INFLUENCE OF FEED ON PRODUCTIVE PERFORMANCE AND EGG QUALITY CHARACTERISTICS OF COMMERCIAL LAYING HENS IN BAUCHI METROPOLIS

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ABSTRACT
An experiment was conducted to determine the influence of different feed on productive performance and egg quality characteristics of commercial layers. A total of 528 Agrited Lohmann brown laying hens managed in a battery cage system and grouped into eleven (11) feed type coded as T1, (maize and wheat offal based diet), T2 (maize, sorghum, wheat offal based diet), T3 (Sorghum and Rice Offal based diet), T4 (Maize, Wheat Offal and Rice Offal based diet), T5 (Maize and Rice Offal based diet), T6 (Sorghum and Wheat Offal based diet), T7 (Sorghum, Wheat Offa and Rice Offal based diet), T8 (Maize, Sorghum and Wheat Offal based diet), T9 (Maize, Sorghum and Wheat Offal based diet), T10 (Commercial based diet), and T11 (Commercial based diet) of 48 birds per treatment were used. In each treatment, the bird were equally distributed into three (3) tiers (16 birds per tiers) of upper, middle and lower tier of the battery cage that serve as replication in a completely randomized design. Feed and water were supplied *ad libitum*. Data generated were analyzed using univariate analysis of variance. Hen-day egg production feed conversion ration were significantly ($p<0.01$) different. Hen-day egg production according age shows that age 2 (72 weeks old) was higher than age 1(92 weeks old). Average egg weight according to age, weeks, period, and treatment showed significant different ($p<0.001$). Egg length, shell thickness, and yolk length show significant effect ($p<0.05$) on External and internal egg quality characteristics observed.It was concluded that self formulated feed could be used in commercial layers feed without detrimental effect on performance, average egg weight and egg quality characteristics.

Keywords: Commercial diets, Formulated diet, Layer chickens, Performance and Egg quality

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. Poultry production in Nigeria was put at 114.3 million comprising 82.4 million chickens, 11% of which was commercially raised, and 31.9 million other poultry including pigeons, ducks, guinea fowls and turkey. 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 (John-Jaja*et al*., 2017). 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 occurrence of these behavioral abnormalities (Medugu *et al*., 2011).As early as 1900, egg number and egg quality have become important parameters for poultry breeding and in poultry industry. Increasing interest in egg quality especially in the developed world has resulted in numerous indices for characterizing egg quality. 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). The by-product of the milling process has no value as human food because of the high fibre content. Lawal *et al* (2012). A common commercial practice used by the industry to increase the digestive capacity of the bird consists of increasing the fiber content of the diets fed from 10 to 17 weeks of age (Lawal *et al*., 2012). However, the scientific information on the benefits of this practice on hen productivity is very limited. (Lawal *et al*., 2012)

MATERIALSANDMETHODS

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 longitude 8.50^0 and 11.0^0East of the Greenwich Meridian and latitude 9.30^0 and 12.3^0North of the equator. It occupies the Centre of the north-eastern region in the Sudan savannah ecological zone of Nigeria. Bauchi State (figure 3) covers a total land area of 49,119Sq kilometers, which is about 5.3% of Nigeria's total land mass (Anon, 2020.

Experimental diets

The energy source (sorghum and maize grains) and the fiber source (wheat offal and rice offal) used in these experiment were purchased from Muda Lawal Market in Bauchi metropolis while the other ingredients were sourced from Animal care services consult (nig) feed Bauchi deport, Bauchi state.

Experimental Birds and their management

A total of 528Agrited Lohmann brown layers at 94 and 72 weeks of age were used for this 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 idea was to prevent spillover of feed from or to neighboring treatments. The chickens were randomly assigned to eleven (11) groups of the experimental diets (Diets 1-9 while 10-11 are commercial diets) that constitute the treatment of 48 birds each. The experiment lasted for 14weeks

Experimental design

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

Data Collection

Productive performance was evaluated by measuring egg production and feed intake. Egg collection and weighing were usually done three times a day: in the morning at 6 am(Period 1) and afternoon (Period 2) at12pm and then the final collection was made in the evening (Period 3)at 6.00 pm. Each bird was fed an average of 109g per head per day. Feed was weighed at feeding time usually every day, and the feed left in the feeder at the end of the week were weighed and subtracted from the total amount supplied during the week. This gave the total feed intake per week, and from this total the weekly and total feed intake per treatment was calculated. Feed conversion ratio was expressed as kilograms of feed consumed per weight and number of egg produced. Hen day egg production per treatment and hen day egg production according to age of the hens (Age 1=94 week old, Age 2=72 weeks old) were determined. The average egg weight according to Day, Period, week and treatment were also analysed

