Trop. J. Anim. Sci. 1 (1): 37 - 42 (1999)
ISSN: 1119-4308

EGG QUALITY CHARACTERISTICS OF FOUR LOCAL POULTRY SPECIES IN NIGERIA

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Target audience: Research scientists, egg marketers, industries.

ABSTRACT

Eggs of four poultry species were assessed to compare their physical quality characteristics. The poultry species were the local chicken, the local duck, the guinea fowl and the local pigeon while egg traits studied included weight, shape index, albumen height, Haugh unit, yolk height, shell characteristics, component weights and percentages and yolk colour. Highly significant ($P < 0.05$) differences were obtained for all the quality traits studied except for egg shape index. Egg weight, yolk height and percentage yolk favoured the local duck to the other poultry species. Egg weights were 74.20 g for ducks, 41.60 g for guinea fowls, 36.26 g for local chickens and 17.55 g for local pigeons. Albumen quality expressed in terms of Haugh unit was lowest in local ducks (41.55). Values were 61.85 for the local chicken, 64.65 for the guinea fowl and 66.34 for the local pigeon. Guinea fowl eggs had the highest quality in terms of the shell strength, shell material and yolk colour. Shell thickness averaged 0.59 mm for guinea fowl eggs, 0.52 mm for duck eggs, 0.36 mm for local chicken eggs and 0.20 mm for eggs of the local pigeon. The reults indicate that the guinea fowl egg was the easiest to transport over long distances, had the longest shell life and is useful for its deeply pigmented yolk. These have obvious implications for creating demand and for sustaining the useful life of the products in a depressed economy.

Key words: Egg characteristics; local poultry species

DESCRIPTION OF PROBLEM

In Nigeria, the different poultry species contribute significantly to the annual protein supply to the populace, especially the rural dwellers. These species include the local chicken, the guinea fowl, the local ducks and the local pigeon. They are found in the various ecological zones in the country, though to varying degrees and there are virtually no taboos that hinder the consumption of their meat and eggs. Akinwumi et al. (1) reported that about 92 % of the total poultry population in Nigeria is made up by the local chicken.

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There is the need to fully explore the potentials of these local poultry species in seeking to meet the demand for animal protein by humans. Relative to imported genetic stock, they are more adapted to the local environment in the face of the all-year-round exposure to extremes of weather conditions. Important in this exploration is the characterisation of the egg quality attributes of the Nigerian local poultry species. This investigation was therefore carried out to compare the egg quality parameters of the local chicken, the local duck, the guinea fowl and the local pigeon.

MATERIALS AND METHODS

Eggs of the scavenging local chickens, local ducks, guinea fowls and local pigeons were used in this study. These birds were reared under the prodominant scavenging system of management in which the birds constantly roam about in search of feed which are mostly kitchen wastes, leafy pastures, crop residues and insects. At dusk, however, they returned to the homestead where minimum shelters were provided.

Before each egg was analysed separately, a floatation test recommended by Payne and Williamson (2) was done to confirm that the egg was not bad. Eggs that had just started to deteriorate will float in pure water. The extent of floating in pure water was proportional to the degree of deterioration. Therefore, those eggs that just managed to float were not used for the study. Also, eggs with too watery albumen were not used and care was taken to avoid damaging the vitelline membrane.

External characteristics. : The external characteristics of the eggs measured included the shell colour, shell texture, shell bloom and presence or absence of protuberances or cracks. The egg weight, length and breadth were also measured. The shell colour was classified as white, brown, tinted or mottled. The texture was assessed as either smooth or rough, while the shell bloom was depicted in terms of cleanliness or incidence of blood and/or soil stains. Weighing was done using a sensitive balance while the egg length and breadth were measured using the vernier calipers to the nearest 0.01 cm. The egg length was measured as the distance between the two extreme ends while the breadth measured the diameter of the egg at its widest circumference. Data on the length and breadth were used to calculate the egg shape index, which is the ratio of the width to the length.

