APRW -75

Egg Production Performance of Layer Birds at the University of Maiduguri Poultry Farm

J. Aliyu and Y.M. Bello
Department of Animal Science, University of Maiduguri, Maiduguri, Borno State, Nigeria.
Corresponding author: Y.M. Bello; E-mail: yazeedmuhammadbello@gmail.com

Abstract
Data were analyzed to investigate the production performance and feed intake 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 a 2-tier battery cage and eggs were picked in the mornings and evenings. The data were analyzed for variance using the SPSS package and the means were separated using the Duncan's Multiple Range Test. The result shows that strain, age, season and year vary significantly ($p<0.001$) in egg production and feed intake. Rhode Island Red recorded the highest egg production (58.83 ± 0.29%) and feed intake (144.78 ± 1.30g) followed by Bovin Brown, while lowest production and feed intake (101.22 ± 0.86 g), (41.81 ± 0.89%) were recorded for Isa Brown. Birds within the age group of 40-44 weeks had the highest egg production (58.76 ± 4.13%) and feed intake (134.86 ± 1.33 g), respectively. The lowest production was recorded at 20 - 24 weeks (35.39 ± 1.99%) while birds of 55-59 weeks recorded lowest feed intake (96.56 ± 1.21 g). Dry-cold season favoured egg production (57.47 ± 0.39%) and feed intake (130.68 ± 1.19g), while the lowest production was recorded in the wet season (46.36 ± 0.87%). However, lowest feed intake was observed in the dry-hot season (115.55 ± 1.18 g). The year 2009 recorded the highest egg production (60.67 ± 2.02%) which was not significantly different from those of 2007 (58.83 ± 0.29%) while the year 2008 recorded the highest feed intake (148.42 ± 0.84 g). Rhode Island Red had the highest egg production and dry-cold season favoured increase feed intake which supports egg production. Layer chickens of 40 - 44 weeks of age had the highest egg production.

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

Introduction

Poultry production is an important and diverse component of agricultural practice, providing significant contribution to human requirement for food and greater economic prosperity. Egg from layers contains substantial amount of nutrient of high biological value. 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). 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, 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 the 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 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 11.83^0N and longitude 13.14^0E (Encarta, 2007). 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 commercial feed were provided *ad libitum*. Eggs were picked twice a day in the morning and evening. All data collected were subjected to analysis of variance using the SPSS package (2007) and means were separated using Duncan's multiple range tests.

Results and Discussions

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 from 25-49weeks (52.71 ± 0.59, 55.35 ± 0.83) while the lowest was at 20 - 24 weeks (35.39 ± 1.99) of age. The trend in egg production shows highest from 25-49 weeks, which declines at 50 - 64 weeks and rose again at 65 - 74 weeks and decline henceforth. Conversely there was no significant difference among ages 25 - 29, 65 - 69, and 70 - 74 weeks. These findings differ from those of Malau-Aduli *et al.* (2003) who reported that 30-39 weeks of age was the peak of production. Siopes (1995) reported higher egg production during the first year than in the second year of production cycle. 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 highly significant ($p<0.001$). The highest egg production was recorded in the dry cold season (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 leading to high mortality, low feed intake and poor laying performance. 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 unfavorable environmental conditions. 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 2007 (58.83) and 2009 (60.67), respectively. Lowest production was recorded in 2006, 2010 and 2011. Variation in egg production within years may be linked to environmental changes in terms of temperature and relative humidity. MalauAduli *et al.* (2003) also reported significant effect of year on egg production.

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 highest ($p<0.001$) 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 strains.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. 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 in age of birds.

Table 1: Least squares means ± S.E of egg production and feed intake by strain, year, season and age of birds

Factors	Subclass	N	Egg production	Feed intake (g)
Overall	Overall	11272	51.63 ± 0.69	121.87 ± 0.73
Strain			***	***
	Bovin brown	6176	53.08 ± 10.16^{b}	122.13 ± 0.97^{b}
	Rhode Island Red	2410	58.83 ± 0.29^{a}	144.78 ± 1.30^{a}
	Isa brown	2685	41.81 ± 0.89^{c}	101.22 ± 0.86^{c}
Age (weeks)			*** ***	
	20-24	1232	35.39 ± 1.99^{f}	125.56 ± 3.01^{bcd}
	25-29	1356	52.71 ± 0.59^{abcd}	120.74 ± 1.99^{d}
	30-34	1347	57.46 ± 0.72^{ab}	128.63 ± 1.88^{abc}
	35-39	877	55.05 ± 2.29^{abc}	124.43 ± 2.62^{bcd}
	40-44	1541	58.76 ± 4.13^{a}	134.86 ± 1.33^{a}
	45-49	1108	55.35 ± 0.83^{abc}	131.11 ± 2.08^{ab}
	50-54	771	48.33 ± 1.50^{cde}	120.64 ± 3.03^{d}
	55-59	674	44.74 ± 1.60^{e}	96.56 ± 1.21^{f}
	60-64	434	45.32 ± 1.90^{de}	98.06 ± 1.78^{f}
	65-69	700	54.67 ± 0.95^{abc}	103.29 ± 1.29^{f}
	70-74	407	56.77 ± 0.56^{ab}	110.88 ± 2.43^{e}
	≥ 75	824	49.48 ± 0.35^{bcde}	123.22 ± 2.60^{cd}
Seasons			***	***
	Dry cold	3624	57.47 ± 0.39^{a}	130.68 ± 1.19^{a}
	Dry hot	3775	51.71 ± 1.79^{b}	115.55 ± 1.18^{c}
	Wet	3436	46.36 ± 0.87^{c}	119.78 ± 1.29^{b}
Year			***	***
	2006	1763	42.53 ± 1.08^{c}	106.64 ± 1.25^{d}
	2007	2410	58.83 ± 0.29^{a}	144.18 ± 1.25^{b}
	2008	1365	49.79 ± 1.85^{b}	148.42 ± 0.84^{a}
	2009	3048	60.67 ± 2.02^{a}	119.32 ± 1.19^{c}
	2010	806	41.61 ± 2.24^{c}	98.61 ± 1.57^{e}
	2011	1879	41.89 ± 0.85^{c}	102.34 ± 1.02^{e}

