the semi-intensive system.

At the fifth week the birds were equally divided into two groups of sixty (60) birds per group. The birds for the intensive system were randomly assigned to 4 pens of 15 birds per pen in a deep litter house. The birds allotted to the semi-intensive group were housed communally in an open deep litter house. The open deep litter house for the semi-intensively managed birds served as a means of housing during the night or unfavourable weather conditions. To simulate the semi-intensive system of management, birds were allowed to roam and scavenge within a fenced area of 20m x 20m in size.

Birds and their management

Within the brooding periods, routine medication and vaccination were carried out to ensure proper health of the birds. At the end of the brooding period, one hundred and twenty (120) birds were randomly selected, balanced for their weights and assigned to the housing systems of twenty (60) birds per group. The initial body weights of the birds in each of the groups were recorded.

Feed and water was provided to the birds *ad libitum* in the two treatment groups. Daily feed requirements were provided at two allotments (in the morning at 8.00am and in the evening at 4.00pm) to avoid wastage and encourage feed intake for the intensively managed group. Similarly, to simulate the semi-intensive management system, daily quantity of feed required by birds is put in twenty (20) feeding troughs and placed at random within the confines where the birds were allowed to roam and scavenge for the feed as well as other materials within their reach in the environment. Broiler starter and finisher rations were fed for 4 weeks of age of birds and 5 – 8 weeks of age of birds respectively. Routine vaccination and medication were carried out using the following drugs: lasota, gumboro, amprolium, vitalyte, etc. Apart from the brooding period only intensively managed birds were medicated.

Feed intake and mortality records were taken on daily basis. Body weight gains and feed conversions of birds per treatment were computed on weekly basis.

Carcass and organ characteristics

On the last day of the experiment, the birds were starved of food but provided with drinking water for 18 hours overnight (Olabode and Onyekwere, 2010). Four (4) birds each were randomly selected from the two treatments groups (different housing systems) and weighed before slaughtering. The birds were defeathered completely using warm water. They were decapitated, eviscerated and weighed to obtain the eviscerated weights. All body organs were separated and weighed to obtain their fresh weights. Carcass yield and organ weight as indices of production were measured using a weighing balance. Similarly, each primal cut (breast muscle, thigh, wing, shank, etc) was weighed and its proportion relative to the carcass was determined (Ukah, et al. 2006). Hence:

$$Dressing\ percentage = \frac{Warm\ carcass\ weight}{Live\ weight}\ x\ 100$$

$$Relative\ organ\ weight = \frac{Fresh\ organ\ weight}{Live\ weight}\ x\ 100$$

Statistical analysis

The data of the parameters studied during the experiment were subjected to statistically analysis using the t- test (Wahua, 1999).

Results and Discussion

The nutrient composition of the proprietary feeds fed to the experimental broiler chickens are shown in Table 1. The nutrient compositions of the feed were: 21%, 6.0%, 5.0%, 1.0%, 0.45% and 2,800 kcal/kg DM ME, 1.0, 0.50, and 0.30 for crude protein (CP), ether extract (EE), crude fibre (CF), calcium (Ca) phosphorus (P) metabolizable energy, lysine, methionine and salt respectively in the broiler starter ration and 18.0%, 6.0, 5.0,1.0, 0.40, 2,900, 0.85, 0.35 and 0.30 for crude protein (CP), ether extract (EE), crude fibre (CF), calcium (Ca) phosphorus (P) metabolizable energy, lysine, methionine and salt respectively in the broiler finisher ration. The crude protein (CP) and energy contents of the proprietary broiler starter diet used for the feeding trial was higher than the CP (20%) and energy (2,640kcal/kg) contents recommended for starting chicks by the Indian Standard Institution (I S I), but lower than the standard range of CP (23 – 25%) but similar to the energy (2,800kca/kg) for the growth of starter chicks in the humid tropics (Oluyemi and Roberts 2000). Similarly, the CP and energy contents are lower than the range of those (19 – 20% and 3,200kcal/kg respectively) recommended for finishing broilers by Oluyemi and Roberts (2000) and Benerjee (2004).

