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Research Article

Evaluation of Hen Age, Body Weight and Egg Weight on Percent Egg Component and the Internal Composition of Harco Hen Eggs

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ABSTRACT

A study was carried out to evaluate the effect of Hen age, body weight and egg weight on internal composition of eggs (mass and composition of albumen and yolk) of Harco Hen Eggs. The effects of egg size on physical composition were also measured. Seventy –two (72) Harco hens of 32 weeks old were assigned into 3 groups corresponding to 3 body weight ranges. Weight range one (WR1) 1.35 – 1.59Kg; weight range two (WR2), 1.60 – 1.80Kg and weight range three (WR3) 1.81-2.25Kg.Each weight range contained 24 laying hens which were divided into three replicates such that each replicates contained 8 birds. The hens were managed in battery cages and the fed a commercial layers ration for 3 months during which the average egg weight and the number of eggs laid by each weight range were evaluated. 72 eggs whose weight fell within 3 weight groups 55 -57g, 60 -62g and 65 -67g and albumen, yolk and shell content were weighed and expressed as percentages of total egg weight. The albumen content of egg weighing 55 -57g, 60 -62g, and 65 – 67g were 62%, 63% and 65.8% and 8.9 % respectively. At the end of each month, 3 eggs were picked randomly from each weight ranges on which proximate analysis was carried out. The results obtained from this study were statistically analyzed by applying percentage and standard error of means. The influence of hen age and weight has no discernible statistical significant effect on the chemical composition of albumen and yolk of eggs. An investigation of the effect of egg weight ranges on the internal composition of eggs also showed no statistical significance but differences in percent of albumen and yolk of egg weight ranges were evident. Increase in egg size was mainly due to increase in albumen content.

Key words: Hen age, Body weight, Egg weight, Percent egg component, Internal composition.

INTRODUCTION

Egg quality is important for consumer appeal and the economic success of a producer depends on the total number of eggs sold. Egg quality encompasses several aspects (Stadelman, 1977), related to the shell (external quality) and to the albumen and yolk (internal quality). Egg quality has a genetic basis and the parameters of egg quality vary between strains of hens (Pandey et al.,1986, Silversides etal.,2006).However, egg quality is also influenced by the housing regimen under which the hens are kept (Fraser and Bain, 1994., Vits et al., 2005) as well as the laying hens (Silversides et al., 2016).

The quality of egg is under the influence of several factors and one of them is hen's age. For consumers the internal egg quality is very important (albumen and yolk)although it cannot be assessed without breaking the egg. With the ageing of layers, it comes some typical changes of eggs such as increasing proportion of yolk, reducing the percentage of dense albumen, reduction of dry matter and reduction of total fat in yolk (Burley et al.;1989).

The mean performance of the egg quality traits declined with advancing in age with the exception of egg weight which increased with age (Ledur et al., (2002) and Johnson et al., (2007).

Influence of hen's age on internal egg quality was investigated by Rossiet al., (1994) who found that the average weight of albumen and yolk and their proportion increased with the age of hens. Whitehead et al., (1991) concluded that, by aging of hens came to significant increase in the proportion of yolk andsignificant decrease in the proportion of yolk and significant decrease in the proportion of albumen and egg shell. Hen age has been shown to increase yolk weight (Suk et al., 2001) and yolk proportion (Rizzi et al., 2005) but decreased albumen percentage (Van den Brandh et al., 2004), while Zemkova et al., (2007) found no significant effects of hen age and egg weight classes on internal composition of eggs (mass and chemical composition of albumen and yolk). This study was therefore designed to evaluate the effect of hen age, body weight ranges and egg weights on the percent egg components and internal composition of Harco Hen Egg.

MATERIALS AND METHODS

The experiment was carried out at the poultry unit of the Teaching and Research farm of the Federal University of Technology, Owerri, Imo State, Nigeria. Owerri is in the South Eastern Agro- Ecological zone of Nigeria. Owerri is located at an altitude of 90m. The mean annual rainfall, temperature and humidity are 2500mm, 26.5 -27.5 oC and 70 – 80% respectively. The duration of the dry season, number of months with less than 65mm of rainfall is 3 months.

The layer birds used for the experiment were of Harco Breeds, 32 weeks old and managed in the battery cages. 100 layers were selected at random and weighed. 72 layers were tagged for individual identification and grouped into 3 weight ranges. Weight ranged 1, 1.35 – 1.59kg; weight range 2, 1.6 -1.89 kg and weight range 3, 1.81 -2.25kg. Each weight range had a total of 24 layers which were grouped into three replicates, each replicate containing 8 layers. The birds were fed ad-libitum with commercial layers ration which on analysis contain dry matter 90.3%, crude protein 21.0%,moisture 9.7%,mineral 7.3%, either extract, 12.65%, water was supplied ad-libitum. Eggs were collected at 3pm each day for 3 months.

