

EGG PRODUCTION PERFORMANCE OF THREE DIFFERENT LAYER STRAINS IN MAIDUGURI, NIGERIA.

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ABSTRACT

Data on egg production were analyzed to investigate the performance of three strains of layer chickens (*Rhode Island Red, Isa Brown and Bovin Brown*) from 2006-2011 at the University of Maiduguri Poultry Unit of the Livestock Teaching and Research Farm, Maiduguri, Nigeria. The birds were reared in open-sided building with a 2-tier battery cages, clean water and feed were provided *ad libitum*. Eggs were picked twice a day. Laying hens were observed daily and records on egg production, feed intake and mortality were kept adequately. Strict health management was observed. The means were separated using the Duncan Multiple Range Test. It was observed that strain, age, season and year vary significantly ($P < 0.001$) in egg production and feed intake, where birds within the age group of 40-44 weeks had the highest egg production ($58.76 \pm 4.13\%$) and feed intake ($134.86 \pm 1.33\text{g}$), respectively. The lowest production was recorded at 20-24 weeks ($35.39 \pm 1.99\%$). Rhode Island Red recorded the highest egg production ($58.83 \pm 0.29\%$) and feed intake ($144.78 \pm 1.30\text{g}$), while lowest production and feed intake ($41.81 \pm 0.89\%$), ($101.22 \pm 0.86\text{g}$) were recorded for Isa Brown. Dry-cold season favoured egg production ($57.47 \pm 0.39\%$) and feed intake ($130.68 \pm 1.19\text{g}$), while the lowest production was recorded in the wet season ($46.36 \pm 0.87\%$). However, lowest feed intake was observed in the Dry-hot season ($115.55 \pm 1.18\text{g}$). Highest egg production ($60.67 \pm 2.02\%$) was recorded in 2009, which was not significantly different from 2007 ($58.83 \pm 0.29\%$).

Keywords: Layers, egg production, feed intake, strains, season.

INTRODUCTION

Layers are primarily developed for egg production and are lighter than broilers and therefore need less feed to maintain their body while laying (Awobajo *et al.*, 2009). In a quest to develop a breed that could survive and perform well under severe climatic condition of most areas, various strains of poultry have been developed to obtain maximum egg production (Akhtar *et al.*, 2007). Majority of poultry are raised under intensive system of farming, which according to the World Watch Institute in 2014, 68% of the world's poultry egg are produced using this technique. Many factors and their interactions influence flock performance, be it economic in relation to animal welfare or other criteria. Almost each farm has a unique combination of location, climate, and management during rearing, breed, feed and management in laying period (Leenstra *et al.*, 2014). Ultimately, interactions among the aforementioned factors tend to impart an effect on layer performance. Therefore, assessing the productive ability of layers becomes significant for evaluating the performance of different strains under same management system, as influenced by factors such as season, year of production and age of birds. This study was undertaken to assess egg production and feed intake parameters among Rhode Island Red, Isa Brown and Bovin Brown as influenced by strain, age, season and year at the poultry unit of the University of Maiduguri Livestock Teaching and Research Farm.

MATERIALS AND METHODS

Records on egg production and feed intake of three commercial layers reared between 2006 and 2011 were obtained from the University of Maiduguri poultry unit of the Livestock Teaching and Research farm, Maiduguri, Borno state. Maiduguri the capital of Borno state, is on an altitude of 345 m above sea level and is situated on latitude 11.83°N and longitude 13.14°E (Encarta, 2009). Maiduguri falls within the Sahelian region of West Africa and it is characterized by fluctuating climatic and seasonal variations. Furthermore, the area has a very short period (3-4 months) of rainfall, between July - September recording 645.9 mm/annum with a long dry season of about 8-9 months' (Aliyu, 2013). The ambient temperature is about 31°C during the wet seasons and above 40°C by April - May, while relative humidity is about 90% in August and as low as 5% in December - January (Encarta, 2009). Based on the climatic changes, the years are divided into 3 seasons, namely; wet (June-September),

dry cold (October -January) and dry hot (February-May). The flock consists of Rhode Island Red, Isa and Bovin Brown, reared in open-sided building with a 2-tier battery cages fitted with feeders and drinkers. Clean fresh water and feed were provided *ad libitum*. Eggs were picked twice a day in the morning and evening. Laying hens were observed daily and records on egg production, feed intake and mortality were kept adequately. Strict

health management, routine vaccination and deworming were observed. All data collected were subjected to analysis of variance using the SPSS package (2006) and means were separated using Duncan's multiple range tests.