Table 1: Proximate nutrient composition of the proprietary broiler starter and finisher feeds

Nutrients	Composition (%)	
	Starter	Finisher
Crude protein	21.0	18.0
Ether extract	6.0	6.0
Crude fibre	5.0	5.0
Calcium	1.0	1.0
Phosphorus	0.45	0.40
Metabolizable energy (Kcal/kg)	2,800	2,900
Lysine	1.00	0.85
Methionine	0.50	0.35
Salt	0.30	0.30

The overall performance of the broiler chickens fed the broiler finisher diet for 28 days (4 weeks) after brooding is shown in Table 2. The feed intake of birds managed under the intensive and semi-intensive systems were not significantly ($P > 0.05$) different. However, the daily weight gains and the feed conversion ratios of the birds managed under the two management systems were significantly ($P < 0.05$) different. Similarly the feed intakes of the broiler finisher chickens in the study are within the range of those (0.10 to 0.56 kg) reported by Obioha (1982) for chickens within the finishing stages. The feed intake broilers may be attributed to the quest by the birds to meet up with their energy requirements. This is in agreement with the investigations of Umole (1987) who gave a number of factors such as the energy content of the feed that will affect feed intake by broilers. However, the intensively managed broilers were reported to record a numerically higher feed intake although not statistically significant to the semi-intensively managed birds but exhibited a higher weight gain significantly. Conversely the total weight assumed by the birds in the two management systems in the study are contrary to the recommended weight (1,650g) for mixed broiler finisher chickens at 8 weeks of age (Olomu, 1979). This variation may be attributed to the difference in the strains of broilers utilized as well as the level of feed intake (van Eekeren, et al. 2006). The feed conversion ratios of the intensively managed birds fell within the levels (2.1- 2.57) reported by Oluyemi and Roberts (2000) for birds within the same duration. However, the feed conversion ratios were higher for the semi- intensively managed group. The mortality rates for birds in the intensive and semi-intensive groups were 3.3% and 5.0% respectively. These rates were within the ideal mortality rates (5%) recommended for a well managed flock (Oluyemi and Roberts 2000).The slightly higher mortality rates recorded for the semi-intensively managed birds may be attributed to bad management or hygienic conditions, bad housing conditions and/or poor feeding (Oruseibio, 2002).

Table-2: Performance of the broiler chickens managed under the intensive and semi-intensive systems for 4weeks after brooding in Etche Local Government Area

Performance parameters	Management systems	
	Intensive	Semi-intensive
Daily feed intake (g/bird)	110.71^{ns}	109.12^{ns}
Total weight (g/bird)	$1,372.25^{a}$	$1,161.25^{b}$
Daily weight gain (g/bird)	49.01^{a}	41.47^{b}
Feed conversion ratio (Feed intake/weight gain)	2.26^{a}	2.63^{b}
Mortality	2	3
Mortality rate (%)	3.3	5.0

a,b. Means bearing different superscripts along the same row are significantly ($P < 0.05$) different; ns = Non- significant

The results in Table 3 shows the carcass weights, dressing percent and the primal cuts in relation to the dressed carcasses of broiler chickens managed under the intensive and semi-intensive systems for 4weeks after brooding in Etche Local Government Area. The results revealed that there were significant ($P < 0.05$) differences in all the parameters investigated. The carcass weight of the birds after slaughter was higher (1,122.25g) for birds managed under the intensive system as compared (911.25g) to the birds managed under the semi-intensive system. The differences in the carcass weight among the birds in the two different management systems reflected on the dressing percentages in the two groups and this was significantly ($P < 0.05$) different. The birds in the intensively managed group had a higher (81.78%) dressing percentage than those of the semi-intensively managed group (78.47%). The significant variations reflected on the carcass weight of the birds also brought about variations in the various primal cuts of the birds. Superior values of primal cuts relative to carcass weights of the broiler chickens were recorded for the intensively managed group as opposed to their semi- intensively managed counterparts. The values recorded for the breast muscles, thigh, wing, back, neck and shank were 280g (24.95%), 300g (26.73%), 180g (16.03%), 110g (9.80%), 80g (7.13%) and 60g (5.35%), respectively for the intensively managed group and 210g (23.05%), 230g (25.24%), 130g (14.27%), 80g (8.78%), 60g (6.58%) and 45g (4.94%) for semi- intensively managed group.

However, the variations in results of dressing percent and primal cuts possessed by the broiler chickens managed under the two different housing systems reflected the trend in body weights of the experimental birds. The result in this study was in support of the findings of Atteh, (2004) who explained that the weight of the organs in broilers is known to indicate the response of birds to their growth. The higher body weight in the broiler chickens managed under the intensive system had a direct reflection in the respective primal cuts such as the breast muscle, thigh, wing, back, neck and shank (Atteh, 2004).