Internal characteristics : Each egg was caretully broken at the equator with a spatula and the contents emptied on a dry, smooth, flat glass surface. The yolk colour was taken using the Roche yolk colour fan. Both yolk and albumen heights were taken and the Haugh unit (HU) was thereafter calculated. The yolk was carefully separated from the albumen and weighed, while the shell weight was taken after washing and drying and the shell thickness taken thereafter. The albumen weight was taken by substracting both the yolk and shell weights from the egg weight.

The data were subjected to analysis of variance using the least-squares and maximum likelihood programme (3) with poultry species as the dependent variables.

RESULTS AND DISCUSSION

Shell colour distribution among the four poultry species is shown in Table 1. The local chicken had both white and light brown eggs; 60 % of the eggs of the local chicken were white while 40 % were light brown in colour. Egg shell colour was found to be greatly varied for the guinea fowl, ranging from white (40 %), brown (26 %), light brown (24 %), mottled (6 %) to tinted (4 %). The local duck and the local pigeon both had white and tinted eggs.

Table 1: Shell Colour Variation Among Local Poultry Eggs

SPECIES	WHITE EGGS %	LIGHT BROWN (%)	BROWN (%)	MOTTLED EGGS (%)	TINTED (%)
Local Chicken	60.00	40.00	-	-	-
Local Duck	92.50	-	-	-	7.50
Guinea Fowl	40.00	24.00	26.00	6.00	4.00
Local Pigeon	87.50	-	-	-	12.50

There were significant ($P < 0.05$) differences in egg quality traits of the four local poultry species. Only egg shape index was not significantly affected by species. Table 2 shows the local duck having the heaviest egg (74.22 g) compared to an average weight of 41.60 g for the guinea fowl egg and 36.26 g for the local chicken egg. Shell thickness was significantly in favour of the guinea fowl egg (0.59 mm) compared to 0.36 mm for the local chicken egg. The local pigeon egg shell was the thinnest (0.20 mm). Shell weight, percent shell, albumen height and yolk colour score also favoured the guinea fowl egg. The guinea fowl egg yolk was the most pigmented, with an average score of 13.00 (deep orange) compared to 4.00 (light yellow) for the local chicken and local pigeon.

The local chicken was most varied in weight, with the weight ranging from 25.5 to 41.6 g. The least varied was the local pigeon egg weight, ranging from 16.7 to 18.2 g. HU was highest for the local pigeon egg (66.34) and least for the local duck egg (41.55). Other HU values were 61.85 for the local chicken egg and 64.65 for the guinea fowl egg. With the exception of the local duck egg, the albumen content of the eggs of the local poultry species (both in absolute and relative terms) was greater than the yolk content (Table 2).

Table 2: Species Differences in Egg Quality Traits

TRAITS	SPECIES							
	LOCAL CHICKEN		DUCK		GUINEA FOWL		PIGEON	
	LSM***	S.E	LSM***	S.E.	LSM***	S.E.	LSM***	S.E.
Egg weight (g)	36.26	0.58	74.22	0.66	41.60	0.58	17.55	1.45
Egg length (cm)	4.71	0.03	6.24	0.44	4.80	0.04	4.20	0.09
Egg width (cm	3.61	0.02	4.51	0.02	3.80	0.02	2.58	0.04
Shape index	0.83ns	0.04	0.73ns	0.04	0.80ns	0.04	0.62ns	0.08
Shell thickness (mm)	0.36	0.05	0.52	0.06	0.59	0.05	0.20	0.13
Shell weight (g)	3.42	0.24	7.45	0.24	8.50	0.27	2.09	0.61
Yolk weight (g)	12.00	0.46	38.36	0.52	13.79	0.45	6.86	1.15
Albumen weight (g	22.41	0.42	27.76	0.48	20.78	0.42	8.60	1.06
% Yolk	33.04	0.40	50.71	0.46	32.68	0.39	38.80	1.01
% Albumen	57.10	0.45	38.21	0.51	50.30	0.44	48.0	1.12
% Shell	10.11	0.43	11.06	0.48	17.91	0.42	12.29	1.07
Yolk colour (score)	4.00	0.21	8.00	0.34	13.00	0.21	4.00	0.52
Yolk height (mm)	13.73	0.39	17.99	0.44	14.96	0.39	8.38	0.98
Albumen height (mm)	3.01	0.05	3.41	0.06	3.65	0.05	1.94	0.13
Haugh Unit	61.85	0.70	41.55	0.79	64.65	0.70	66.34	1.76
Egg weight range (g)	25.5-41.6		68.7- 80.2		34.8- 45.6		16.7 - 18.2	