Every 2 weeks, 4 eggs were randomly selected from the replicates and used to determine percent shell albumen and yolk content. At the end of each month, 3 eggs were picked randomly from each weight range on which proximate analysis was carried out. Moisture contents were determined by oven – drying at 700C for 72 hours, protein content was measured using the Kjeldal method. Other proximate analysis was conducted using the AOAC (1990) methods.

129 eggs were weighed, 29 of them were selected. The aim of the selection was to sort out eggs whose weight fell within the three weight ranges, 55 – 57g, 60-62g and 65 -67g The selected eggs were individually broken out, the wet shell (plus membrane), albumen and yolk were weighted. All weighting was done using Matteler 165 electronic balances. The weight of each egg components was expressed as a percentage of total egg weight. Obtained results were statistically analyzed using standard error means and percentage.

RESULTS AND DISCUSSION

The results obtained in the investigation of the percentage of physical egg components (% albumen, % yolk and % shells) and chemical parameters of albumen and yolk influenced by age, body weight ranges of both the hens and the examined eggs as presented in Tables 1, 2 and 3. The effect of hen age, body weight ranges and egg weight on the proportion of albumen, yolk and shell showed that the percentage albumen content of the eggs weighing 55-57g, 60-62g and 65-67g were 62.90%, 63.70% and 65.80% respectively as shown in Table 1. The yolk content of the eggs weighing 55-57g, 60-62g and 65-67g were 27.0%, 26.50% and 28.80% respectively. The results obtained showed that increasing the weight of the eggs increased the percent albumen but decreased the percent yolk and shell contents.

The eggs from hens with lower body weight (1.35-1.59kg) at 32-35 weeks of age recorded lower egg weight, lower percent albumen and yolk and higher percent shell content while the hens with higher body weight (1.81-2.25kg) at 40-43 weeks of age recorded higher egg weight, higher percent albumen and lower percent yolk and shell. Hen body weight has been shown to determine egg weight. Lewis (1992) reported that average egg weight is dependent upon the pullet body weight at start of lay. The hen in the weight range (1.81 – 2.25kg) recorded the higher egg weight of 65-67g.

The body weight ranges of the hen have significant effect on the weight of yolk and albumen of egg laid. The mass of albumen increased as the weight of the eggs increased while the mass of yolk decreased. The age of the hens have no significant effect on the mass albumen and yolk. The effect of hen age and weight on percent crude protein and crude fat (ether extract) of albumen and yolk of eggs laid (chemical composition of eggs) showed that the crude protein and fat content of the albumen and yolk of the different weight ranges at 32-35 weeks of age had the highest crude protein content which was 82.90%, the lowest crude protein content (64.5%) was also recorded at same age but by layers belonging to WR3 as shown in Table 2. The crude fat content of the yolk varied between 25.90 to 62.70% as presented in Table 3. The chemical composition of the yolk and albumen was variable and no consistent trend was established. The hen age has been shown to decrease the yolk weight and yolk proportion increased albumen percentage.

Table 1: The Effects of Egg Weight on the Percentages of Egg Components

	% WHOLE EGG			
Egg weight (g)	**Percent albumen**	**Percent yolk**	**Percent shell**	**Total**
55 -57	62 .90[c]	27.00[a]	10.10[a]	100
60 -62	63.7[b]	26.50[a]	9.80[b]	100
65 -67	65.80[a]	25.80[a]	8.40[c]	100
SEM	0.70	0.29	0.43	

[abc] mean within the same column with different superscript are significantly different (P<0.05)

Table 2: Effect of hen age and weight on percent crude Protein and crude fat (ether extract) of albumen of egg

	Age of Layers (Weeks)					
	32-35		36 -39		40-43	
Weight Ranges of Layers (kg)	**CP**	**EE**	**CP**	**EE**	**CP**	**EE**
1.35 -1.59 (WRI)	78.10[b]	0.15[C]	65.40[a]	3.20[a]	71.10[b]	10.20[a]
1.60 -80 (WR2)	82.90[a]	0.90[a]	69.00[a]	3.30[a]	71.50[a]	8.30[a]
1.81 -2.25 (WR3)	64.50[C]	0.20[b]	75.00[a]	3.70[a]	66.30[c]	13.30
SEM	4.50	0.20	2.51	0.13	0.36	1.19

[abc] mean within the same column with different superscript are significantly different (P<0.05). *Eggs were collected during the first 28 days of each month.

