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EFFECT OF BEAK TRIMMING, NUMBER IN BATTERY CAGE CELL AND LEAF HANGING ON PERFORMANCE AND FEATHER CONDITION SCORE OF LAYER CHICKENS

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ABSTRACT
This study was conducted to evaluate the effect of beak trimming, leaf hanging and number in cage cell on performance and feather condition score of 44 weeks old laying chickens reared in battery cages. Two hundred and sixteen laying chickens were assigned to twelve treatments in a 3 x 2 x 2 factorial arrangement in a complete randomized design. The factors were number in cell (3, 2 or 1 bird per cage cell), beak trimming (trimmed or not trimmed) and leaf hanging (with leaf or no leaf). Each treatment was replicated thrice with 6 birds per replicate. Egg production, feed intake and feed conversion ratio were measured. Feather condition and mortality were also measured. The results of the study showed that beak trimming did not affect the feed conversion ratio of laying chickens. Egg production was higher for hens that were not beak trimmed. Leaf hanging decreased the feed intake. Egg production was affected by number in cell with placing 1 bird per cell having better than having 3 birds in a cell. Beak trimming affected feather condition score with laying chickens with trimmed beaks having better feather condition score than those not trimmed. Beak trimming, leaf hanging and number in cell did not influence mortality due to cannibalism. From the result of this study, it can be concluded that beak trimming reduced egg production but improved feather condition score of laying chicken. Beak trimming should be done prior to birds start laying to prevent cannibalism as indicated by feather condition score.

Keywords Cage chicken feather cannibalism

Introduction
Over the past decades, much progress has been made in developing valid methods to assess hen health and welfare. Assessing hen health and welfare is difficult and multifactorial. Important considerations include freedom from disease, ability to perform specific behaviours, ability to cope with sometimes stressful environments, and protection from housing-specific challenges to fully assess hen welfare (Lay *et al.,* 2011).
High bird density is often used in layer production to reduce housing and equipment costs per bird. However, this may cause significant bird stress, impairing bird welfare (Rios *et al.,* 2009).
Cannibalism, behaviour exhibited when a bird starts pecking and tearing off the skin or underlying tissue of another bird, is undoubtedly one of the major causes of mortality in cage-housed hens not beak-trimmed (Lay *et al.,* 2011).
Cannibalism is a learned behavior, passed on from one hen to another, and has been reported in all types of housing systems (Shields and Duncan, 2009). Once an outbreak occurs, it is very difficult to control. The potential for the behavior to spread may be increased in large flocks, as more birds are likely to learn the behavior or to become victims (Shields and Duncan, 2009). Due to the restrictive nature of battery cages, hens are unable to access many other birds, which may make the behavior easier to manage, although, feather-pecked hens in cages are unable to escape more aggressive cage mates (Shields and Duncan, 2009).
Beak trimming is performed to minimize injury due to feather pecking and cannibalism in the flock and is routinely practiced in US flocks (Lay *et al.,* 2011). However, beak trimming has been banned in some countries (e.g., Sweden), and bans are under consideration in some other countries (United Kingdom) due to the pain associated with the procedure (Lay *et al.,* 2011). This study was conducted to evaluate the

effect of beak trimming, leaf hanging and number in cage cell on performance and feather condition score of laying chickens reared in battery cages.

Materials and Methods

Experimental site

The experiment was conducted at the Livestock Teaching and Research farm, Department of Animal Science, Federal University, Dutsin-Ma, Katsina state. Dutsin-Ma lies on latitude 12°26'N and longitude 07°29'E. Rainfall is between May and September with a peak in August. The average annual rainfall is about 700 mm. The mean annual temperature ranges from 29°C – 31°C. The highest air temperature normally occurs in April/May and the lowest in December through February (Abaje *et al.*, 2014).

Experimental animals and their management

The research was conduct using 44 weeks old laying chickens reared under battery cage system. One hundred and forty four layers chickens were used for the research. They were assigned to twelve treatments in a 3 x 2 x 2 factorial arrangement in a complete randomized design (CRD). The factors were stocking density (3, 2 or 1 birds per cage cell), beak trimming (trimmed or not trimmed) and leaf hanging (with leaf or no leaf). Each treatment was replicated thrice with 6 birds per replicate. The birds were randomly assigned to each treatment. They were placed according to the cage cell stocking density (3, 2 or 1 bird per cage cell), those assigned to the beak trimming group were beak trimmed at the commencement of the study and leaf was hanged in cell allocated for leaf hanging. The birds were offered a layer mash formulated according to the NRC (1994) recommendation for layers. All routine management practices will be strictly adhered to.

Data collection

Feed intake

A given quantity of feed was allotted to each replicate at the beginning of every week. Feed intake was determined by subtracting the left-over of the feed supplied from the quantity allotted at the end of every week.

Egg production

Number of eggs laid was recorded on daily basis and were used to determine hen day egg production and hen housed egg production.

Feather condition

Feather condition score was carried out according the feather condition scoring sheet adapted from Glatz and Runge (2018).