RESULTS AND DISCUSSION

Percentage hen-day egg production according to feed type (treatment), feed conversion ration and hen-day egg production according to age of the laying hen is presented in Table 2. There was significant effect of treatment ($P<0.001$) on hen-day egg production, feed conversion ratio and age of the laying hen. Hen-day egg production was higher in T10 (71.02%) and T11

(70.53%) followed by T9 (67.11%), T3 (64.13%), T4 (64.07%) and T7 (64.03%). Lowest hen-day egg production was observed in T5 (61.62%), T1 (60.41%), T6 (60.28%) and T2 (60.01%). This findings is in line with the finding of (Filho *et al*., 2015) who report that feed type had significant effect on percentage hen-day egg production. The present result disagreed with the finding of (Mohammed *et al*., 2010) who reported that egg production and egg weight increased when maize is replaced with enzyme supplemented barley. Means of feed conversion ratio was statistically similar in T1 (2.88), T2 (2.83), T6 (2.82) and T5 (2.79) followed by T7 (2.70), T3 (2.65), T9 (2.64) and T8 (2.64). The lowest feed conversion ratio was seen in T10 (2.45) and T11 (2.45).This findings disagree with the finding of (Mohammed *et al*., 2010) who noted significant increase in feed conversion ratio due to substitution of yellow maize with enzyme supplemented barley grain in laying hen diet. Also Oyeagu *et al*., 2015 reported higher significant effect of feed conversion ratio value in Shaver Brown and Nera Black hens fed formulated diet. Based on the age of laying hen, age 1 (94 weeks old) had lower percentage hen-day egg production (62.33%) than age 2 (72 weeks old) that had higher percentage hen-day egg production (69.55%).

The external and internal egg quality characteristics are presented in Table 3. The external and internal egg quality characteristics observed are egg weight, egg length, egg width, shell thickness, shell weight, yolk length, yolk weight and albumen weight. There was significant difference ($P<0.05$) in egg length, shell thickness and yolk length. No significant effect ($P>0.05$) in egg weight, egg width, shell weight, yolk weight and albumen weight. Highest means of egg length was observed in T7 (58.19) and T8 (57.47) followed by T6 (57.07), T3 (57.05), T4 (56.54), T5 (56.54), T9 (56.44), T1 (56.27), T10 (55.30) which were statistically similar. Lowest egg length was observed in T11 (54.83) and T2 (54.67). Highest means of shell thickness was observed in T2 (1.49) followed by the other treatment with were statistically similar. Means yolk length was higher in T3 (37.46) compared to other treatment that were statistically similar. This finding is in harmony with observation of (Medugu *et al*., 2011) who reported that result obtained from diets formulated with alternative cereal grain and cereal by-product had no adverse effect on feed intake, feed conversion ration, yolk weight, albumen weight and egg quality of laying hen.

CONCLUSION AND RECOMMENDATION

Based on the result obtained, the following conclusions were made:

- Energy source; maize or sorghum could be included in formulating layer mash.
- Fibre source; wheat offal or rice offal could be included in layer mash.
- The influence of these combination (maize or sorghum as energy source; wheat offal or rice offal as fibre source could be used in formulating layer mash and obtained higher egg production and quality eggs.
- Agrited Lohmann brown hen stay longer in production and performed better.

RECOMMENDATION

From the result obtained, it could be recommended that: energy source (maize or sorghum), fibre source (wheat offal or rice offal) which is less cost and always available could be included in the diet of laying hen with no adverse effect on production performance, egg weight, internal and external egg quality characteristics

Table 1: Percentage composition of the experimental diets and their grantee analysis Diets

Ingredients Diets	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Maize %	44.70	22.35	0.00	44.70	44.70	0.00	0.00	22.35	22.35
Sorghum %	0.00	22.35	44.70	0.00	0.00	44.70	44.70	22.35	22.35
Rice offal %	0.00	11.76	11.76	11.76	0.00	23.53	11.76	23.53	0.00
Wheat offal %	23.53	11.76	11.76	11.76	23.53	0.00	11.76	0.00	23.53
Concentrate %	29.41	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	0.18
Bone meal %	0.18	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	100

