

ABG -21

Fulani Ecotype Chicken Genetic Resource under a Pastured Poultry Management System – 1 – Factors Affecting Egg Characteristics

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Abstract

The objectives of this study were to evaluate the effect of age of hens on egg production and external egg characteristics of Fulani ecotype hens (FEH). Data on weekly egg production records covering 45 weeks of 143 laying hens under a pastured poultry management system were analyzed. Age distribution of hens was divided into 9 sub-phases, based on the period of lay with five weeks making up each sub-phase. During the 45-week evaluation period, hen-day egg production (HDEP) showed a bimodal distribution with first and second peaks recorded at 25th and 37th week of egg lay. Significant differences were observed across age groups for all observed traits ($p \leq 0.05$). The highest HDEP (27.20 ± 2.1), egg weight (43.07 ± 0.57 g) and egg length (5.14 ± 0.01 cm) were observed between weeks 57 and 61, while weeks 62 and 66 recorded the highest egg width (3.82 ± 0.02 cm) and egg shape index (0.75 ± 0.005). It could be concluded that FEH may have double peaks during their production period, and that age influenced egg production and egg characteristics.

Keywords: Fulani chickens, ecotype, hen-day egg production, egg characteristics

Introduction

Raising chickens for eggs offer a means of solving problems of animal protein shortage especially in the rural areas of many African countries (Sonaiya *et al.*, 1999). Achieving this, requires efficient evaluation and selection of laying hens for egg production characteristics and traits that can be considered as selection criteria for breeding stocks (Dana *et al.*, 2010). External traits of eggs including egg shape, weight/size, and colour, influence consumer preferences and are included in selection criteria for layers.

Fulani ecotype chickens possess the characteristic dual purpose of serving as alternative means of meat and egg production especially in rural areas of parts of Nigeria (Fayeye *et al.*, 2005). A study on the effect of age on egg production of FEC hens will uncover information that will contribute to improved lifetime performance of layers (Ledur *et al.*, 2000).

The objective of this study was to evaluate the effect of age of hens on egg production and to assess external egg characteristics of Fulani ecotype hens under a pastured poultry management system.

Materials and Methods

One hundred and forty-three pullets were used for this study. The pullets were divided into two batches of 60 and 83 birds. The pullets were vaccinated against Newcastle disease, tagged and raised for forty-five (45) weeks at the Pastured Poultry Unit, Teaching and Research Farm, Obafemi Awolowo University Ile-Ife, Osun State, Nigeria. They were fed layers' mash diet containing 18% CP and 2,900Kcal/Kg of Metabolizable energy (ME) for the period of the experiment. Clean water was provided daily.

Hens were trap-nested and weekly egg production data was collected from the first week of lay to the 45th week. Eggs were weighed, using SF-400, electronic scale of 10 Kg capacity. External egg traits such as the egg length and width were measured using a Vernier Calliper, with 1/100 cm graduation. Egg shape index (ESI) was determined by dividing the egg width by the egg length and then multiplying by one hundred. Twelve hens were removed from the flock due to mortality.

Period of egg lay (45 weeks) was divided into 9 sub-phases consisting of 5 weeks/sub-phase. Hen-day egg production (HDEP) was determined by dividing the number of eggs produced by the number of chickens available multiplied by one hundred.

Statistical Model: $Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \epsilon_{ijk}$

Where: Y_{ijk} = egg trait of the k^{th} bird in the j^{th} phase of lay of the i^{th} batch; μ = overall mean; α_i = fixed effect of i^{th} age group ($i=9$), β_j = effect of j^{th} batch ($i=2$), $(\alpha\beta)_{ij}$ = interaction effect between j^{th} phase of lay and the i^{th} batch

ϵ_{ijk} = Random error associated with each observation

Results and Discussion

The hen-day egg production (HDEP) for the Fulani ecotype hens (FEH) is displayed in Figure 1. HDEP increased rapidly until the 4th week of egg lay, which also served as the 1st peak of production (recording 31%). This was however, followed by fluctuations in performance for HDEP. At week 37 of egg lay, a 2nd peak (30%) was observed. Subsequently, there was a gradual reduction to 27.5%, where a sustained level was observed till week 41, before another decline. This production trend is similar to that reported by Mube *et al.* (2014) on local barred hens in Cameroon. These irregularities could be attributed to broodiness habit of indigenous chickens, a resting phase, during which they do not lay eggs (Ajayi, 2010).

