



INFLUENCE OF FEED TYPE ON PRODUCTIVE PERFORMANCE OF COMMERCIAL LAYING HENS IN BAUCHI METROPOLIS

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ABSTRACT

A 14 weeks trial was conducted to determine the influence of feed type on productive performance of commercial laying hens in Bauchi Metropolis. A total of 384 Agrited Lohmann Brown laying hens managed in a battery cage system and grouped into eight (8) feed types coded as T1 (Maize, Wheat Offal), T2 (Maize, Sorghum, Wheat Offal), T3 (Sorghum, Rice Offal), T4 (Maize, Wheat Offal, Rice Offal), T5 (Maize, Rice Offal), T6 (Sorghum, Wheat Offal), T7 (Sorghum, Wheat Offal, Rice Offal), T8 (Maize, Sorghum, Wheat Offal) of 48 birds per treatment were used. In each treatment, the birds were distributed into three (3) tiers (16 birds per tier) of upper, middle and lower tiers of the battery cage that served as replication in a completely randomized design. Feed and water were supplied *ad-libitum*. Data generated were analyzed using General Linear Model Analysis for hen day egg production and Univariate Analysis of Variance for feed intake and feed conversion ratio. Hen-day egg production was highest in T4 (65.48%) and T3 (65.43%) and the lowest in T1 (64.50) and T2 (64.41%); $p < 0.001$. Feed intake (g/day) ranged from 108.77kg to 107.67kg with birds on T4 consuming more feed than the other. Feed conversion ratio was highest ($p < 0.001$) in T1 (2.64) and T7 (2.64) and lowest in T3 (2.59) and T8 (2.88). It was concluded that different feed type had influence on productive performance of commercial laying hens.

Keywords: Formulated, diets, Layer, Chickens, Performance.

INTRODUCTION

Livestock farming particularly poultry is one of the fastest growing divisions of the agricultural sector in Nigeria. It contributes immensely to the three major economic sectors (Petroleum, Mining and Agricultural) in Nigerian economy and has evolved from subsistence farming to an extremely profit driven commercial enterprise. This could be attributed to high productivity; high feed conversion efficiency, improved fertility, hatchability, growth rate, egg yield and meat quality through genetics and breeding within a short time and without a huge investment when compared with other livestock breeding (Aboki *et al.*, 2014). The chicken egg, which is naturally designed for reproduction, is a veritable source of protein affordable to all classes of people whether rich or poor (Swiatkiewicz *et al.*, 2010). Most poultry feeds are cereal-based, as cereals often comprises between 50-75% of the diet. These cereals supply a high proportion of starch which provides the dietary energy. Feed consumption is a variable phenomenon and is influenced by several factors such as strain of the bird, ambient temperature, and density of birds in the shed, hygienic conditions, rearing environment, feed restriction, and feed characteristics. Feed conversion ratio measures how the birds convert the feed in to egg production. Poultry has high feed conversion ratio as compared to other animals. Such behavior also depends on type of the chicken. Broilers are fast growing and are efficient in feed conversion into meat, they need both high energy and protein feeds. Thus, they are encouraged to eat more feed. However, layers are slow growing and have high feed conversion ratio to produce more egg rather than meat. Feed conversion ratio was identified as the major trait in egg production (Shaheen *et al.*, 2015). Keeping animals out of their natural habitat and for human commercial purposes, always leads to compromises, trying to fulfill basic needs of the animals and at the same time manage an economically sustainable production. Animals used in food production are bred and to a high extent adapted to live and produce under these conditions. However, behavioral problems can arise. In laying hens, feather pecking and cannibalism lead to welfare problems as well as economical loss for the egg producer when they occur.



Studies have shown that increased fibre intake can reduce the risk or occurrence of these behavioral abnormalities (Medugu *et al.*, 2011).

