COMPARISON OF EGG QUALITY PARAMETERS FROM AUTOMATED AND NATURAL VENTILATED POULTRY HOUSING SYSTEMS

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Abstract
The study was conducted to compare the egg (n=54) quality parameters of laying hens (Isah Brown) from automated and naturally ventilated poultry pens housing systems. The treatments were regarded as T1 and T2 which represent eggs from naturally ventilated and automated pens respectively. The parameters assessed were egg quality parameters (external and internal). The results of the study showed that there were significant differences ($p<0.01$) between treatments in all the external egg quality parameters evaluated with the exception of egg length, egg shape index and eggshell thickness. However, the egg internal quality parameters indicated significant differences ($p<0.01$) in albumen height, yolk height, yolk width, yolk index, and Haugh unit while albumen weight, albumen width, albumen index, yolk weight, and yolk colour showed no significant difference between the treatments ($p>0.05$). It is been concluded that egg quality parameters from automated pen house of laying hens indicated higher quality in comparison with naturally ventilated poultry pen house.
Keywords: laying hens, housing system, external egg quality, interior egg quality

Introduction

Suitable housing plays a vital role in raising all types of poultry birds. Automated pens provide the ideal thermal environment for birds (Glatz and Bolla, 2004). Birds' performance in controlled-environment sheds is generally superior to that in naturally ventilated pens, as the conditions can be maintained in the birds' thermal comfort zone. Achieving the ideal environment for birds depends on the appropriate management of the poultry house. In developing countries, most medium-scale commercial layer and chicken meat houses rely on natural airflow through the shed for ventilation (Daghir, 2001).

It has been found that the number of non-standard eggs (soiled, poor shell quality) was several times higher in cases of naturally ventilated as compared to the automated housing system. An automated pen poultry house system keeps the bird safe, well growing, and productive and protects the poultry birds from adverse weather conditions, injury, and predators. Housing is among the two main factors of a successful poultry farming business (Kuit *et al.,* 1989). Good use of nest boxes is of paramount importance to avoid an excess of dirty and cracked eggs.

An egg from an automated pen demonstrates better shell quality, especially in terms of strength and thickness, higher egg shape index values, yolk index, and albumen quality expressed especially by Haugh units (Klecker *et al.,* 2003). Moreover, consumers perceive the housing system of layers as a factor affecting positively the quality of eggs, thus the method by which hens are raised as determinants of sales and consumers' yardstick to purchase eggs. Several studies have shown that housing systems do influence egg quality parameters (Rossi and De Reu (2011). However, a clear relationship between the housing system and egg quality is still lacking in the semi-arid environment. Therefore, the aim of this was to compare egg quality parameters from automated and naturally ventilated poultry housing systems in the semi-arid region of Nigeria.

Materials and Methods

Materials

The study was conducted in the physical laboratory of the Faculty of Agriculture, Usmanu Danfodiyo University, Sokoto main campus. Electronic sensitive scale, vernier caliper, micrometer screw gauge, yolk separator, cutting board, Roche yolk colour fan, divider, and meter ruler were used in the present study.

Methods

External egg quality parameters (egg weight, length, width, shell weight, shell thickness and egg shape index) and internal egg quality parameters (albumen height, albumen weight, albumen width, albumen index, yolk height, yolk weight, yolk width, yolk index, yolk colour and Haugh unit) were analysed according to the procedure described by Garba *et al*. (2010).

Data Analysis

The data generated from this experiment were subjected to t-test analysis (2-tailed sample) using Excel as a tool for data analysis.

Results and Discussion

External Egg Quality Parameters

The results indicated no significant differences between all the external egg quality parameters except egg weight, shell weight and egg width. The reason for this might be attributed to the fact that the automated pen provided the ideal thermal environment for the birds, as the condition can be maintained in the bird's thermal comfort zone (Glatz and Bolla, 2004). However, as noted by Bain (2011), any stress or diseases that compromise the health of the birds will increase the incidence of egg abnormalities which include a reduction of egg weight. The naturally ventilated environment is less controlled compared to an automated pen house, and there is more risk for laying hens to suffer from some bacterial or parasitic diseases (Lay *et al.,* 2011).

