

EFFECT OF PLUMAGE COLOUR ON EGG PRODUCTION AND QUALITY CHARACTERISTICS OF TIV LOCAL CHICKEN

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Abstract

This study was conducted to determine the effect of plumage colour on egg production and quality characteristics of Tiv local chicken ecotype. The various plumage colours were ash, black, brown, grey and white. The birds (100) were housed individually in battery cages according to their plumage colour and allowed to lay for a period of three months. Data collected include egg number, HDP, HHP and egg quality (internal and external) characteristics, data collected were subjected to one-way Analysis of Variance of the SPSS software version 21. The results obtained indicated that plumage colour had no significant ($P>0.05$) effect on egg production. However, brown plumage coloured layers had non significant ly highest number of eggs (48.67 ± 5.17). Plumage colour had significant ($P<0.05$) effect on internal and external quality characteristics except on egg length, egg shape index, albumen height and York index. Brown coloured layers had significantly ($P<0.05$) higher egg weight, egg width and egg shell weight.

Keywords: battery cage, egg number, external egg quality, hen day, hen house, internal egg quality

INTRODUCTION

The traditional poultry sub-sector consists of native indigenous chicken which have been classified into many ecotypes (Momoh, 2007), and is confined to rural areas, villages, and peri-urban settlements where free ranging can be practiced. In Nigeria, the native chickens constitute about 80% of the 120 million birds in the country which are kept under traditional family based production system. They contribute substantially to annual egg and meat production for family consumption and for sale. In Nigeria, indigenous chickens were characterized along genetic of feather and plumage color (such as normal or frizzled feathered), body structure (such as naked neck, dwarf type) and color variation (such as black, white, brown, mottled etc). Gwaza *et al.* (2015) observed that, there is diversity in local chicken with respect to plumage types, plumage colour, leg feathering and comb types. Gwaza *et al.* (2015) reported the presence of some major genes affecting feather structure and feather distribution in the Nigerian local chickens. Gwaza *et al.* (2015) further noted that major genes of plumage colour are important as they enhance the thermoregulatory activities of the birds. There is however no evidence of work done on egg production and quality characteristics as a result of plumage colour. The objective of the study was to determine the effect of plumage colour on egg characteristics of the Tiv local chicken.

MATERIALS AND METHODS

The experiment was carried out at the Livestock Teaching and Research Farm of the Faculty of Agriculture, Shabu – Lafia campus, Nasarawa State University Keffi, Nasarawa State. The experimental birds were sourced from Tiv settlements iin Nasarawa and Benue states. One hundred (100)laying hens were used. They were grouped based on their plumage colors. Each colour group was housed separately in the battery cage system. They bird were fed formulated layers mash containing 16.5 percent crude protein and 2600kcal/kg metabolizable energy. Eggs were collected on daily basis in the morning and evening. The eggs were weighed immediately using sensitive electronic scale. The eggs were further assessed for external and internal characteristics using destructive techniques, based on the plumage colour of the hens laying them. Though local chickens are hardy, anti-stress and egg production multivitamin was administered periodically to enhanced egg production and check against possible disease outbreak. Egg production was monitored for 3 months and it was expressed based on hen day and hen housed egg production.

Parameters

Egg Number: The total numbers of eggs laid by each hen was recorded monthly for a period of 3 months (part period egg production). The following measures of egg production were determined:

- (a) Percent part-lay Hen Housed egg production (% HHP) These were expressed as:

$$\% \text{ HHP} = \frac{\text{Total egg laid}}{\text{No. of birds housed} \times \text{No of days since housed}} \times \frac{100}{1}$$

- (b) Percent Hen day egg production (% HDP)

$$\% \text{ HDP} = \frac{\text{Total egg laid}}{\text{No. of birds alive} \times \text{No of days since hen laid}} \times \frac{100}{1}$$

Egg Weight: The weights of the first 3 eggs of each hen were taken in grams at months 1, 2 and 3 of lay to determine average egg weight.

Egg Quality Traits

External Egg Quality: External egg qualities traits such as egg length, egg width, egg shape index, egg shell weight and egg shell thickness were recorded at months 1, 2 and 3 of lay of lay. Egg length and egg width were measured using a vernier calipers. For shell thickness measurement, eggs were broken and the shells were gently washed with clean water and cuticle gently removed and air dried for 24 hours. Samples were taken and measured with the aid of micrometer screw gauge.

Internal Egg Quality: The internal egg qualities recorded include albumen length, albumen height, albumen width, yolk height, yolk width, yolk index and haugh unit. These were carried out at months 1, 2 and 3 of lay using the destructive techniques. By this method, the eggs will be gently broken and the content carefully poured on a flat platform. Vernier caliper was used to measure albumen length, albumen width, yolk width and yolk height.

Experimental Design

The design of the experiment was Completely Randomized Design (CRD). Simple random sampling technique was employed for the distribution of the birds' population.

Data Analysis.

Data collected on all the parameters of egg traits were analyzed using a one-way Analysis of Variance (ANOVA) and correlation in a completely randomized design of the SPSS statistical software (2011).