As human population continues to grow, there is need to ensure food safety for all, especially the more susceptible sector of human population. There is increasing need for land, for development of new neighborhood, industries, recreational parks and other facilities. The consequence of this is a gaping need for food of both plant and animal origin, thereby increasing the cost of food and feedstuffs, hence driving food out of reach of most people (Swiatkiewicz *et al.*, 2010). There is therefore need to reduce the competition between man and livestock for the same feedstuffs by turning to unconventional feedstuffs in the short run while plant breeders work towards obtaining high yielding varieties of crop which will ensure adequate supply and quality feed for livestock (Makinde and Sonaiya, 2011). Most poultry feeds are cereal-based, as cereals often comprises between 50-75% of the diet. These cereals supply a high proportion of starch which provides the dietary energy. Cereal grains (e.g. maize, sorghum, wheat and barley) contribute most of the carbohydrates in poultry diets. The majority of carbohydrates of cereal grains occur as starch, which is readily digested by poultry (Ajijghigh *et al.*, 2018). Other carbohydrates which occur in varying concentrations in cereal grains and protein supplements include polysaccharides and oligosaccharides all of which are poorly digested by poultry. Poultry convert feed into food products quickly, efficiently, and with relatively low environmental impact compared with other livestock. Maize is used for other purposes such as bio-fuel, brewing, starch industries and for human consumption. However, inadequate production of this grain and the intense competition for maize between man, industries and livestock especially in the drier areas of the tropics has made poultry rations to be expensive (FAO, 2012). Sorghum is very important ingredient in poultry diets. It has over 90% of the feeding value of maize (Bashar *et al.*, 2012). Sorghum are the most widely grown cereal crops that have been successfully cultivated in the semi-arid regions of Asia and Africa since prehistoric times and their cost are relatively less in the areas of cultivation with little industrial uses in Nigeria (Oladipo *et al.*, 2015).

MATERIALS AND METHODS

Study Area

The study was conducted at a private poultry farm at Abubakar Tafawa Balewa University Quarters, Kari Housing Estate, Tirwun along Maiduguri road Bauchi, Bauchi state, Nigeria. The state lies between longitudes 8.50⁰ and 11.0⁰ East of the Greenwich Meridian and latitudes 9.30⁰ and 12.3⁰ North of the equator. It occupies the western portion of the north-eastern region in the Sudan savannah ecological zone of Nigeria. Bauchi State covers a total land area of 49,119Sq kilometers, which is about 5.3% of Nigeria's total land mass (Anon., 2020). The State has an annual rainfall of 1097mm. There are two seasons in a year; the rainy reason (from April to October) and the dry season (from October to April).

Bauchi State is bordered by seven States as follows: Kano and Jigawa to the north, Plateau and Taraba to the south, Gombe and Yobe to the east and Kaduna, Kano and Plateau to the west.

Experimental Diets

The energy source (sorghum and maize grains), the fiber source (wheat offal and rice offal) and calcium and phosphorus sources (limestone and bone meal) used for the study were purchased from Muda Lawal Market in Bauchi metropolis while the concentrate was sourced from Animal Care Services Consult (Nig) Feed, Kobi Street Deport, Bauchi.



Table 1: Percentage Composition of the Experimental Diets

Ingredients Diets	1	2	3	4	5	6	7	8
Maize %	44.70	22.35	0.00	44.70	44.70	0.00	0.00	22.35
Sorghum %	0.00	22.35	44.70	0.00	0.00	44.70	44.70	22.35
Rice offal %	0.00	11.76	23.53	11.76	23.53	0.00	11.76	23.53
Wheat offal %	23.53	11.76	0.00	11.76	0.00	23.53	11.76	0.00
Concentrate %	29.41	29.41	29.41	29.41	29.41	29.41	29.41	29.41
Limestone %	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
one meal %	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Total	100	100	100	100	100	100	100	100

Table 2: Proximate Composition of the Experimental Diets

Diets	1	2	3	4	5	6	7	8
CP %	21.53	22.70	21.11	21.20	21.53	25.11	25.15	22.09
CF %	4.23	3.10	3.94	3.67	4.06	4.11	5.00	4.13
EE %	3.64	4.12	4.16	3.75	3.90	4.03	4.13	4.00
Ash %	6.74	4.86	7.10	7.26	6.65	8.10	8.30	8.20
NFE %	63.86	59.22	63.69	64.12	63.86	58.65	57.42	61.58
DM %	93.00	93.50	93.00	94.50	94.00	93.50	94.00	94.00
ME(kcal/kg)	3358.48	3497.93	3379.03	3364.36	3379.54	3337.58	3303.49	3327.42