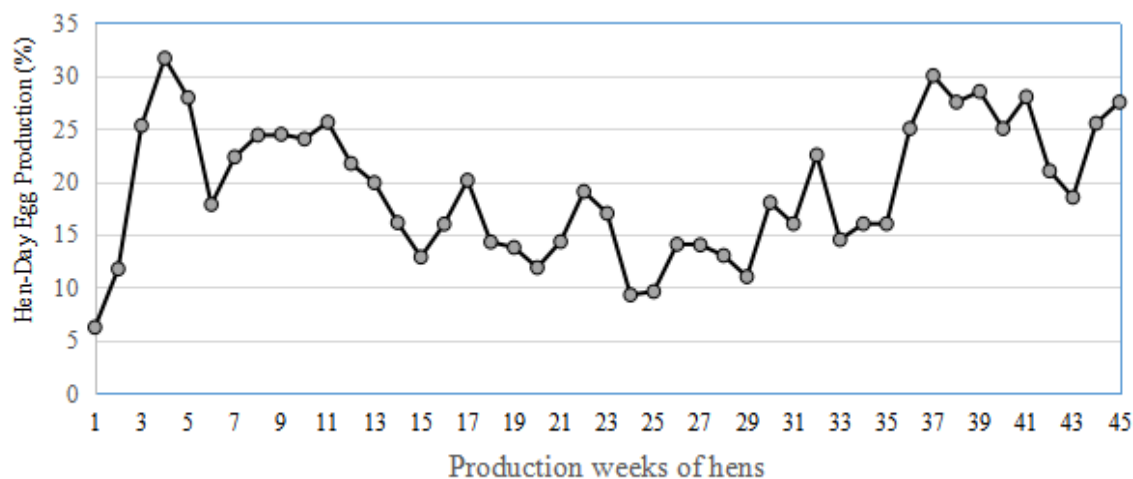


Fig. 1. Hen-Day Egg Production (HDEP) for Fulani Ecotype Chickens (45 Weeks)

Least squares means and Duncan groupings of the age effect on HDEP and external egg characteristics are presented in Table 2. Significant differences were observed across different age groups for all observed traits ($p \leq 0.05$). The highest HDEP was observed between weeks 57 and 61 (27.20 ± 2.1). These results may indicate that HDEP is affected by the age of the birds, in agreement with Şekeroğlu *et al.* (2014), and Okoro *et al.* (2017). These authors reported significant changes in HDEP across the different age classes of hybrid ATA-S hens and Boschveld indigenous chickens respectively. Şekeroğlu *et al.* (2014) also reported an increase in HDEP from 18 to 42 weeks of age. The Fulani ecotype hens however, showed more fluctuations in HDEP, with two peaks recorded before mid-lay (25th week) and at the 37th week, where a second peak was observed.

Table 1. Least Squares Means and Duncan groupings of Age effect on Egg Production and Some External Egg Characteristics

Age (Weeks)	Egg production traits \pm SE				
	HDEP (%)	Weight (g)	Width (cm)	Length (cm)	Egg Shape Index
22-26	20.56 \pm 2.21 ^{ebcd}	31.77 \pm 0.57 ^e	3.43 \pm 0.02 ^e	4.65 \pm 0.01 ^f	0.74 \pm 0.005 ^{ab}
27-31	22.60 \pm 2.21 ^{abc}	37.06 \pm 0.57 ^d	3.57 \pm 0.02 ^d	4.84 \pm 0.01 ^e	0.74 \pm 0.004 ^{ab}
32-36	19.23 \pm 2.21 ^{bcd}	38.91 \pm 0.57 ^c	3.61 \pm 0.02 ^{dc}	4.94 \pm 0.01 ^d	0.73 \pm 0.005 ^b
37-41	15.20 \pm 2.21 ^d	40.56 \pm 0.57 ^b	3.66 \pm 0.03 ^{bc}	5.03 \pm 0.02 ^c	0.73 \pm 0.005 ^b
42-46	13.85 \pm 2.21 ^d	41.45 \pm 0.57 ^{ab}	3.69 \pm 0.03 ^b	5.05 \pm 0.02 ^{bc}	0.74 \pm 0.006 ^{ab}
47-51	14.01 \pm 2.21 ^d	42.06 \pm 0.57 ^{ab}	3.69 \pm 0.03 ^b	5.09 \pm 0.02 ^{ab}	0.73 \pm 0.006 ^b
52-56	17.00 \pm 2.21 ^{dc}	42.74 \pm 0.57 ^a	3.69 \pm 0.03 ^b	5.06 \pm 0.02 ^{bc}	0.73 \pm 0.005 ^b
57-61	27.20 \pm 2.21 ^a	43.07 \pm 0.57 ^a	3.73 \pm 0.02 ^b	5.14 \pm 0.01 ^a	0.73 \pm 0.004 ^b
62-66	24.10 \pm 2.21 ^{ab}	42.53 \pm 0.57 ^a	3.82 \pm 0.02 ^a	5.09 \pm 0.02 ^{ab}	0.75 \pm 0.005 ^a
P-value	<.0001	<.0001	<.0001	<.0001	0.0403

*Means with different alphabets are significantly different; $p \leq 0.05$; HDEP: Hen-Day Egg Production

The egg weight, egg length and egg width, from this study increased as the birds mature in age. The lowest egg weight, length and width were observed in weeks 1 to 5 of lay, while higher values were observed in the latter weeks (6-45), thus implying that these parameters are affected by age of the birds. Egg characteristics, have been reported to be influenced linearly by the age of the hens (Okoro *et al.*, 2017). This can be due to the fact that the birds develop higher body weight, as they advance in age (Alsoyabel *et al.*, 1991; Usman *et al.*, 2014), or as a result of increase in albumen content of the eggs (Olori and Sonaiya, 1992). This increased albumen formation, according to Austic and Nesheim (1990), is dependent of the stage of the hen's reproductive cycle, which is however, attributed to the magnum size of the oviduct, which increases with age of layer. The oviduct weight is reported to be a stronger influence among all the factors affecting egg weight (Gerstmayr and Horst 1990). The egg shape index, however increased, up until 42nd to 46th week, before a gradual reduction is observed.

Conclusion

Results from this study showed that FEH have double peaks during their production period and that age can serve as an important factor in egg production and egg characteristics. With the highest production and heaviest eggs observed at 57 and 61 weeks, selection process can thus be targeted at this period for elite stock, serving as the basis for genetic improvement of Fulani ecotype chickens.

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