ABG -07

Effects of Age and Management System on Egg Quality Traits of Fulani Ecotype Hens

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Abstract
The study was carried out to determine the effect of age and management system on egg quality traits of Fulani ecotype hens. Egg quality traits were measured at 20, 22 and 24 weeks of age from 45 Fulani ecotype hens reared in the cage and deep litter system of management. However, 50 to 70 eggs were utilized at different ages. Data were collected on Egg weight (EW), Egg length (EL), Egg width (EWD), Shell weight (SW), Shell thickness (ST), Yolk weight (YW), Yolk width (YWD), Yolk height (YH), Albumen length (AL), Albumen width (AWD), Albumen weight (AW), Albumen height (AH), Yolk index (YI), Albumen index (AI) and Haugh unit (HU); analysed for fixed effect of age and fixed effect of management system. Significant ($p<0.05$) differences were observed in external and internal egg qualities at different ages and management systems. Egg weight, egg length and egg width increase linearly to 24 weeks of age. Age influenced all the observed internal egg qualities except yolk width. Management system had a significant effect on egg weight, egg length, shell weight, yolk weight and yolk height but was significantly ($p<0.05$) influenced in eggs collected from deep litter system. The results indicated that age of the birds and system of management significantly affects egg quality traits. Consequently, it was concluded that Fulani ecotype egg quality traits were better in deep litter system of management and egg quality traits differ significantly at different ages.

Keywords: Hens, Fulani, ecotype, egg shell, yolk, albumen

Introduction

Poultry is a term used collectively for species of domestic birds of economic importance (Oluyemi and Roberts, 2000) among which are chicken, turkeys, ducks etc. Poultry production stemmed from the ancient traditional practices and in general, village producers who kept small flocks of between 2 and 20 birds per household (Gueye, 1997) and they survived as scavengers.

The Fulani-ecotype chicken is native to the drier parts of the country. Although the Fulani-ecotype chicken has been confirmed to be superior to other ecotypes within Nigeria in term of live weight and egg production. They laid bigger eggs, have higher body weight than other ecotype chickens when placed under the same environmental conditions, and were more adaptable to our environment, tough, resistant to prevailing diseases, hardy in nature and survive more (Ajayi, 2010).

Chicken egg contains all the essential amino acid for human and provides a significant amount of several vitamins and minerals including vitamin A, riboflavin, folic acid, vitamin B6, vitamin B12, choline, iron, calcium, phosphorus and potassium along with 163 calories /100g (Ahsan and Massod, 2002) of energy. These significant features led the consumers to demand some internal and external qualities of eggs for this nutrient (Uluocak *et al.,* 1995). The relationship between weight, length and width of eggs has been reported by Daviloo (2000) who also noted that the proportion of yolk, albumen and shell that contribute to the egg weight increase with the hen's age, reaching a plateau by the end of the laying cycle.

This study was therefore designed to determine the effects of age and management system on egg quality traits of Fulani ecotype hens in south west Nigeria.

Materials and Methods

Experimental site: The experiment was carried out at the Teaching and Research Farm, Livestock section (Poultry unit) of the Federal University of Technology Akure, Ondo State, Nigeria. Akure isislocated on latitude 7°18"N and longitude 5°10"E. The site is within the hot, wet equatorial climate with high rainfall as 1,500mm and relative humidity above 75% all the year round with a mean annual temperature of about 27°C. Forty-five Fulani ecotype hens were used for the study. Twenty-three (23) were reared in the cage system while twenty-two (22) were reared in deep litter system**.** All the experimental birds were fed with commercial feeds (18%CP and 2800 Kcal/kgME) and also provided with fresh water.