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

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 ± 1.19) while the lowest was in the dry hot season (115.55 ± 1.18). Seasonal fluctuations are very crucial to the overall layer performance where feed intake is highly affected. This is because a change in season brings about change in weather (temperature, humidity, wind) pattern. Temperature during the dry hot period in the study area usually rises above 42^{o}C which greatly affects feed intake and general performance. It has been reported by Talukder *et al.* (2010) that at temperature of above 27^{o}C, feed consumption gradually declines and at temperature of 35^{o}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 ambient temperature may decrease to an average of 26^{o}C that could create a conducive environment for the layers. Similarly, Talukder *et al.* (2010) stated that the highest feed intake was obtained at temperatures of 16^{o}C as compared to temperature of 35^{o}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 ± 0.84) followed by 2007, 2009, 2006 and 2011, respectively. The lowest feed intake was recorded in the year 2010 (98.61 ± 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 and disease outbreaks had adverse effect on layer performance.

Conclusion

Rhode Island Red consumed more feed and was superior in egg production. Highest feed intake and egg production were recorded during the dry cold seasons. Layers at 40-44 weeks of age were highest in egg production, while highest egg production was obtained between 2007 and 2009.

References

Akhtar, N., Mahmood, S., Hassan, M. and Yasmeeen, F. (2007). Comparative study of production potential and egg characteristics of Lyallpur Silver Black, Fayoumi and Rhode Island Red breeds of poultry. *Pakistan Veterinary Journal,* 24(4): 184-188.

Aliyu, J. (2013). Productivity Assessment of four strains of indigenous chicken in a semi-arid region of North-Eastern Nigeria. *Ph.D. Thesis*, Department of Animal Science, University of Maiduguri, Maiduguri, Nigeria.

Applegate, T., Ladwig, J.E., Weissert, L. and Lilburn, M.S. (1999). Effect of hen age on intestinal development and glucose tolerance of the pekin duckling. *Poultry Science,* 78: 1485-1492.

Ashraf, M., Mahmood, S., Khan, M.S and Ahmad, F. (2003). Productive behaviour of Lyallpur silver black and Rhode Island Red breed of poultry*. International Journal of Agriculture and Biology,* 5(3):384.

Awobajo, O.K., Salau, K.A., Igbasanu, A.O., Mako, A.A., and Ettu, R.O. (2009). Comparative study of the performance of breeds of layers in sub-Saharan region of Africa*. International Journal of Poultry science.*8 (12): 1165-1169

Encarta (2007). Encarta Microsoft @ Student 2007 (DVD). Redmond, WA: Microsoft corporation.

Encarta (2009). Encarta Microsoft at student 2009 (DVD) Redmond, W.A. Micrososft cooperation.

Hossain, M.S. (1992). Comparative study on egg production and feed efficiency of different Breeds of poultry under intensive and rural conditions in Bangladash. *Livestock Research for Rural Development* Bulletin. 4

Leenstra, F., Maurer, V., Galea, F., Bestman, M., Amsler-Kepalaite, Z., Visscher, J., Verneij, I. and Van krimpen, M. (2014). Laying hen performance in different production systems; why do they differ and how to close the gap? Results of discussions with groups of farmers in The Netherlands, Switzerland and France, benchmarking and model calculations. *European Poultry Science*. 78.

Malau-Aduli, A.E.O., Bawa, G.S. and Jeel, K. (2003). Factors affecting egg production and layer bird mortality in private poultry farms in the sub-humid zone of Nigeria. *eprints.utas.edu.au/597/2/ASJ-2-pdf AccessedMarch 13, 2012*

Mehta, V.S., Lakhotia, R.L. and Singh, B. (1986). A study on forced resting and recycling of white layers. *Indian Journal of Production and Management* 2:138-140.

Oarad, Z., Marder, J. and Soller, M. (1981). Effect of gradual acclimatization to temperature up to 44^0C on productive performance of the desert Bedouin fowl, the commercial white leghorn and the two crossbreeds. *British Poultry Science,* 22:511-520*.*

Schafer, C.M., Corsiglia, C.M., Mireles, A. Jr. and Koutsos, E.A. (2005). Turkey breeder hen age effects on growth and systemic and intestinal inflammatory response in female poults examined at different ages post-hatch. *Journal of Applied Poultry Research,* 14:258-264

Siopes, T.D. (1995). Turkey breeder hen performance by strain during consecutive lay periods. *Poultry Science.* 74:1269-1279.

SPSS (2007). Statistical Package for the Social Sciences. SPSS Inc. Released 2007. SPSS for Windows, Version 16.0. Chicago, SPSS Inc.

Talukder, S., Islam, T., Sarker, S., and Islam, M.M. (2010). Effect of environment on layer performance. *Journal Bangladesh Agril. Umir.,*8(2): 253-258.

Yasmeen, F., Mahmood, S., Hassan, M., Akhtar, N., and Yaseen, M. (2008). Comparative productive performance and egg characteristics of pullets and spent layers. *Pakistan Veterinary Journal* (28)1: 5-8