RESULTS AND DISCUSSIONs

Egg Production

Egg production records by strain, age, season and year are presented in Table 1. Rhode Island Red recorded significantly highest ($P<0.01$) egg production followed by Bovin brown (53.08 ± 10.16) and lastly Isa brown (41.81 ± 0.89). Ashraf *et al.* (2003) also reported significant strain difference with Rhode Island Red recording highest egg production (69.44%) than Lyallpur Silver Black (49.24%) and concluded that higher production of this strain may be due to its superior genetic constitution. Age of layer birds in this study significantly ($P<0.001$) affected egg production. The highest production was recorded at 40-45 weeks (58.76 ± 4.13) while the lowest was at 20-24 weeks (35.39 ± 1.99) of age. Yasmeen *et al.* (2008) stated that egg production in the pullets (12.80 ± 1.114) was higher than spent layers (10.06 ± 0.966) %. The probable explanation for more egg production in first production cycle may be the ability of birds to utilize their feed more efficiently than those of second production cycle. The effect of season on egg production was significant ($P<0.01$). The highest egg produced was recorded in the dry cold season of (57.47 ± 0.39) while the lowest was in the wet season (46.36 ± 0.87). The thermo neutral zone of laying hen is between 18 - 28°C. High temperatures of above 40°C recorded in the dry season affect the overall performance of layer bird; high mortality, low feed intake and poor performance are recorded throughout this period. Oarad *et al.* (1981) stated that higher temperature reduces the productive performance of layers. A clear explanation of the low production in the wet and dry hot seasons is reflected by the amount of feed taken which is relatively low due to incoordination of birds because of unfavorable environmental conditions. Temperature fluctuation is more pronounced during the rainy seasons as it may rise to certain degree prior to the commencement of rain, this short duration changes can cause less feed intake by the birds and consequently results in poor egg production. Higher relative humidity (above 70%) recorded around July- August may also cause a decrease in egg production. Talukder *et al.* (2010) spelt out that a marked decrease in egg production was recorded when relative humidity is above 70%. Year of study had high significant effect ($P<0.001$) on egg production. Egg production was highest in the years 2009 (60.67) and 2007 (58.83), respectively. Lowest production was recorded in 2006, 2010 and 2011. Clear explanations on variation in egg production within years may be linked to feeding and other management practices, environmental changes in terms of temperature and relative humidity. Malau Aduli *et al.* (2003) also reported significant effect of year on egg production.

Feed Intake

The effects of strain, age, season and year on feed intake of the layer birds are presented in Table 1. Feed intake/bird/day in Rhode Island Red was significantly higher ($P<0.001$) compared to Bovin and Isa brown. Normally, feed consumption is considered a heritable character; however, a plausible explanation for the high feed intake in Rhode Island Red might be linked to their size because they are larger than the other two breeds. Hossain (1992) recorded no significant effect in daily feed intake among Rhode Island Red, Barred Plymouth Rock and indigenous DESI hens. A genetically superior breed with high performance will need greater amount of feed for maintenance and production. Age of birds on feed intake was significant ($P<0.001$). The highest intake was recorded at 40-44 and 45-49 weeks. However, there was no significant difference among birds of 20-39, 50-54 and those of greater than 75 weeks of age. Reduced feed intake due to age of birds might be attributed to prevalence of disease or frequent molting in the flock.

Table 1: Least square means $\pm$ S.E of feed intake (g) and egg production by strains, year, season and age

