

Comparison of Conventional and Semi-Conventional Management Systems on the Performance and Carcass Yield of Broiler Chickens

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Target Audience: Animal scientists, Broiler producers, Meat processors, Extension officers

Abstract

Animal welfare and products quality have become issues of great concern in animal agriculture. Industrialized commercial and highly production system has been criticized for failure to provide adequate welfare. Therefore, there is need to document commercial productivity research gap between conventional and semi conventional rearing systems on the performance and carcass yield of broiler chickens in Nigeria ecosystem. One hundred and fifty (150) 3 weeks old Marshal Strain of broiler chickens were randomly allocated into two treatments of three replicates per treatment to determine performance and carcass yield under conventional and semi conventional management systems. Birds under conventional system were fed ad libitum while those under semi conventional system were given seventy percent feed quantity of broilers under the conventional system. Data were collected on final body weight (FBW), total weight gain (TWG), feed intake (FI), Mortality and feed conversion ratio (FCR) for performance indicators while dressing percentage, major cuts, organs and offals were determined for carcass yield. Broiler chickens reared using conventional system recorded highest ($p < 0.05$) final body weight (2238.7g/bird), total weight gain (1857.7g/bird) and relative breast weight (18.51%). Broiler chickens reared under semi conventional recorded superior ($p < 0.05$) FCR (1.97) and abdominal fat content (0.89%) compared with those on conventional system that recorded 2.11 and 1.32%, respectively. The study revealed that semi conventional system could be employed in broiler chicken production where superior FCR and low fat (leaner meat) is preferred.

Keywords: *conventional system, semi conventional system, broiler, management, carcass yield*

Description of Problem

Animal welfare is an important factor affecting animal productivity and quality of animal products. The indoor management system used in producing animals particularly, broilers in industrialized commercial and other large commercial farms set-up is often criticized for its failure to provide adequate welfare (1). In many countries, this approach has led to the development of livestock and poultry meat under less complex

technology and less conventional rearing conditions. The conventional system of production involves rearing in a controlled environment; temperature, feed, water and other inputs are highly controlled and intensively monitored. It has a lot of human influence. Conventional system of poultry production is criticized for bird's stress, poor physiological and behavioral responses, performance and meat quality (2, 3 and 4). Conversely, advocates of the conventional farming system say it is

highly efficient, saves land and feed due to increased productivity (5). However, research has shown that conventional system of broiler production is laden with high stocking density of 28-40kg/m² while the birds are administered with, at the same time antibiotics for prophylactic and/or therapeutic purposes including the use of GM products in the feed of the birds (6).

Semi conventional production system varies widely from large stationary houses opened into a run to small portable houses that are moved frequently to new pasture. The system has been opined to reduce stress and increase comfort leading to products' better taste and flavor (7 and 8). In the rural areas, semi-conventional production system represents a profitable alternative for small producers, offers better broiler welfare (7, 9, 10 and 11), carcass yield and quality. Semi conventional production systems have been acclaimed to produce healthy meat, reduce disease infection, improve bone strength and reduce mortality (12).

In recent years, more attention and concern has been raised about the conditions of the conventional broiler production and the impact on consumers' health (13, 14,15). This has resulted in consumers moving away from the conventional broiler production to more natural and environmentally friendly production systems in Europe and America (15). However, unlike Europe and America, semi conventional production techniques has not been well developed for commercial market niche in Nigeria in spite of its great potentials as the Nigerian native production system.

The need to ascertain and document the research gap between conventional and semi conventional rearing systems on the performance and carcass yield of broiler

chickens in Nigeria ecosystem for commercial productivity necessitated this study.

Materials and Method

The study was carried out at the Poultry unit of the Directorate of University Farms (DUFARMS), Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. The conventional housing was a concrete floor housing type with dwarf walls covered with chicken net. The roof was made of zinc materials. The area of each pen was 4.5m² while the semi conventional housing system was a typical moveable wooden cage raised floor (deep litter) type with dwarf wall and the side covered with chicken net. The roof was made of zinc materials. The size of the cage was 3.9m² and the height was 1.7m from the base of the cage. The cage opened into a fenced pasture area of 14m in length, 5m breadth and 2m above soil level.