LSM = Least Square Means
SE = Standard Error
*** = Significant ($p<0.001$), except indicated otherwise indicated
ns = not significant

Yolk quality was also assessed by the firmness or standing ability, colour, general appearance, presence or absence of meat or blood spots and mottling and non-mottling of yolk. Eggs of local ducks had the firmest yolk with an average yolk height of 17.99 mm.

The weight, cost and relative availability were used to grade the eggs of the four local poultry species. The local chicken eggs were the cheapest and most available while the costliest and least available were the eggs of the local pigeon. This is regardless of the size of the eggs of the pigeon (Table 3).

Table 3: Grading Local Poultry Eggs With Respect to Weight, Cost and Availability

GRADING FACTOR	HIGHEST	HIGH	LOW	LEAST
Av. Egg Weight (g)	DK (74.2)	GF (41.0)	LC (36.3)	PN (17.6)
Cost Per Egg (N)	PN (100.00)	DK (50.00)	GF (15.00)	LC(10.00)
Availability	LC	DK	GF (Seasonal)	PN

LC: Local chicken, GF: Guinea fowl, DK: Local duck, PN: Local pigeon.

The variations obtained for egg shell colour for the different species indicate that the trait is a species characteristic and is important in determining consumer preference. In addition to this, Abiola (4) observed that this trait might also be determined by the ear lobe colour. However,

the present study has not found any effect of shell colour on internal quality parameters of eggs of the species.

The identical egg shape indices obtained for these species indicate that most avian species have similar egg shapes which have been described as ovoid. Eggs that are too large or too small conform to this shape, though they may not fit into conventional egg packaging materials. As a result, they may break very easily during packaging and transportation.

The relatively very high values of shell thickness and shell weight reported for the guinea fowl egg indicate that the guinea fowl egg is more resistant to breakage compared to eggs of other local poultry species. Hamilton (5) obtained a positive and significant relationship between shell thickness and shell strength. It is therefore possible that the very high values of shell thickness and shell weight obtained in the present study for the guinea fowl eggs are adaptive features enabling the guinea fowl to cope with the adverse conditions of the natural environment in the wild. With its more compact size and higher weight, the guinea fowl egg shell seems to be less porous to gases and microbes as compared to the local chicken egg. They probably can therefore be stored longer and handled safer with less risk of damage than the eggs of the other species.

The values obtained for the various traits of the local duck egg indicate that the egg might be very porous. This implies that albumen moisture loss might be greater and more rapid in the local duck egg compared to the other species. The advantage of the duck egg in yolk weight, percent and yolk height relative to eggs of other local species might not be due to the sheer absolute size of the duck egg.

The variation in yolk colour observed among the local poultry species may be attributed to the different sources of eggs and their different feeds. The deep orange colour of the guinea fowl egg yolk could be due to consumption of pasture which contain carotenoid pigment(6). Orr and Flecher (7) have also reported that yolk colour is carried over to food products obtained from the yolk. Therefore, guinea fowl eggs with their natural yolk colour would make excellent materials for the pastries and food product manufacturers mindful of colour in their products provided the birds have access to pasture. This has obvious implications for creating lasting demand for egg and egg products in a developing economy.

Blood or meat spots, mottled yolks, blood-smeared eggs and double-yolk eggs were not observed in this study. Nalbandov and Card (8) included these as part of the characteristics of the chicken egg.

CONCLUSIONS AND APPLICATIONS

The present study shows that the eggs of local poultry species found in Nigeria meet the United States Standards for quality of industrial eggs as earlier categorised (8). Eggs of the local chicken, guinea fowl and local

pigeon with their very high HU of more than 60 are in category A while eggs of the local duck with an average HU of 41 fall under category B.

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