Factors	Subclass	N	Egg production	Feed intake
Overall	Overall	11272	51.63 $\pm$ 0.69	121.87 $\pm$ 0.73
Strain			***	***
	Bovin brown	6176	53.08 $\pm$ 10.16 ^b	122.13 $\pm$ 0.97 ^b
	Rhodes Island Red	2410	58.83 $\pm$ 0.29 ^a	144.78 $\pm$ 1.30 ^a
	Isa brown	2685	41.81 $\pm$ 0.89 ^c	101.22 $\pm$ 0.86 ^c
Age (weeks)			***	***
	20-24	1232	35.39 $\pm$ 1.99 ^f	125.56 $\pm$ 3.01 ^{bcd}
	25-29	1356	52.71 $\pm$ 0.59 ^{abcd}	120.74 $\pm$ 1.99 ^d
	30-34	1347	57.46 $\pm$ 0.72 ^{ab}	128.63 $\pm$ 1.88 ^{abc}
	35-39	877	55.05 $\pm$ 2.29 ^{abc}	124.43 $\pm$ 2.62 ^{bcd}
	40-44	1541	58.76 $\pm$ 4.13 ^a	134.86 $\pm$ 1.33 ^a
	45-49	1108	55.35 $\pm$ 0.83 ^{abc}	131.11 $\pm$ 2.08 ^{ab}
	50-54	771	48.33 $\pm$ 1.50 ^{cde}	120.64 $\pm$ 3.03 ^d
	55-59	674	44.74 $\pm$ 1.60 ^e	96.56 $\pm$ 1.21 ^f
	60-64	434	45.32 $\pm$ 1.90 ^{de}	98.06 $\pm$ 1.78 ^f
	65-69	700	54.67 $\pm$ 0.95 ^{abc}	110.88 $\pm$ 2.43 ^e
	70-74	407	56.77 $\pm$ 0.56 ^{ab}	123.22 $\pm$ 2.60 ^{cd}
	≥ 75	824	49.48 $\pm$ 0.35 ^{bcde}	
Seasons			***	***
	Dry cold	3624	57.47 $\pm$ 0.39 ^a	130.68 $\pm$ 1.19 ^a
	Dry hot	3775	51.71 $\pm$ 1.79 ^b	115.55 $\pm$ 1.18 ^c
	Wet	3436	46.36 $\pm$ 0.87 ^c	119.78 $\pm$ 1.29 ^b
Year			***	***
	2006	1763	42.53 $\pm$ 1.08 ^c	106.64 $\pm$ 1.25 ^d
	2007	2410	58.83 $\pm$ 0.29 ^a	144.18 $\pm$ 1.25 ^b
	2008	1365	49.79 $\pm$ 1.85 ^b	148.42 $\pm$ 0.84 ^a
	2009	3048	60.67 $\pm$ 2.02 ^a	119.32 $\pm$ 1.19 ^c
	2010	806	41.61 $\pm$ 2.24 ^c	98.61 $\pm$ 1.57 ^e
	2011	1879	41.89 $\pm$ 0.85 ^c	102.34 $\pm$ 1.02 ^e

a,b,c,d,e,f= means in the same row within a subset with different superscript differs significantly (P<0.001) *** = P<0.001

Mehta *et al.* (1986) observed that old layers consumed more feed than pullets because they are considerably heavier than pullets and therefore may require more energy for maintenance, while Applegate *et al.* (1999) and Schafer *et al.* (2005) observed no difference in feed intake with increase age of birds. Disparity in findings among different authors might be linked to the difference in the distinguishable genetic makeup as suggested by Yasmeen *et al.* (2008). Season of the year also had a significant effect (P<0.001) on feed intake. The highest feed intake was observed during the dry cold season (130.68 $\pm$ 1.19) while the lowest was in the dry hot season (115.55 $\pm$ 1.18). Temperature during the dry hot period in the study area usually rise above 42°C which greatly affects feed intake and general performance. It has been reported by Talukder *et al.* (2010) that at temperature of above 27°C, feed consumption gradually declines and at temperature of 35°C there was remarkable decrease of feed intake. Technically, high temperature reduces feed intake and permits constant water intake so as to minimize the animal's metabolic rates. At dry cold season, the temperature may decrease to about 26°C that could create a conducive environment for the layers. Similarly, Talukder *et al.* (2010) stated that the highest feed intake of 122 $\pm$ 0.14 was obtained at temperatures of 16°C as compared to 90 $\pm$ 0.35 at temperature of 35°C. Years of study had been found to have high significant effect (P<0.001) on the amount of feed consumed by the birds. Feed intake during the year 2008 was found to be highest (148.42 $\pm$ 0.84) followed by the years 2007, 2009, 2006 and 2011, respectively. The lowest feed intake was recorded in the year 2010 (98.61 $\pm$ 1.57). Differences in the amount of feed

consumed with reference to years may be ascribed to climatic changes, which occur spontaneously, climate and weather changes like temperature, rainfall pattern, other factors may include change feeding practices, management and disease outbreaks.

CONCLUSION

It was concluded from this study that Rhode Island Red consumed more feed and was the most superior in egg production. Difference in feed intake and egg production with respect to year were also observed. Highest feed intake and egg production was recorded during the dry cold seasons. Layers at 40-44 weeks of age were highest in egg production.

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