APRW -70

Effects of Brand of Feed and Egg Storage Duration on Physical Attributes of Eggs from Laying Hens in the Deep Litter Housing System

O.A. Ogunwole, I.A. Oludoyi, T.V. Abioye, O.O. Adagba, F.O. Jemiseye and S.O. Olufeko
Agricultural Biochemistry and Nutrition Unit, Department of Animal Science, University of Ibadan, Ibadan, Nigeria
Corresponding author: I.A. Oludoyi; E-mail: oludoyiiretiolu@gmail.com; Telephone: 07038685550

Abstract
This study was carried out to determine the effects of brands of feed and egg storage duration on physical attributes of eggs from laying hens in the deep litter housing system. Lohmann Brown layers (n=240) aged 23 - week were randomly allotted to four feed brands. Eggs (n=120) were sampled and stored at an ambient temperature ranging from 25.3 - 26.5^{o}C and relative humidity of 65 - 67% at week 37. The physical characteristics were determined at days 0, 5, 10, 15 and 20 of eggs storage. The experiment was a 4x5 factorial arrangement in a completely randomised design. Similar ($p>0.05$) eggshell thickness was observed from hens on feed brand 2 (0.33mm), 3 (0.31 mm) and 4 (0.32 mm) but significantly ($p<0.05$) higher value was recorded in brand 1 (0.35 mm). Egg weight, length and width were not statistically affected ($p>0.05$) by the different proprietary feeds. Eggs from feed brand 2 and 4 had deeper yolk colour while those from 3 were lighter. There was no significant effect of treatment ($p>0.05$) on albumen height, Haugh unit, yolk weight and diameter of eggs from the different feeds. The egg weight was not altered by the duration of storage from days 5 to 20. The shell weight, yolk weight, egg width and length did not vary during the period of storage. Eggshell weight of feed proprietor 1 was higher while those from 4 were lower on storage day 20. Feed brands did not alter the gross physical attributes of eggs in this study appreciably.

Keywords: Feedbrands, egg physical attributes, duration of storage, laying hens, deep litter

Introduction
Chicken eggs are cheap source of qualityanimal protein which can adequately meet the nutritional requirements of the growing population (Beneda *et al*., 2014). They are commonly used as raw materials in the cosmetics and pharmaceutical industries (Ahmadi and Rahimi, 2011). The quality of eggs is however, directly influenced by nutrition of the hens (Leeson and Caston, 2003). Sub-standard feeds are commonly manufactured in the Nigerian poultry industrymay be due to the ineffectiveness of the quality control agencies (Ucheghu *et al*., 2008). High cost and non-availability of feed ingredients among other factors usually lead to compromise by some producers on quality at the detriment of the poultry farmers who purchase such products and fed them to the laying chickens. Also, the age of feed materials and processing method could affect the nutritional value of feed (Esonu *et al*., 2001).Studies (Hossain *et al*., 2006; Orheruata *et al*., 2006;Ucheghu *et al*., 2009; Ochika*et al*., 2015; Sanusi *et al*., 2015) have been on the impact of different commercial feeds on meat quality and performance of broiler chickens.
There is however, dearth of sufficient experimental evidences on the effect of proprietary feeds on physical characteristics of eggs.

Therefore, this study was carried out to examine the influence of some selected brands of feed on egg quality of hens raised in the deep litter housing system.

Material and Methods
Thisstudy was carried out at the Poultry Unit of the Teaching and Research Farm, University of Ibadan, Ibadan. Lohman Brown layers (n=240) aged 23-week were randomly allotted to four feed brands; (B1, B2, B3 and B4). At week 37, 120 eggs were sampled and stored at an ambient temperature which ranged from 25.3 - 26.5^{o}C and relative humidity of 65-67%. The internal and external attributes were determined at days 0, 5, 10, 15 and 20 of egg storage. The experiment was a 4x5 factorial arrangement in a completely randomised design. The egg weights were measured with Amput High Precision Weighing Balance. Egg length and width were measured with Vernier caliper. The eggshell was air dried at room temperature for 24 hours after which the weight and thickness were determined. Each egg was broken on a flat plate and the yolk was separated carefully from the albumen. Vernier caliper was

used in determining the yolk height. Haugh unit was calculated using the equation described by Haugh (1937) as HU= 100log (h+7.6-1.7$W^{0.37}$).

Results and Discussion

The effects of brands and storage days on egg physical quality indices are shown in Table 1. No significant effect of treatment (p>0.05) was observed in the egg weight, length, width, shell weight, albumen height, Haugh unit, yolk weight and diameter of eggs from hens on the different feed brands. This contrasted the findings of Uchegbu *et al*. (2008) and Oyedeji *et al*. (2013) on reduced egg weight of hens fed the different proprietary feeds. Brand 2 and 4 had deeper yolk colour which may be due to the presence of pigmenting agents and oxygen-containing carotenoids in the feed ingredients used. Also, some manufacturers include supplemental carotenoids in the feed which when consumed were transferred to the blood and later deposited in the yolk.The shell of eggs from feed brand 1 was significantly thicker (p<0.05)compared with other groups. Albumen height, yolk height and Haugh unit were reduced during storage days. This is in consonance with the reports of Jin*et al*. (2011) on albumen height. Haugh unit is used to determine the freshness of eggs hence the reason it reduced as the storage duration increased. The reduction in the yolk height could be attributed to the osmotic migration of moisture content from the albumen to the yolk via the vitelline membrane (Tabidi, 2011).