A total of one hundred and fifty (150) day old Marshal Strain broiler chicks brooded indoor for three weeks were randomly allocated into the treatment groups each having 75 birds in three replicates and each replicate contained 25 birds. All necessary routine and occasional management practices were carried out. Birds under conventional system were fed with commercial broiler finisher diet *ad libitum* while those reared using semi-conventional system were given 70 percentage of the quantity of the feed given to those under conventional management system as recommended by (8). The commercial finisher diet contained 20.34% crude protein and 2780 ME (kcal/kg).

Data were collected on feed intake, body weight gain, mortality and feed conversion ratio for growth indices. At the

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end of the 35d feeding trial, nine (9) birds per treatment (3 birds per replicate) were randomly selected for carcass yield evaluation. The birds were fasted for 24 hours to clear their guts of wastes in order to avoid contamination of carcass. Following this, the birds were weighed and then sacrificed through neck decapitation. Thereafter, they were de-feathered, eviscerated and dressed (legs and neck removed). Dressed carcass was dissected into primal cuts while offals and organs were carefully excised (16). The thighs, wings, drumsticks, breast muscle and back were separated and weighed. Weights were expressed as percentage of the live weight. Data were subjected to statistical analysis using t-test as contained in (17). Means were tested at 95% confidence limit as contained in (17).

Table 1: Effect of conventional and semi conventional management systems on the performance of broiler chickens

Parameters	Management System	
	Conventional	Semi conventional
Initial weight (g/b)	381.0 \pm 15.88	318.0 \pm 12.88
Final body weight (g/b)	2238.7 \pm 24.88	1751.0 \pm 11.68
Total weight gain (g/b)	1857.7 \pm 24.88	1370.0 \pm 11.68
Daily weight gain (g/b)	53.07 \pm 0.71	39.14 \pm 0.33
Feed intake (g/b/d)	110.24 \pm 0.0	77.17 \pm 0.0
Mortality (%)	0.00 \pm 0.0	4.00 \pm 0.04
Feed conversion ratio	2.11 \pm 0.03	1.97 \pm 0.02

^{a,b} Means on the same row with different letters differed significantly (p<0.05).

Table 2: Effect of conventional and semi conventional management systems on the carcass yield of broiler chickens.

Parameters	Management Systems	
	Conventional	Semi conventional
Eviscerated (%)	77.98 \pm 1.29	73.22 \pm 0.86
Dressed (%)	67.01 \pm 2.26	54.75 \pm 6.03
Abdominal Fat (%)	1.32 \pm 0.05	0.89 \pm 0.08
*Major Cuts (%)		
Thigh	11.42 \pm 0.09	10.92 \pm 0.23
Drum Stick	9.66 \pm 0.01	9.78 \pm 0.19
Wings	9.39 \pm 0.35	9.13 \pm 0.27
Breast	18.51 \pm 0.47	15.95 \pm 0.28
*Organs (%)		
Liver	2.28 \pm 0.11	2.31 \pm 0.29
Spleen	0.15 \pm 0.16	0.12 \pm 0.02
Gizzard	2.77 \pm 0.10	2.73 \pm 0.20
Heart	0.48 \pm 0.43	0.49 \pm 0.29
*Offals (%)		
Small Intestine	4.49 \pm 0.47	6.09 \pm 0.26
Large Intestine	0.20 \pm 0.20	0.29 \pm 0.04
Caeca	0.62 \pm 0.06	0.76 \pm 0.29

^{a,b}: Means on the same row with different letters differed significantly (P<0.05)

* expressed as percentage of live weight

Results and Discussion

Table 1 shows the effect of conventional and semi conventional management systems on performance of broiler chickens. Final body weight, total weight gain and feed conversion ratio of the broiler chickens differed significantly ($p < 0.05$) with management systems. Broilers reared using conventional system recorded higher final body weight (2238.7g/bird), total weight gain (1857.7g/bird), daily weight gain (53.08g/bird) but poor feed conversion ratio (2.11) while those under semi conventional recorded 1751.0g/bird, 1370.0g/bird and 39.14g/bird for final body weight, total weight gain and daily weight gain, respectively but superior feed conversion ratio (1.97).

Variation in the result of weight gain could be attributed to the increased exercise by birds that are opened to roam in the paddocks, thus increasing energy demands with consequent increase in the use of feed for body weight gain among birds under semi conventional system than the conventional system which are often limited to available space consequently, higher stocking density of 8-15 birds per square meter. Results of final body weight and daily weight gain were in agreement with (6) who reported significant variation in the weight gains of broiler chickens reared using conventional and free range production system. Lesser growth rate in broiler chickens reared under semi conventional system than in conventional rearing system was also reported by (18). However, the result was at variance with the finding of (19) who reported that body weight gain of broiler chicken in the confined system was lesser than in the semi-confined system, due to poor bird's comfort and welfare. However, broiler

chickens reared using semi conventional system recorded better FCR in this study. This result was contrary to the finding of (6) who reported superior FCR of 1.97 for birds reared using conventional system over the free range, which were 2.98. Variation could be as a result of supplementary feeding and additional scavengeable feed resources within the paddock, which were available and were probably enjoyed by birds under semi conventional production. It could also be as a result of improved welfare of birds as opined by (19).

Production system had no significant ($p > 0.05$) influence on the mortality of the broiler chickens. It is well documented that mortality is influenced by several factors such as exposure to bad weather condition during the first three weeks, heat stress during the growing period, problems of water quality and water distribution, inappropriate housing and high bird density among others (6, 11, 20). These factors had no influence on the experimental birds as they were more than the three weeks of age at the commencement of the study and the experimental birds were well managed without such stress like environmental, physical (water scarcity) and physiological (inappropriate stocking density) as opined by (6,11,20). Consequently, mortality record was similar between broiler chickens reared using conventional and semi conventional production systems.

Effect of management systems on carcass yield of broiler chickens is shown in Table 2. The result shows no significant ($p > 0.05$) differences in the dressed percentage of birds raised under conventional and semi conventional management systems. However, relative eviscerated and abdominal fat weight

varied significantly ($p < 0.05$). Relative weight of evisceration (77.98%) and abdominal fat (1.31%) were higher in birds reared under conventional system compared to those reared under semi conventional system which recorded 73.22% and 0.88%, respectively. Lower abdominal fat in the carcass of birds under semi-conventional system could be due to the extensive and increased exercise or intensive locomotor activity, which placed high demand on energy and consequently, reduced abdominal fat content and favored muscle mass development. This result was in line with the findings of (11, 21) who reported less abdominal fat in birds reared using semi conventional system.

Table 2 also revealed that management system had no significant ($p > 0.05$) effect on thigh, drum stick and wings of broiler chickens. This was in accordance with the report of (21). Semi conventional production system in this study had no influence on muscle mass development and probably no negative influence on chicken tenderness.

Production system had significant ($p < 0.05$) effect on the breast yield of the broiler chickens reared using conventional and semi conventional management systems. Birds raised under conventional system recorded highest ($p < 0.05$) relative breast yield (18.51%) compared to the counterpart raised under semi conventional system, which recorded 15.95%. This result was in contrast with the opinions of (18) who reported that breast and thigh meat content of carcass increased when birds had access to outdoor space and their stocking density was lower in an organic production system.

The organs and offals of the experimental birds compared ($p > 0.05$) with management systems except for the

small intestine ($p < 0.05$). Broiler chickens reared under semi conventional production system recorded significantly ($p < 0.05$) higher relative weight of small intestine (6.09%). This could be as a result of access to grasses in the paddock and intake of various forages, insects, as well as sand particles. It was reported (22) that the crude fibre content of the scavenge-able feed resources in the paddock was significantly higher than that of commercial diets fed to the birds in the conventional system and this could stimulate the development of the stomach particularly, the small intestine which harbor feed particles for relative long time for about 50-70 minutes after gizzard which holds feed particles for 90 minutes (23) and its more muscular.

Conclusion and Applications

1. Broiler chickens reared using semi convention production system had better feed efficiency.
2. Broiler chickens reared under the semi-conventional system produced leaner meat.
3. Semi conventional broiler production system could be adopted in commercial broiler chicken production where superior FCR and lean meat is desired.

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