RESULT

The effect of plumage colour on monthly egg number is presented in table 1. Plumage colour had no significant ($P>0.05$) effect on monthly egg number in the Tiv local chicken ecotype. Similarly, the effect of plumage colour on hen day and hen housed egg production (table 2) was not significant. However, plumage colour (table 3) had significant ($P<0.05$) effect on internal and external egg quality characteristics except on egg length, egg shape index, albumen height, and York width. Brown plumage colour had significantly ($P<0.05$) higher egg weight ($42.20 \pm 1.04\text{g}$) followed by white and yellow plumage colours with values of (39.93 ± 0.70 and $39.64 \pm 0.70\text{g}$) respectively. Grey plumage colour had the lowest egg weight ($35.80 \pm 0.86\text{g}$). Similarly, brown plumage colour had significantly ($P<0.05$) higher egg width ($3.97 \pm 0.08\text{cm}$). This was followed by white plumage colour ($3.82 \pm 0.03\text{cm}$) while grey plumage colour had the lowest egg width ($3.68 \pm 0.04\text{cm}$). Ash, black, brown, white and yellow plumage colours had statistically similar egg shell weight among themselves (4.02 ± 0.09 , 4.25 ± 0.10 , 4.14 ± 0.12 and $4.17 \pm 0.11\text{cm}$) but they all differed significantly ($p<0.05$) from grey plumage colour. Brown plumage colour had significantly ($p<0.05$) higher egg shell thickness ($46.20 \pm 0.72\text{mm}$) followed by black, white and yellow plumage colour (44.50 ± 0.44 , 44.60 ± 1.02 and $45.29 \pm 1.06\text{mm}$) while grey had the lowest egg shell thickness ($40.00 \pm 2.10\text{mm}$). Ash plumage colour had significantly ($p<0.5$) higher albumen length ($7.82 \pm 0.13\text{cm}$) followed by black, brown and grey plumage colours, while white and yellow had the lowest albumen length. Black plumage colour had significantly ($p<0.05$) higher albumen width ($5.90 \pm 0.78\text{cm}$) compared to other plumage colours which were similar statistically. Black, brown, grey, white and yellow had statistically similar York height and york index, but they all differed significantly ($p<0.05$) from ash colour 38.25 ± 3.10 , $1.41 \pm 0.14\%$. Grey plumage colour had significantly ($p<0.05$) higher haugh unit (29.17 ± 1.61), followed by ash and white plumage colour, (25.42 ± 1.09 and 24.35 ± 1.34) while brown plumage colour has lowest haugh value (23.69 ± 1.03).

Table 1: Effect of Plumage Colour on Monthly Egg number of Tiv Local Chicken Ecotypes raised in battery cage system

Egg production	White	Black	Yellow	Brown	Ash	Grey	LOS
Month 1	13.80±3.22	16.17±1.96	16.33±1.76	14.00±3.71	20.00±4.00	20.00±0.00	NS
Month 2	10.60±3.47	15.17±3.98	14.33±2.40	16.00±2.35	15.00±1.00	8.00±0.00	NS
Month 3	17.40±2.62	17.60±2.11	18.00±1.73	19.40±1.33	19.00±1.00	21.50±0.50	NS
Total	41.80±8.66	49.00±7.79	48.67±5.17	49.40±5.14	54.00±4.00	49.50±0.50	NS

Table 2: Effect of plumage colour on Hen Day and Hen Housed Egg Production of Tiv Birds raised in Battery Cage

Egg Production	White	Black	Yellow	Brown	Ash	Grey
Hen day egg production						
Month 1	46.00	53.89	54.44	46.67	66.67	66.67
Month 2	35.33	50.56	47.78	53.33	50.00	26.67
Month 3	58.00	58.89	60.00	64.67	63.33	70.00
Total	46.44	54.45	54.07	54.89	60.00	54.45
Hen housed egg production						
Month 1	46.00	53.89	54.44	46.67	66.67	66.67
Month 2	35.33	50.56	47.78	53.33	50.00	26.67
Month 3	58.00	58.89	60.00	64.67	63.33	70.00
Total	46.44	54.45	54.07	54.89	60.00	54.45

Table 3: Effect of Plumage Colour on Egg Quality Characteristics of Tiv Local Chicken Ecotypes raised in battery cage system