Mortality

Mortality was recorded as it occurred and mortality due cannibalism was noted.

Data Analysis

All data generated will be subjected analysis of variance. Significantly ($P<0.05$) different means will be separated using Duncan's Multiple Range Test as contained in SAS (1999) package.

RESULTS AND DISCUSSION

Effect of Beak trimming, Leaf Hanging and number in cell on the performance of Laying Chickens reared in battery cages

The effect of beak trimming on the performance of laying chicken is shown in table 1. Beak trimming did not affect ($P>0.05$) the feed conversion ratio of laying chicken. However, hen day egg production, hen housed egg production and average daily feed intake were higher ($P<0.05$) for birds that were not beak trimmed. The above results agreed with the findings of Beane *et al.* (2001) who observed that beak-trimmed layers had lower egg production at the beginning of lay. Francelino *et al.* (2005) found a reduction in egg production in beak trimmed birds as compared to those not submitted to beak trimming.

Leaf hanging decreased (P<0.05) the feed intake of laying chickens while other parameters studied were not affected (P>0.05). Number of hens in cell affected (P<0.05) hen day egg production which was higher in 1 bird per cell compared to 3 birds per cell while 2 birds per cell was similar (P>0.05) to both. It was observed that the higher the cage stocking density the lower the egg production.

Table 1: Effect of Beak trimming Leaf Hanging, Density on the performance of Laying Chicken reared in battery cages

Treatments	Hen Day Egg Production	Hen House Egg Production	Average Daily feed intake	Feed conversion ratio/crate kg	Feed conversion ratio/Dozen kg
Beak trimming					
Trimmed	36.45^{b}	33.31^{b}	77.05^{b}	6.55	2.62
Not trimmed	49.07^{a}	47.84^{a}	87.88^{a}	5.58	2.23
SEM	2.31	2.60	2.11	0.39	0.15
Leaf Hanging					
Leaf	40.10	38.39	77.74^{b}	6.00	2.40
No Leaf	45.41	42.76	87.19^{a}	6.13	2.45
SEM	2.31	2.57	2.11	0.39	0.15
Number In Cell					
1	48.24^{a}	44.83	80.16	5.18	2.07
2	41.50^{ab}	40.63	83.02	6.37	2.55
3	38.53^{b}	36.27	84.21	6.64	2.66
SEM	2.83	3.15	2.58	0.47	0.19

Effect of beak trimming, leaf hanging and number of hens in cell on feather condition score of laying chickens reared in battery cage

Beak trimming affected the feather condition score of laying chickens reared in battery cages as shown on table 2. Laying chickens that were beak trimmed had better (P<0.05) feather condition score than chickens that were not beak trimmed. Leaf hanging and number of hens in cell did not affect (P>0.05) feather condition score. The feather score observed in birds that were beak trimmed (2.46) was close to the average score which is normal for laying chickens at the age of 44 weeks and above. While birds not beak trimmed were having feather condition score of (2.90) which was close to 3 thus indicating feather pecking as highlighted by Glatz and Runge (2018).

Table 2: Effect of beak trimming, leaf hanging and density on feather condition score of laying chicken reared in battery cages

Treatments	**Feather condition score**
Beak trimming	
Trimmed	2.46$^{\mathbf{b}}$
Not trimmed	2.90$^{\mathbf{a}}$
SEM	0.07
Leaf hanging	
With Leaf	2.75
No leaf	2.61
SEM	0.07
Number in cell	
1	2.60

2	2.72
3	2.72
SEM	0.09

Effect of beak trimming, leaf hanging and number in cell on overall mortality and mortality due to cannibalism of layer chicken reared in battery cage

Beak trimming, leaf hanging and number in cell did not significantly affect mortality (P>0.05) as shown in table 3. The effect of beak trimming, leaf hanging and number in cell showed no significance difference among the treatments on mortality due to cannibalism (p>0.05) as shown in table 4.4 which means beak trimming, leaf hanging and number in cell had no influence on mortality due to cannibalism.

Table 3: Effect of beak trimming, leaf hanging and number in cell on overall mortality and mortality due to cannibalism of layer chicken reared in battery cage.

Treatments	**Overall Mortality**	**Mortality due to cannibalism**
Beak trimming		
Trimmed	11.11	2.78
Not trimmed	5.56	1.39
SEM	2.84	1.54
Leaf hanging		
With Leaf	8.33	2.78
No leaf	8.33	1.39
SEM	2.84	1.54
Number in cell		
1	12.50	2.08
2	4.17	4.17
3	8.33	0.00
SEM	3.48	1.88

Conclusion

From the result of this study, it can be concluded that beak trimming reduced egg production and feed intake of laying chickens and improved feather condition score of laying chickens. Mortality due to cannibalism of laying chickens were not affected by beak trimming, leaf hanging or number of hens in cell. Beak trimming should be done prior to birds start laying to prevent cannibalism as indicated by feather condition score.

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