Eggs collected at 20th, 22nd and 24th week were examined for the external and internal qualities. Egg weight was measured with a Mettler PC 2000 balance after washing and drying with a towel to remove contaminants from the shell. Vernial caliper was used to measure the egg length and egg width. The height of yolk and thick albumen were measured by using spherometers. Haugh unit was calculated as per Haugh (1937) by using the following equation: $H U = 100 \log (H - G^{0.5} (30 W^{0.37} - 100) / 100 + 1.9)$: Where HU = Haugh Unit, H = Albumen height in cm, G = 32.2 and W = egg weight in grammes. Subsequently, the yolk was separated from albumen and weighed. Shell weight was measured after removal of remaining albumen with water and subsequent sun drying for six hours. The weight of albumen was calculated by subtracting the weights

of yolk and shell from the weight of the whole egg. Shell thickness was measured with a micrometer screw gauge in millimeter. Data collected were subjected to 2x3 factorial analysis of variance using the general linear model of SAS (2008). Means separation was carried out using Duncan Multiple range test (DMRT) as outlined in SAS statistical package.

Results and Discussion

Table 1 shows the least squares means for the effects of management system and age on the external egg quality traits. The effect of age on the external egg quality traits had significant ($p<0.05$) difference on the egg weight, egg length and egg width. Also the effect of management on the external egg quality traits revealed significant ($p<0.05$) difference in the egg weight, egg length and shell width. This result agrees with the findings of Ojedapo (2013) who reported that age and season of management are factors influencing egg quality traits. Table 2 shows the least squares means for the effects of management system and age on the internal egg quality traits of the birds. The effect of age on the internal egg quality traits had significant ($p<0.05$) effect on the yolk weight, yolk height, albumen length, albumen width, albumen height, albumen weight, yolk index, albumen index and Haugh unit. Management system had a significant effect ($p<0.05$) on yolk height and albumen width of the eggs from Fulani ecotype hens. This was in agreement with the report of Fayeye *et al*. (2005).

Table 1: Least squares meansfor the effects of management system and age on external egg quality traits of Fulani ecotype hens

Parameters		EW (g)	EL (cm)	EWD (cm)	SW (g)	ST (mm)
Age	20 weeks	28.26±0.50^{c}	4.69±0.04^{b}	3.58±0.03^{b}	4.57±0.07	0.32±0.01
	22 weeks	30.77±0.33^{b}	4.73±0.02^{b}	3.62±0.03^{b}	4.66±0.06	0.32±0.01
	24 weeks	32.88±0.48^{a}	4.89±0.02^{a}	3.83±0.03^{a}	4.71±0.06	0.32±0.01
Management						
CA		29.65±0.39^{b}	4.74±0.02^{b}	3.66±0.03	4.53±0.05^{b}	0.32±0.01
DL		31.64±0.42^{a}	4.81±0.02^{a}	3.70±0.03	4.76±0.05^{a}	0.33±0.01
Age*Management						
CA	20 weeks	27.58±0.57	4.66±0.04	3.60±0.06	4.50±0.09	0.32±0.01
CA	22 weeks	30.16±0.52	4.70±0.03	3.59±0.04	4.50±0.10	0.32±0.01
CA	24 weeks	31.20±0.71	4.85±0.04	3.78±0.03	4.58±0.08	0.32±0.01
DL	20 weeks	28.93±0.80	4.73±0.06	3.55±0.03	4.64±0.10	0.33±0.01
DL	22 weeks	31.38±0.37	4.76±0.03	3.66±0.03	4.83±0.07	0.33±0.01
DL	24 weeks	34.49±0.45	4.92±0.02	3.88±0.05	4.82±0.08	0.33±0.01
Age		*	*	*	NS	NS
Management		*	*	NS	*	NS
Age*Management		NS	NS	NS	NS	NS

^{a,b,c,} = Means on the same column but with different superscripts are statistically ($p<0.05$)significant.
EW = Egg weight, EL = Egg Length, EWD = Egg Width, SW = Shell Weight, ST = Shell Thickness.