Table-3: Carcass characteristics of broiler chickens managed under the intensive and semi-intensive systems for 4weeks after brooding in Etche Local Government Area

Parameters	Management systems	
	Intensive	Semi-intensive
Live weight (g/bird)	$1,372.25^{a}$	$1,161.25^{b}$
Carcass weight (g/bird)	$1,122.25^{a}$	911.25^{b}
Dressing percent (%)	81.78^{a}	78.47^{b}
Breast muscle (g)	$280\ (24.95)^{a}$	$210\ (23.05)^{b}$
Thigh (g)	$300\ (26.73)^{a}$	$230\ (25.24)^{b}$
Wing (g)	$180\ (16.03)^{a}$	$130\ (14.27)^{b}$
Back (g)	$110\ (9.80)^{a}$	$80\ (8.78)^{b}$
Neck (g)	$80\ (7.13)^{a}$	$60\ (6.58)^{b}$
Shank	$60\ (5.35)^{a}$	$45\ (4.94)^{b}$

a,b. Means bearing different superscripts along the same row are significantly ($P < 0.05$) different; Values in parenthesis are percentages of the parts in a dressed carcass.

The results in Table 4 shows the relative internal organ weights of broiler chickens managed under the intensive and semi-intensive systems for 4weeks after brooding in Etche Local Government Area. The results revealed that there were significant ($P < 0.05$) differences in the weight of the lungs of the broilers managed under the two different housing systems. The broiler chickens managed under the semi-intensive system possess a higher value 25g (2.74%) in terms of lung weight than those managed intensively 22g (1.96%). Similarly, significant differences ($P < 0.05$) occurred in the kidney weight of broiler managed under the semi-intensive and intensive systems. The kidney weight of the semi-intensively managed broilers was higher 20g (2.19%) than those of their intensively managed counterparts18g (1.60%). This trend of variation in organ weights was also true for other internal organ parts of the broiler chickens managed under the two different housing systems. Notably a high gizzard weight twice as large as 68.25g (7.49%) was recorded for broilers managed under the semi-intensive as opposed to the broiler chickens managed intensively with a gizzard weight of 37.25g (3.32%).

It was observed that, the semi-intensively managed broiler chickens showed higher values in terms of organ weights. This may be as a result of the type of diets the birds were exposed to, since they were allowed to scavenge and were exposed to a wide range of diets ranging from diets high in fibre especially as they peck grasses and sand or pebbles as was observed. These findings was in agreement with the reports of Atteh, (2004) who explained that the weight of organs in broilers reflects the anatomical response of birds to the type of diets consumed, such as the use of whole grains in the feed, or those high in fibre.

In addition, the comparatively larger gizzard weight of broiler chickens managed under the semi-intensive system may have been as a result of the exposure of the birds to a variety of materials including coarse sand, pebbles, whole grains and other feed materials with varying particle sizes as they scavenge during the day time which may have caused the gizzard to be thicker and of a larger weight resulting to increased muscularization of the walls due to series of abrasive actions that may have lead to the formation of numerous layers thus making their walls thicker and heavier (Oluyemi and Roberts, 2000).

Table 4: Relative internal organ weights of broiler chickens managed under the intensive and semi-intensive systems for 4weeks after brooding in Etche Local Government Area

Parameters	Management systems	
	Intensive	Semi-intensive
Lungs (g)	22 (1.96) [a]	25 (2.74) [b]
Kidney (g)	18 (1.60) [a]	20 (2.19) [b]
Liver (g)	20 (1.78) [a]	23 (2.52) [b]
Heart (g)	15 (1.34) [a]	20 (2.19) [b]
Gizzard (g)	37.25 (3.32) [a]	68.25 (7.49) [b]

a,b. Means bearing different superscripts along the same row are significantly ($P < 0.05$) different; Values in parenthesis are percentages of the parts in a dressed carcass.

Conclusion and Recommendation

The performance parameters investigated shows better results in broiler chickens managed under the intensive system. Broilers managed under the intensive system possessed a higher body weight and this trend reflected in the dressing percentage as well as the primal parts or cuts of the birds. Conversely, the internal organ parts of broilers managed under the semi-intensive system were better developed.

The intensive system of managing broilers is therefore, recommended for adoption by poultry farmers in Etche Local Government Area of Rivers State because it encouraged better performance of birds in terms of body weight gains as well as showed an improvement in the dressing percentage and primal cuts among broilers. In addition, the system is flexible and creates room for future expansion since large number of chickens can be accommodated with minimal labour requirements and low economic losses due to predators, poor weather conditions and thieves. Finally, with the current trend in the supermarket revolution where meat type poultry such as broilers are sold dressed or in form of primal parts or cuts for easy packaging and sales in Nigeria, it is pertinent that broiler producers plan in this direction of processing these products to enhance marketability of the meat. The sale of broilers in primal cuts or parts will enable consumers that are unable to purchase the products in whole quantities to get them in parts within their reach.

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