The average range of shell thickness obtained from this study (0.38mm - 0.40mm) was 0.02mm greater than the recommended values of 0.30mm - 0.36mm (Oluyemi and Roberts, 2000). This could be attributed to environment and diet.

Table 1: External egg quality parameters

	Natural Pen	**Automated Pen**		
Parameters	**Mean**	**Mean**	**T-Statistic**	**P-Value**
Egg Weight (g)	69.50±2.80	75.21±4.48	-3.259	0.005**
Egg Length (cm)	5.86±0.12	5.92±0.17	-0.950	0.356
Egg Width (cm)	5.92±0.17	4.61±0.07	21.812	0.000**
Shell Weight (g)	7.05±0.38	7.94±0.95	-2.630	0.018*
Egg Shell thickness (mm)	0.38±0.06	0.40±0.04	0.249	0.807
Egg shape index	0.79±0.01	0.79±0.01	-0.856	0.405

* = Significant ** = Highly significant

Internal Egg Quality Parameters

There was a significant difference between all the internal egg quality parameters except albumen height, yolk height, yolk width, yolk index, and Haugh unit (Table 2).

Table 2: Internal egg quality parameters

	Natural Pen	**Automated Pen**		
Parameters	**Mean**	**Mean**	**T-Statistic**	**P-Value**
Albumen height (cm)	0.72±1.30	0.86±1.11	2.481	0.025*
Albumen weight (g)	45.97±2.84	49.56±4.54	0.041	0.058
Albumen width (cm)	8.88±0.48	8.68±0.50	-0.861	0.397
Albumen index	0.08±0.03	0.09±0.03	0.951	0.356
Yolk height (cm)	1.62±0.13	1.44±0.14	-2.711	0.015*
Yolk weight (g)	16.48±0.79	17.73±1.92	1.80	0.090
Yolk width (cm)	3.97±0.18	4.22±0.26	2.497	0.024*
Yolk index	0.41±0.04	0.35±0.04	-3.473	0.003**
Yolk colour	3.96±0.64	4.11±0.40	0.610	0.550
Haugh unit (%)	81.35±10.19	89.45±5.71	2.080	0.054*

* = Significant ** = Highly significant

The height of egg white (albumen) in fresh eggs should not be less than 0.5cm (Maria and Dmowski, 2005). The values reported in this study (0.72cm - 0.86cm) were higher than the recommended value of 0.5cm in a fresh egg. Thus, albumen height in the present study could be regarded as superior.

There were no significant differences in yolk colour for both treatments according to the Roche yolk colour fan assessment. The colour of the yolk scores indicated light colouration. Previous research has indicated that the yolk colour of an egg depends on the type of diet, the system of production, and the housing system (Garba *et al.,* 2010; Hasin *et al.,* 2006).

There were significant differences between the treatments in the Haugh unit evaluation at ($P<0.05$). Natural Ventilated poultry pen housing system (T1) has recorded 81.35±10.19 Haugh unit and for automated pen house recorded 89.4±5.71 (Table 2). A Haugh Unit value of 79 and above is an indication

of good quality. Brandt *et al. (*1991) reported that eggs of inferior quality have Haugh units of less than 40%.

There was no statistical significance in the albumen index, but there are highly significant differences at ($P<0.01$) in yolk indices in both treatments measured. Yolk index values range from 0.36 to 0.46 which is further indicated the freshness characteristics of the eggs from species of laying hens. Since, according to Maria and Dmowski (2005) yolk index not lower than 0.30 characterize a fresh egg.

Conclusion

It is been concluded that egg quality parameters from automated pen house of laying hens have indicated higher quality compared to naturally ventilated housing systems and are therefore recommended for superior egg quality parameters.

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