Table 2: Performance characteristic of laying hen fed experimental treatment

Treatment	**HDP**	**FCR**
Overall means ± SE	64.30 ± 0.30	2.70 ± 0.013
Treatment 1	60.42 ± 0.98^{d}	2.90 ± 0.04^{a}
2	60.01 ± 0.98^{d}	2.80 ± 0.04^{ab}
3	64.14 ± 0.98^{c}	2.70 ± 0.04^{d}
4	64.10 ± 0.98^{c}	2.70 ± 0.04^{bcd}
5	61.63 ± 0.98^{cd}	2.80 ± 0.04^{abc}
6	60.30 ± 0.98^{d}	2.80 ± 0.04^{abc}
7	64.10 ± 0.98^{c}	2.70 ± 0.04^{cd}
8	64.03 ± 0.98^{c}	2.60 ± 0.04^{d}
9	67.11 ± 0.98^{b}	2.60 ± 0.04^{d}
10	71.03 ± 0.98^{a}	2.50 ± 0.04^{e}
11	70.05 ± 0.98^{a}	2.50 ± 0.04^{e}
LOS	*** * ***	* * *
Age	*** * ***	
Age 1 (96 weeks)	62.33 ± 0.36	
Age 2 (72 weeks(	69.55 ± 0.58	

HDP-Hen day egg production. FCR Feed conversion ratio * * * -P<0.001LOS Level of significant

Table 3: Influence of feed type on external and internal egg quality characteristics

		Treatment										
Variables	**Overall means± SE**	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**	**T9**	**T10**	**T11**	**LOS**
Egg weight (g)	59.85 ± 0.22	59.65 ± 0.77	61.11± 0.76	59.68± 0.76	58.92± 0.69	60.54± 0.85	60.13± 0.90	60.75 ± 0.55	60.13± 0.55	59.77± 0.74	58.73± 0.55	59.02± 0.88	NS
Egg length (mm)	56.40± 0.20	56.28± 0.67abc	54.67± 1.34c	57.05 ± 0.27ab	56.55 ± 0.41abc	56.54± 0.67abc	57.07± 0.46ab	58.19± 0.41a	57.47± 0.38a	56.44± 0.42abc	55.31± 0.45bc	54.83± 0.81c	X
Egg width (mm)	42.82± 0.15	43.02± 0.46	42.33± 1.06	42.78± 0.25	42.62± 0.42	42.48± 0.31	42.71± 0.23	42.64± 0.18	43.15 ± 0.52	42.56± 0.34	42.73± 0.27	43.97± 0.80	NS
Shell thickness (mm)	0.87± 0.43	0.88± 0.50b	1.49± 0.46a	0.83± 0.41b	0.85 ± 0.59b	0.73± 0.40b	0.75 ± 0.48b	0.78± 0.50b	0.82± 0.40b	0.82± 0.43b	0.81± 0.55b	0.81± 0.41b	X
Shell weight (g)	8.85 ± 0.72	9.23± 0.32	9.05 ± 0.21	8.77± 0.26	8.78± 0.30	8.82± 0.25	8.96± 0.29	8.61± 0.22	8.66± 0.19	8.94± 0.20	8.95 ± 0.19	8.65 ± 0.19	NS
Yolk length (mm)	36.37± 0.14	36.08± 0.60	36.70± 0.54	37.50± 0.32	36.50± 0.34	36.72± 0.50	36.31± 0.44	36.50± 0.43	35.5 ± 0.43	35.90± 0.62	36.35 ± 0.45	36.18± 0.45	NS
Yolk weight (g)	15.23± 0.78	15.10± 0.24	15.25 ± 0.25	15.24± 0.24	14.99± 0.30	15.50± 0.26	15.26± 0.23	15.53± 0.20	15.15 ± 0.20	15.00± 0.22	15.50± 0.30	15.10± 0.20	NS
Albumen weight (g)	24.11± 0.11	24.32± 0.40	24.31± 0.30	24.00± 0.37	23.90± 0.53	24.22± 0.42	24.22± 0.41	24.13± 0.30	23.80± 0.32	24.01± 0.30	24.44± 0.35	23.80± 0.25	NS

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