Experimental Birds and their Management

A total of 384 Agrited Lohmann brown layers at 96 weeks of age were used for the study. The bird were kept in an open sided house, fitted with three-tier battery cages with feeders and automated nipple drinkers. Long plastic rubber pipe were constructed and used to partition the feeding troughs at intervals of four (4) cages. The chickens were randomly assigned to eight (8) groups of the experimental diets that constituted the treatments of 48 birds each. Health conditions were determined by closely observing the chickens for signs of ill health. Chickens showing signs of ill health such as watery nasal or ocular discharge, cough, weakness, loss of appetite, watery faeces and difficulty in standing were replaced. The birds were routinely vaccinated and medicated at monthly interval against diseases such as Newcastle, Gumboro and Coccidiosis. All necessary routine management practices were strictly observed throughout the period of the study. The experiment lasted for 14weeks from July to October 2019.

Experimental Design

Each treatment was replicated three times (3) with 16 birds per replicate in a completely randomized design (CRD).

Data Collection

Egg collections were done three times a day, corresponding to three periods of production: period 1 (Morning) 6:00am – 12:00pm, period 2 (Afternoon) 12:00pm – 6:00pm and period 3 (Evening) 6:00pm – 6:00am. Each bird was fed an average of 109g per head per day. Feed was weighed at feeding time every day, and the feed left in the feeder at the end of the week were weighed and subtracted from the total amount fed during the week. This gave the total feed intake per week, and from this the total feed intakes per treatment were calculated. Feed conversion ratio was expressed as grams of daily feed intake per egg mass as described by Abougabal and Taboosha (2017). Hen day egg production per treatment (T1-T8), feed intake and feed conversion ratio were recorded. The feeds were mixed manually on a floor on a polythene leather to avoid contamination. Table 2 shows treatment 1 containing Maize and Wheat Offal as the standard diet suggested by Animal Care Services Consult (Nig) Feed. Treatments 2–8 constituted various levels of replacement of the Maize with Sorghum and Wheat Offal with Rice Offal. The samples of diets 1-8 were sent to Biochemical Laboratory Unit, Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria for proximate analysis while the metabolizable Energy was calculated as described by Pazenga (1985) as ME (kcal/kg) = 37 x %



of CP + 81x % of EE +35x % of NFE, where CP= crude protein, EE= ether extract and NFE= nitrogen free extra. the results of which are shown in Table 3.

Statistical Analysis

Data collected were analyzed using the Univariate Analysis of Variance and means separation used descriptive statistics procedure of the SSTYPE (3) Software (Statistical Package For Social Science), version 21.0 (IBM, 2019). Significant differences between treatment means were separated by Duncan Multiple Range Test (Duncan, 1955).

The models utilized were as follow:

For hen day egg production, feed conversion ratio and feed intake, the model was

$$Y_i = U + T_i + e_i$$

Y_i = Dependent variable (HDP, FCR and feed intake)

U = Overall means

T_i = Effect of i^{th} Treatment (1,2,3,4,5,6,7,8)

e_i = Residual Error.

RESULT AND DISCUSSION

Performance of Commercial Laying Hens Fed Different Feed Types

It is a well-known fact that egg production is of great importance and the success of any enterprise depends on total number of eggs produced. The fact that feed type had significant effect on percentage hen-day egg production as observed in this study corroborates with the finding of Filho *et al.* (2015) among commercial laying hens. The authors reported significant variation on hen-day egg production and observed that birds fed diets with high protein level lay more eggs than those feed energy rich feeds. They further explained that high number of egg noticed could be as a result of amino acid profile of the feed. Similar report by Amao *et al.* (2010) showed that varied protein level significantly affect egg production. The authors noticed that high level of soya bean meal (40%) in poultry diets increased egg production significantly and the overall performance and health being of the bird was improved. Similar assertion was made by John-jaja *et al.* (2018) and Olawumi and Dudusola (2011) reported different strains or breeds of hens may significantly affect egg production. In the other hand Mohammed *et al.* (2010) reported that egg production and egg weight increased when maize is replaced with enzyme supplemented barley. The feed intakes were statistically influenced by feed type, implying that there are variations in response of layers to different feed type. These findings agreed with the report of Ani *et al.* (2013) that feed intake and average daily weight in poultry were significantly different among the treatment diets when 0, 5, 10 and 20% of rice milling waste were used. The finding does not tally with the report of Olusiyi and Wafar (2017) in broiler chickens fed graded dietary levels of rice milling residue as a fibre source to replace wheat offal at the levels of 0, 25, 50, 75 and 100% and no effect was observed on performance of the birds. The feed conversion ratio obtained in this study were influenced by feed type. Similar report by Mohammed *et al.* (2010) noted significant increase in feed conversion ratio due to substitution of yellow maize with enzyme supplemented barley grain in laying hen diet. Oyeagu *et al.* (2015) reported higher significant effect of feed conversion ratio value in Shaver Brown and Nera Black hens fed formulated diet. They further explained that the observed differences in feed conversion ratio between strains that were fed the various feed may be attributed to genetic variation. This is in line with report of Hocking *et al.* (2003) which showed that genetic variation existed in egg production and feed conversion ratio. This finding is not in harmony with observation of Medugu *et al.* (2011) that result obtained from diets formulated with alternative cereal grain and cereal by-product had no adverse effect on feed intake, feed conversion ratio and egg quality of laying hen.