Table 3: Effect of hen age and weight on percent crude protein and crude fat (ether extract of yolk of eggs)

	Age of Layers (Weeks)					
	32-35		36 -39		40-43	
Weight Ranges of Layers (kg)	**CP**	**EE**	**CP**	**EE**	**CP**	**EE**
1.35 -1.59 (WRI)	26.50[a]	55.40[a]	25.00[a]	55.60[a]	26.50[a]	25.90[a]
1.60 -80 (WR2)	27.80[a]	46.60[a]	26.50[a]	53.20[a]	28.80[a]	61.80[a]
1.81 -2.25 (WR3)	31.30[a]	56.50[a]	31.30[a]	54.60[a]	24.30[a]	62.70
SEM	1.17	2.56	1.54	0.57	1.06	9.90

[abc] mean within the same column with different superscript are significantly different (P<0.05)

The effect of hen age on the percent of albumen, yolk and shell as observed in this study showed that hen age increases percent albumen and decrease the percent of yolk and shell in Harco hen eggs. Ross et al. (1994) reported that the mass of albumen and yolk and size of yolk increased with the aging of birds. The results showed that albumen/yolk ratio was the smallest among eggs from younger poultry (28 weeks of age), and the highest in eggs from older poultry (55- 78 weeks) significant effect of hen age on inner quality of eggs was consonance with the findings of Scot et al., (2000) and Lapao et al., (1991) who reported that eggs from older hens had poor inner quality. The percent egg shell of the Harco hens decreased with age as shown in Table 1, because hens have difficulty producing an increased amount of egg shell at an older age (Joyner et al., 1987).

CONCLUSION

The findings from this study showed that the larger size eggs had higher percent albumen content, therefore as the egg sizes increases percent yolk and shell decreases. There was no discernible effect of hen age and body weight on chemical composition of Harco hen eggs.

References

AOAC (1990). Association of Official Analytical Chemist (16th edition). Association of Official Analytical Chemist, Washington, DC. USA.

Burley, RW AND Vadehra, DV. (1989). The avian egg chemistry and biology. John Wiley and sons, New York, NY.

Fletcher, DL., Britton, WM., Pesti, GM and Rahn, SP (1983). The relationship of layer flock age and egg weight on egg component, yields and solid component. Poultry Sci. 62: 1800- 1805.
Fraser, AC and Bain, MM (1994). A comparison of eggs shell structure from birds housed in conventional battery cages and in a modified free range system. Pg. 151-152 in Proc. 9th European Poult. Conf. World's Poultry Science Association, United Kingdom Branch, Glasgow, UK.
Harvey, W.R (1990). User's guide for LSMLMW and MIXMDL, PC-2 Version, 1990.
Johnston, SA and Gous, RM (2007). Modelling the changes in the proportions of the egg components during a laying cycle. Br. Poult. Sci. 48:347-353.
Joyner, CJ., Peddie, MJ and Tailor, TG. (1987). The effect of age on egg production in the domestic hen. Gen. Comp. Endocrinol. 65:331-336.
Ledur, MC., Lijedahl, LE., Macmillian, I., Asseistine, L. and Fairfull, R.W (2002). Genetic effects of aging on egg quality traits in the first laying cycle of white leghorn strains and strains crosses. Poult. Sci. 81:1439-1447.
Lewis, PD (1992). Personal Communication.
Pandeey, NK., Mahapatra, SS. Verma, SS. and Johri, DC. (1986). Effect of strain on physical egg quality characteristics in white leghorn chickens. Int. J. Poult. Sci. 21:304-307.
Rizzi, C., and Chiericato, GM. (2005). Organic farming production. Effects of age on the productive yield and egg quality of hens of two commercial hybrid hen and two local breeds. Ital. J. Anim. Sci. 4:160-162.
Rossi, M. and Pompei, M. (1994). Changes in some egg components and analytical values due to hen age components and di Scince e Technologiie Alimentari e Microbiologiche, Universita di Milano, via Celoria 2, 2013 Milano, Italy.
Scott, TA. and Silversides, FG. (2000). The effects of storage and strain of hen egg quality. Poultry Science. 79:1725-1729.
Silversides, FC., Korver, DR. and Budgell, KL (2006). Effect of strain of layer and age at photostimulation on egg production, egg quality and bone strength. Poult. Sci. 85:1136- 1144.
Stadelman, WJ. (1977). Quality identification of shell in egg science and technology. 2nd ed. W. J. Stadelman and D.J. Cotterill, Ed. AVI Publishing Company Inc., Westport, CT.
Suk, YO and Park, C. (2001). Effect of breed and age of hens on the yolk to albumen ratio in two different genetic stocks. Poult. Sci. 80:855-858.
Van den Brand H., Parmentier, H.K and Kemp, B. (2004). Effect of housing system (outdoor vs cages) and age of laying hens on egg characteristics. Br. Poult Sci. 45:745-752.
Vits, AD., Weizenburger, H., Hamann, H. and Distl., O. (2005). Influence of different small group systems on production traits, egg quality and bone braking strength of laying hens. First c ommunication: production traits and egg quality. Zuchtungskunde 77:303-323.
Whitehead, CC., Bowman, AS. and Griffin, HD. (1991). The effects of dietary fat and bird age on the weights of eggs and egg components in the laying hen. Brit. Poult. Sci. 32:656-574.
Zemkova, L., Simenovova, J., Lichovinkaova, M. and Somerlikova, K. (2007). The effect of housing system and age of hens on the weight cholesterol concentration of the egg. Czech J. Anima. Sci., 52:110-115.