Egg characteristics	Ash	Black	Brown	Grey	White	Yellow	LOS
Egg weight	37.27±0.4 ^{9^{cd}}	38.87±0.3 ^{5^{bc}}	42.20±1.0 ^{4^a}	35.80±0.8 ^{6^d}	39.93±0.7 ^{0^b}	39.64±0.7 ^{0^b}	*
Egg length	4.83 ±0.06	4.88±0.05	4.93±0.07	4.88±0.07	4.86±0.04	4.98±0.06	NS
Egg width	3.71±0.03 ^{bc}	3.79±0.01 ^{bc}	3.97±0.08 ^a	3.68±0.04 ^c	3.82±0.03 ^b	3.78±0.03 ^{bc}	*
Egg shape index	76.97±1.2 ⁰	77.11±0.7 ⁶	79.23±1.4 ¹	75.42±0.3 ⁵	78.66±0.9 ⁸	74.64±2.3 ⁰	NS
Egg shell weight	4.02±0.09 ^a	3.92±0.07 ^{ab}	4.25±0.10 ^a	3.66±0.20 ^b	4.14±0.12 ^a	4.17±0.11 ^a	*
Egg shell thickness	42.7±1.29 ^{b^c}	44.50±0.4 ^{4^{ab}}	46.20±0.7 ^{2^a}	40.00±2.1 ^{0^c}	44.60±1.0 ^{2^{ab}}	45.29±1.0 ^{6^{ab}}	*
Albumen length	7.82±0.13 ^a	7.53±0.13 ^{ab}	7.24±0.15 ^{ab}	7.22±0.18 ^{ab}	6.63±0.11 ^b	6.91±0.55 ^b	*
Albumen height	0.55±0.02	0.58±0.02	0.60±0.03	0.60±0.08	0.63±0.39	0.59±0.03	NS
Albumen width	5.54±0.09 ^b	5.90±0.78 ^a	5.50±0.10 ^b	5.30±0.09 ^b	5.35±0.08 ^b	5.61±0.13 ^{ab}	*
York height	1.41±0.14 ^b	1.62±0.0 ^a	1.70±0.04 ^a	1.58±0.02 ^a	1.72±0.03 ^a	1.65±0.03 ^a	*
York width	3.74±0.06	3.67±0.04	3.77±0.04	3.70±0.06	3.74±0.05	3.76±0.05	NS
York index	38.25±3.1 ^{0^b}	44.53±0.8 ^{9^a}	45.28±0.9 ^{8^a}	42.75±0.9 ^{3^{ab}}	46.32±1.0 ^{6^a}	43.97±1.1 ^{5^a}	*

	25.42±1.0	23.69±0.9	20.49±1.0	29.17±1.6	24.35±1.3	22.43±1.0	*
Haugh unit	9 ^b	3 ^{bc}	3 ^c	1 ^a	4 ^b	8 ^{bc}	

Los = Level of significant, ^{abc} = mean value with the same superscript on the same row are not significantly (P<0.05) different.

DISCUSSION

The egg number obtained for Tiv local chicken according to plumage colour strongly agree with the report of Momoh (2007) who reported that indigenous poultry of Nigeria for short term egg production was 48.5±41. The egg number is however higher than 38.56 egg reported by Vivian (2011) as the short term (90 days from first lay) egg number for the Nigerians light chicken ecotype. The external and internal egg quality figures of the Nigeria local chicken have shown variation due to plumage colour. The mean egg weight (35.80±0.86 g) obtained in the present study strongly with the report of Adedokun and Sonaiya (2001) who gave mean values of 39±1.0, 37.9±1.0 and 37.1±1.0g for three chicken ecotype from derived savanna, guinea savanna and rain forest agro-ecological zones of Nigeria, respectively. Tule (2005) reported an annual mean weight of light and heavy ecotype on deep litter as 38.73 g and 38.59 g and those on battery cage as 38.54 g and 39.35 g. Egg weight is largely affected by environmental factors, feeding, chicken ecotype, age, genetic make-up and parental average body weight (Yakubu *et al.*, 2008). Mean egg length obtain in the present study strongly agree with the value (5.15cm) reported by Yakubu *et al.* (2008) in Nigeria local chicken. The mean value of egg width obtained in this study is slightly lower than the value (3.68±0.04) reported by Gwaza *et al.* (2015) for Tiv local chicken. Egg shape index value (74.64±2.30 and 75.42±0.35) obtained in this study is slightly higher than 72.60% reported by Yakubu *et al.* (2008) for normal feathered indigenous chickens in Nigeria. Higher egg shape index is an indicator of external egg quality. Mean value of egg shell weight obtained in this study (3.66±0.20 g) is lesser than the value of 5.8±20.16 reported by Gwaza *et al.* (2015). The slightly lower shell weight recorded in this study could probably be due to the efficacy of the weighing scale use, weight of the eggs and/or the method/period of drying of the shell. Egg shell thickness in the current study (40.00±2.10 mm) is higher than the value reported by Yakubu *et al.* (2008) and Momoh *et al.* (2007). Albumen height obtained in this study fairly agree with the value of 0.651cm report by Bobbo *et al.* (2013) for egg quality characteristic of phenotypes of local chickens in Adamawa State if Nigeria. Variation in internal characteristic of egg could be due to the freshness of the egg and the type of feed given.

CONCLUSION AND RECOMMENDATION

The study was conducted to determine the effect of plumage colour on egg production and egg quality characteristics of Tiv local chicken ecotype. From the finding of this work, it was concluded that plumage colour had no effect on egg production but had a significant effect on egg quality characteristic. Brown colour is hereby recommended for commercial egg production due to it high egg production.

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