Table 3: Performance Characteristics of Commercial Laying Hens Fed Different Feed Types

Characteristics	Overall means ± SE	1	2	3	4	5	6	7	8	LOS
Hen day egg production (%)	65.80 ±0.24	64.50 ^d ±0.78	64.41 ^d ±0.78	65.43 ^c ±0.78	65.48 ^c ±0.78	65.32 ^c ±0.78	64.41 ^d ±0.78	65.38 ^c ±0.78	65.43 ^c ±0.78	***
Feed intake (kg)	12.08 ±0.18	12.09 ^b ±0.58	12.07 ^b ±0.58	12.09 ^b ±0.56	12.28 ^a ±0.58	12.07 ^b ±0.58	12.05 ^b ±0.58	12.09 ^b ±0.58	12.09 ^b ±0.58	***
Feed conversion ratio	5.10 ±0.24	5.47 ^a ± ±0.80	5.45 ^{ab} ± 0.80	5.09 ^{cd} ± 0.80	5.20 ^{bcd} ±0.80	5.29 ^{abc} ±0.80	5.38 ^{abc} ±0.80	5.18 ^{cd} ± 0.80	5.10 ^d ±0.80	***

- LOS - Level of Significance
- SE - Standard Error
- T1 - Maize/ Wheat Offal
- T2 - Maize, Sorghum/ Wheat Offal, Rice Offal
- T3 - Sorghum / Rice Offal
- T4 - Maize /Wheat Offal and Rice Offal
- T5 - Maize / Rice Offal



CONCLUSION AND RECOMMENDATION

Based on the result obtained, it is concluded that different feed types significantly influenced the performance of laying hens.

Based on the result of hen day production performance. From the performance of laying hens, a substitute for commercial feed is self-formulated diets.

REFERENCES

- Aboki, E., Jongur, A. A. U., and Onu, J. I. (2013). Productivity and technical Efficiency of Family Poultry Production in Kurmi Local Government Area, of Taraba State, Nigeria. *Journal of Agriculture and Sustainability*, **1**: 52-66.
- Abougabal, M. Sh. and Taboosha, M. F. (2017). Productive Performance, Economic Efficiency and Egg Quality of Laying Hens as Affected by Different Molting Methods. *Middle East Journal of Applied Sciences*, **7**(2): 349-360.
- Ajighjigh, D. T., Mahmud, M. and Waziri, D. (2018). Growth Performance and Economics of Production of Broiler Chicken fed Agro-Industrial by-products. *IORS Journal of Agriculture and Veterinary Science*, **11**(10): 87-92.
- Amao, S. R., Ojedapo, I. O. and Sosina, A. O. (2010). Effect of Strains on Some Growth Traits of Meat-Type Chickens Reared in Derived Savanna Environment of Nigeria, *Journal of Agriculture and Veterinary Science*. **2**: 56-63.
- Anon (2020). Bauchi State Wikipedia. <https://images.app.goo.gl/FGBWQZLsFgFEK7869>
- Ani, A. O., Kalu, I., Ugwuowo, L. C. and Iloh, E. A. (2013). Dietary effect of rice milling waste and supplementary enzymes on performance of broiler chicks. *African Journal of Biotechnology*, **12**(34): 5326-5332.
- Bashar, Y. A., Abubakar, A. and Ukpele J. (2012). Pearl Millet as an Alternative to Maize or Sorghum in the Diets of Broilers in Sokoto, Nigeria. *International Journal of Applied Agricultural and Apicultural Research*, **8**(1): 1-8.
- Filho, V. J. A., Geraldo, A., Machado, L. C., Avitodebrito, J., Bertechini, A. G. and Murayama, E. S. F., (2015). Effect of protease supplementation on production performance of laying hens. *Acta Scientiarum*, **37**(1): 29-33.
- Food and Agriculture Organization (FAO) (2012). The State of Food Insecurity in the World. Economic Growth is necessary but not Sufficient to Accelerate Reduction of Hunger and Malnutrition. Food and Agriculture Organization of the United Nations, Rome, Italy, Pp. 15-45.
- Hocking, P. M., Bain, M., Channing, C. T., Fleming, R. and Wilson, S. (2003). Genetic variation for egg production, egg quality and bone strength in selected and traditional breeds of laying Fowl. *British Poultry Science*, **44**(3): 365-373.
- IBM Corporation Released (2019). IBM SPSS Statistics for Windows, version 21.0. IBM Corporation, Armonk, N. Y., USA. Retrieved from <http://hadoop.apache.org>.
- John-Jaja, S. A., Abdullah, A. R. and Nwokolo, S. C. (2017). Genetic analysis of egg quality traits in Bovan Neva Black laying hen undersparse egg production period. *Iranian Journal of Applied Animal Science*, **7**(1): 155-162
- Lawal, T. E., Faniyi, G. F., Alabi, O. M., Ademola, S. G. and Lawal, T. O. (2012). Enhancement of the feeding value of wheat offal for broiler feeding after its solid-state fermentation with *Aspergillus niger*. *African Journal of Biotechnology* **11**(65): 12925-12929.
- Makinde, O. A. and Sonaiya, E. B. (2011). Utilization of sun-dried maize offal with blood meal in diets of broiler chickens. *Open Journal of Animal Sciences*, **1**(3): 106-111.
- Medugu, C. I., Raji, A. O., Igwebuike, J. U. and Barwa, E. (2011). Alternative cereal grains and cereal by-products as sources of energy in poultry diets- A review. *Research Opinions In animal and veterinary sciences*, **1**(8): 530-542.
- Mohammed, Kh. A., Toson, M. A., Hassanien H. H. M., Soliman M. A. H., and Sana H. M., EI-Nagar (2010). Effect of barley replacement and enzyme supplementation on performance and egg quality of laying hens, *Egypt Poultry Science*, **30**: 731-745



- Oladipo, M.F., Onimisi, P.A. and Bawa, G.S. (2015). Response of broiler starter chickens fed kaura based diets supplemented with enzymes. In: Proceedings of the 40th Annual Conference of the Nigerian Society for Animal production, March 15-19, 2015 held at NAPRI/ABU, Zaria, Kaduna state. Editors: Adeyinka, I.A., Kabir, M., Abdu, S.B., Erakpotobor, G.I., Hassan, M. R. and Iyiola-Tunji, A.O. Pp 341-343.
- Olawumi, S. O. and Dudusola, I. (2011). Assessment of long-term production traits of three breeds of exotic commercial layers in the Derived Savannah zone of Nigeria. *Journal of Applied and Natural Science*, **3**(1): 20-24.
- Olusiyi. J.A and Wafar. R.J. (2017). Performance of Broiler Chickens Fed Graded Dietary Levels of Rice Milling Residue as a Fibre Source, *Asian Research Journal of Agriculture* **4**(1): 1-6.
- Oyeagu, C. E., Ani, A. O., Egbu, C. F., Udeh, F. U. and Omumuabuikie, J. N. (2015). Comparative performance of Neva Black and Shaver Brown hens fed self-compounded and commerce layers diets. *Asian Journal of Science and Technology*, **6**(1): 940-94.
- Shaheen, M., Ahmad, I., Anjum, F.M., Syed, Q-A. and Saeed, M.K. (2015). Effect of processed Rice bran on growth performance of broiler chicks from Pakistan. *Bulgarian Journal of Agricultural Science*, **21**(2): 440-445.
- Swiatkiewicz, S., Koreleski, J and Arczewska, A. (2010) Laying performance and eggshell quality in hens fed diets supplemented with prebiotics and organic acid, *Czech J. Anim. Sci.*, **7**: 294-306.