The effect of interaction of brand and duration of storage on the physical attributes of eggs is presented in Table 2. Eggshell weight of feed brands 1 was higher and those of 4 were lower on storage day 20. On day 0, deeper yolk colour was observed in eggs from feed brand 4 while thicker shell was recorded on day 5 in egg from feed brand 1. The yolk height was significantlyhigher in those fed feed brand 1 on day 0.

Table 1: Effects of feed brands on physical attributes of eggs in duration of storage

Brand	Egg weight (g)	Egg length (mm)	Egg width (mm)	Shell weight (g)	Shell thickness (mm)	Albumen height (mm)	Yolk weight (g)	Yolk diameter (mm)	Haugh unit	Yolk colour
1	60.95	56.83	56.83	6.77	0.35^{a}	7.00	14.50	38.90	82.05	5.20^{b}
2	60.54	55.71	55.71	6.53	0.33^{ab}	7.44	14.80	40.32	83.81	6.57^{a}
3	59.66	55.76	55.76	6.27	0.31^{b}	6.69	14.33	39.47	80.09	3.67^{c}
4	60.82	56.21	56.21	6.50	0.32^{b}	6.74	13.80	40.61	79.90	7.30^{a}
SEM	0.82	0.40	0.40	0.16	0.01	0.21	0.45	0.85	1.58	0.28
Storage										
0	64.18^{a}	57.05	44.17	6.58	0.33^{b}	9.78a	14.92	38.71	98.19^{a}	6.33^{a}
5	59.46^{b}	55.42	43.38	6.67	0.39^{a}	7.90^{b}	14.21	38.81	88.73^{b}	4.67^{b}
10	60.12^{b}	56.02	43.51	6.50	0.29^{c}	6.58^{c}	14.71	40.31	80.43^{c}	6.00^{a}
15	59.89^{b}	56.86	43.46	6.54	0.30^{b}	6.01^{c}	14.79	40.93	75.66^{c}	5.75^{ab}
20	58.81^{b}	55.28	43.24	6.29	0.31^{ab}	4.58^{d}	13.18	40.36	64.28^{d}	5.67^{ab}
SEM	0.92	0.45	0.25	0.18	0.01	0.23	0.50	0.92	1.77	0.31

^{a,b,c} Means in the same column having different superscripts are significantly different (p<0.05), B1, B2, B3 and B4: brands of feed, SEM- Standard error of the mean

Table 2: Effect of interaction of feed brands and duration of storage on physical characteristics of eggs

Brand	Storage	Albumen height (mm)	Yolk height (mm)	Shell weight (g)	Shell thickness (mm)	Yolk colour
	0	10.62^{ab}	18.76^{ab}	6.67^{abcd}	0.35^{bcd}	7.00^{abcde}
	5	7.79^{cd}	15.20^{abcd}	6.67^{abcd}	0.46^{a}	3.33^{fg}
B1	10	6.13^{defg}	14.29^{bcd}	6.00^{abcd}	0.29^{cd}	5.17^{abcdefg}
	15	6.13^{defg}	14.21^{cde}	6.67^{abcd}	0.33^{bcd}	5.00^{abcdefg}
	20	4.36^{g}	9.87^{e}	7.83^{a}	0.33^{bcd}	5.50^{abcdefg}
	0	11.39^{a}	19.65^{a}	5.67^{abcd}	0.32^{bcd}	7.00^{abcde}
	5	8.03^{cd}	16.77^{abcd}	6.33^{abcd}	0.40^{ab}	4.83^{bcdefg}
B2	10	6.69^{cdefg}	15.76^{abcd}	7.00^{abc}	0.29^{cd}	6.17^{abcdef}
	15	6.35^{defg}	13.62^{cde}	6.50^{abcd}	0.31^{cd}	7.17^{abcd}
	20	4.71^{fg}	12.90^{cde}	7.17^{abc}	0.30^{cd}	7.67^{abc}
	0	8.41^{bcd}	15.4^{3abcd}	6.50^{abcd}	0.33^{bcd}	3.00^{fg}
	5	8.13^{cd}	16.51^{abcd}	6.67^{abcd}	0.33^{bcd}	2.83^{g}
B3	10	6.87^{cdef}	15.59^{abcd}	6.67^{abcd}	0.28^{d}	4.77^{cdefg}
	15	5.30^{efg}	14.42^{bcd}	6.17^{abcd}	0.28^{d}	3.83^{efg}
	20	4.76^{fg}	13.14^{cde}	5.33^{cd}	0.33^{bcd}	4.00^{defg}
	0	8.71^{ab}	17.03^{abc}	7.50^{ab}	0.34^{bcd}	8.33^{a}
	5	7.65^{cde}	15.25^{abcd}	7.00^{abc}	0.37^{bc}	7.67^{abc}
B4	10	6.61^{cdefg}	15.47^{abcd}	6.33^{abcd}	0.31^{ab}	8.00^{ab}
	15	6.28^{defg}	15.60^{abcd}	6.83^{abc}	0.30^{cd}	7.00^{abcde}
	20	4.47^{g}	12.54^{de}	4.83^{d}	0.29^{cd}	5.50^{abcdefg}
	SEM	0.65	1.23	0.51	0.22	0.87

^{abc} Means in the same column having different superscripts are significantly different ($p<0.05$), B1, B2, B3 and B4: brands of feed, SEM: Standard error of the mean.

Conclusion and Recommendation

Most egg physical attributes were not affected by the selected feed brands used in this study. Authors therefore, recommended that farmers could give any of the feed brands to laying hens housed in the deep litter housing system. Feed producers may have improved on the uniformity in the quality of their brands.

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