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PERFORMANCE OF LAYING HENS FED DIETS CONTAINING VARYING LEVELS OF BREWERS DRIED GRAIN AS ENERGY SOURCE

V. N. Obidimma, F. N. Madubuike and B.U Ekenyem
Department of Animal Science and Fisheries, Imo State University,
P.M.B. 2000, Owerri, Nigeria

ABSTRACT
A total of 100 twenty-two- week old Nera Black pullets were used in an eight- week long experiment to assess the effect of brewer's dried grain (BDG) as energy source on performance of laying hens. Five experimental diets were formulated to represent T_1, T_2, T_3, T_4 and T_5 which contained 0. 25, 50, 75 and 100% brewer's dried grain levels respectively. The laying hens were grouped into 5 treatments and each treatment group was further replicated four times in a completely randomized design. Feed and drinking water were supplied adlibitum and adequate sanitation and medication measures were also applied. Live weights of the birds were taken at the start of the experiment while final live weights were taken at the end of the experiment. Feed intake, egg weight, feed conversion ratios, hen-day egg production and cost benefit analysis were assessed. Results showed that hen-day egg production of 58.60 and 35.00% for birds on 75 and 100% brewers dried grain diets differed significantly ($p<0.05$) from that of birds on 0 and 50% which were statistically the same ($p>0.05$) T_1 had the highest ($p<0.05$) hen-day egg production. