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Performance and External Egg Quality of Layers under Varying Stocking Density in Locally Fabricated Metal-Type Battery Cage System

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Target Audience: Poultry Farmers, Agricultural Policy

Abstract

Study determined the performance and external egg quality of layers in locally fabricated metal-type battery cage at different stocking density. One hundred and forty four point of lay harco black strain birds were randomly divided into 3 treatments stocked 2, 3 and 4birds per cell. The result showed insignificant (P>0.05) difference with final weight of the birds but body weight gain and feed intake varied significantly (P<0.05). Birds stocked at 2/cell gained 15g/birds in weight while birds stocked 3 and 4 per cell lost 75g/bird and 125g/bird, respectively. Birds stocked at 2 and 4/cell recorded similar (P>0.05) feed intake, 114.00 and 112.50g/bird/day, respectively while those stocked at 3/cell recorded significantly (P<0.05) low feed intake (103.89g/bird/day). No significant (P>0.05) variation was obtained with egg length, egg breadth and egg weight across treatments. However, birds stocked 2/cell had highest significant (P<0.05) ESI and HDP (0.77 and 76.60%, respectively) while birds stocked 4/cell had least ESI (0.74) and HDP (68.15%). Hen house production decreased significantly (P<0.05) with increasing stocking density from 76.60% to 68.15% in the cage type. The study concluded that stocking density of layers in locally fabricated metal-type battery cage had significant effect on weight gain, feed intake, and hen house production of layers and layers stocked 3/cell gave the optimum ESI and HDP.

Keywords: Metal-type battery cage, stocking density, growth performance, egg quality

Description of Problem

It has been reported that 75% of all commercial layers in the world and 95% in the United States are kept in cages (1). The birds in the cage system are well managed in a manner that minimizes infection with parasite and disease and also facilitates optimal daily care and inspection but the cage system is more expensive to build than high-density floor confinement system (2). To this end, various manipulation of housing and facility system that provides comfort to laying birds and good profit margin to the farmers remains of great concern in view of the percentage cost housing and equipment (10 – 13%) contributes to cost of poultry production (3 and 4).

The unit cost of imported 3-tier battery cage (96 birds capacity) ranges between ₦120, 000 and 145,000 ($750 and 906) depending on the make while the locally fabricated cage of 90 birds capacity costs ranges between ₦35, 000 and 45,000 ($219 and 282), a situation which made the rush for the locally fabricated cages almost irresistible to small commercial poultry farmers (personal communication and market survey, October, 2010 and March, 2011).

As a means of reducing housing, equipment, and labour cost per pen in layers, commercial poultry egg producers are often tempted to increase the number of stock per cell. In order to enhance productivity (5) and to meet the modern egg production, management strategies and food security for the Nigerian growing human population of 2.83% growth rate (6), the cage system of egg production in Nigeria is favoured like in most countries (1, 7). The general household surveys conducted by National Bureau of Statistics (NBS) between 1995 and 2005 show that Children (0 14 years) constitute a very hi gh percentage (37% in 2005) of the household population in Nigeria (8).

This indicates unprecedented importance of poultry production and consumption of poultry products to the Nation, which is a dependable and great component of household food security since children need food with high protein content like eggs and chicken which are cheaper and reliable sources of animal protein (9).

Utilization of available local materials will further enhance speedy reduction in cost of housing, equipment and foreign reserve through reduced importation and promote indigenous technology and expertise without compromising birds' welfare. This will also guarantee sustainable animal protein production, improved protein intakes and food security. There is therefore the need to evaluate the effect of stocking density on the performance and external egg quality of layers using locally fabricated metal-type battery cage.

Materials and Methods

Experimental location

This experiment was conducted at the Poultry Unit of Teaching and Research Farm Directorate (TREFAD), Federal University of Agriculture, Abeokuta, Nigeria. The site falls within latitude 7^{0}13'22.44''N and longitude 3^{0}25'48.57''E (Google Earth, 2010).

Experimental birds

A total of 144 point of lay (17 weeks old) Harco black strain birds purchased from a reputable commercial farm was used in this study.

Experimental cage

The cages were the 3-tier locally fabricated type of 5 cells compartment. Each cell has a standard dimension of 45cm by 30cm by 60cm. The material was made up of silver coated iron metal rod arranged parallel in a rectangular shape. The base was slight tilted to the front to permit the egg to roll out easily and gently when it is laid

Management of birds

The birds were stocked using different stocking density of 2, 3 and 4 birds per cell, each tier serving as replicate. The birds allotted on equal weight basis were fed with commercial grower diet until they attain 10% egg production. There after, each bird per treatment and replicate was given 150g of feed daily while water was given *ad libitum*. All recommended medication and vaccination were adopted. The study lasted for 70 days.

Data collection

Data was collected on the final weight, weight gain and feed intake of the experimental birds per replicate. The weights of the birds per treatment were determined using top loading scale and weight gain was calculated as the difference between the final and initial weight at the end of 10th week. Record of daily eggs lay per treatment and replicate was also taken and this was used to calculate the hen-day and hen-house production. External quality of the eggs laid was measured using egg weight, length and breadth. Egg shape index (ESI) was also calculated.

Statistical analysis

All data that generated were subjected to analysis of variance (ANOVA) in a complete randomized design using SAS (10). Significant means at 5% were separated using Duncan's Multiple Range Test (11) as contained in SAS (10).

Results and Discussion

Birds stocked at 2/cell had the highest final weight (1615g/bird) and was similar (P>0.05) with the values recorded for birds stocked at 3 and 4 birds/cell which gave 1520.75 and 1486.67g/bird, respectively (Table1).

Total weight gain of the birds in the battery cage-type was significantly (P<0.05) influenced by stocking density of the cage. Birds stocked at 2/cell gained 15g/bird in weight throughout the 70d period while birds stocked at 3 and 4/cell lost 40g and 125g/bird, respectively. This result was at variance with (12) who reported that stocking density did not affect weight gain of the birds. The cage type could be responsible for this observation.

Feed intake varied significantly (P<0.05) with stocking density in the battery cage system. Birds stocked at 2/cell had the highest feed intake (114.00g/birds/day) while birds stocked at 3 per cell recorded the least (103.89g/bird/ day). The result was in agreement with (13) who reported that broiler housed at high stocking density ate the least feed and the utilization most efficient when compared with those at lower density.

The result of mortality is also shown in Table 1. Mortality was insignificant (P>0.05) across the treatments. Though birds stocked 3/cell recorded 2.22% mortality, this could not be attributed to treatment. The result is still within the normal range (5%) recommended for healthy birds (1).

Table 1: Growth performance of laying birds under varying cage density in locally fabricated metal-type battery cage

Treatment (Number of birds stocked per cell)				
Parameters	2	3	4	SEM
Initial Weight (g)	1600.00	1595.75	1615.00	46.815
Final Weight (g)	1615.00	1550.75	1486.67	72.88
Total Weight Gain (g)	15.00[a]	*40.00[ab]	*128.33[b]	67.165
Feed Intake (g/bird/day)	114.00[a]	103.59[b]	112.50[a]	2.641
Mortality (%)	0.00	2.22	0.00	2.22

[ab] – Means within rows followed by different superscripts are significantly different (P<0.05) *negative weight gain

Table 2: External egg quality of laying birds under varying cage density in locally fabricated metal-type battery cage

Parameters	Treatment (Number of birds stocked per cell)			
	2	3	4	SEM
Egg Weight (g)	55.25	53.93	54.89	1.29
Egg Length (cm)	5.38	5.39	5.41	0.07
Egg Breadth (cm)	4.11	4.05	3.98	0.08
Egg Shape Index	0.77[a]	0.75[ab]	0.74[b]	0.01
Hen-day Production (%)	76.60[a]	72.52[ab]	68.15[b]	4.08
Hen-house Production (%)	76.60[a]	72.52[ab]	68.15[b]	4.08

[ab] – Means within rows followed by different superscripts are significantly different (P<0.05)

The effect of stocking density on the external egg quality of laying birds in locally fabricated metal-type battery cage is presented in Table 2. Egg weight, length and breadth were not significantly influenced by stocking density. Conversely, ESI reduced significantly (P<0.05) with increased stocking density. Birds stocked at 2/cell recorded 0.77 ESI while birds stocked at 3/cell and 4/cell recorded 0.75 and 0.74, respectively. Egg of birds stocked 2/cell could be assumed to be of higher quality compared to those stocked 3/cell and 4/cell. This result is supported by (14) who reported ESI as a measure of egg quality. However, the result still falls within the range reported by researchers (15, 16) who reported the ESI range of 0.74 – 0.77 in laying birds.

The result of stocking density on Hen day production of layers in the cage type is also shown in Table 2. Hen day production decreased significantly (P<0.05) with increasing stocking density in the cage type. Bird stocked 2/cell had the highest hen day production of 76.60% while those stocked 3/cell and 4/cell recorded 72.52% and 68.15%, respectively. This was in agreement with the finding of (17, 3) who reported that the level of performance of a laying hen depends not only on inherited capacity but also to a great extent upon her environment (housing, climate and nutrition).

Conclusion and Application

This study concluded that:

1. Stocking density of locally fabricated metal-type battery cage had significant effect on weight gain, feed intake, and hen house production.
2. Bird stocked 3/cell gave the optimum ESI and HDP.

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