Conclusion

From this study, it was found that egg quality traits were influenced differently by the factors considered. Age has a significant effect on egg quality traits and keeping indigenous birds in deep litter system favoured the birds with better egg quality traits. It is hereby recommended that deep litter system of management with age of bird could be combined as a useful tool for genetic improvement of Nigerian indigenous birds through breeding and selection programme.

Table 2: Least squares meansfor the effects of management system and age on internal egg quality traits of Fulani ecotype hens

Parameters		YW(g)	YWD(cm)	YH(cm)	AL(cm)	AWD(cm)	AH(cm)	AW(g)	YI	AI	HU
Age	Wk										
	20	11.53±0.23^{b}	4.43±0.05	0.45±0.02^{b}	10.06±0.12^{a}	9.24±0.11^{a}	0.26±0.01^{b}	11.70±0.32^{c}	4.03±0.20^{a}	1.35±0.04^{b}	84.19±0.06^{a}
	22	12.49±0.23^{a}	4.50±0.04	0.51±0.02^{b}	10.00±0.14^{a}	9.18±0.11^{a}	0.29±0.01^{b}	13.42±0.28^{b}	4.11±0.18^{b}	1.55±0.07^{b}	84.25±0.07^{b}
	24	12.41±0.25^{a}	4.40±0.08	0.73±0.03^{a}	8.75±0.20^{b}	8.19±0.23^{b}	0.45±0.02^{a}	15.21±0.33^{a}	5.91±0.23^{b}	2.75±0.12^{a}	85.13±0.10^{a}
Mgt											
CA		11.81±0.19^{b}	4.47±0.03	0.54±0.02^{b}	9.72±0.15	8.99±0.15	0.33±0.01	13.13±0.30	4.61±0.19	1.84±0.10	84.56±0.08
DL		12.47±0.21^{a}	4.42±0.06	0.59±0.02^{a}	9.48±0.14	8.75±0.13	0.34±0.01	13.78±0.30	4.77±0.20	1.94±0.10	84.50±0.08
Mgt*Age											
CA	20	11.93±0.35	4.50±0.08	0.44±0.02	10.19±0.17	9.38±0.18	0.26±0.01	11.34±0.39	3.81±0.21	1.31±0.07	84.21±0.07
CA	22	12.13±0.30	4.52±0.05	0.52±0.03	10.2±0.16	9.10±0.17	0.29±0.02	13.46±0.42	4.30±0.26	1.52±0.10	84.27±0.11
CA	24	11.38±0.30	4.38±0.05	0.65±0.04	8.76±0.30	8.48±0.37	0.45±0.03	14.60±0.52	5.73±0.35	2.69±0.19	85.21±0.15
DL	20	11.12±0.28	4.35±0.08	0.46±0.03	9.92±0.16	9.11±0.14	0.26±0.01	12.06±0.51	4.25±0.35	1.39±0.06	84.18±0.09
DL	22	12.85±0.33	4.49±0.06	0.50±0.02	9.80±0.22	9.25±0.14	0.30±0.02	13.39±0.37	3.93±0.24	1.57±0.10	84.23±0.10
DL	24	13.39±0.30	4.42±0.14	0.80±0.03	8.73±0.26	7.92±0.28	0.46±0.02	15.80±0.40	6.08±0.30	2.82±0.16	85.07±0.14
Age		*	NS	*	*	*	*	*	*	*	*
Management		*	NS	*	NS	NS	NS	NS	NS	NS	NS
Age*management		*	NS	*	NS	NS	NS	NS	NS	NS	NS

a, b ,c = Means on the same column but with different superscripts are statistically (p<0.05) significant.
Mgt = Management system, Wk = Week, CA = Cage, DL = Deep litter, YW = Yolk Weight, YWD = Yolk Width, YH= Yolk Height, AL = Albumen Length, AWD = Albumen Width, AH = Albumen Height, AW = Albumen Weight, Y I = Yolk Index, AI = Albumen Index and HU= Haugh Unit.

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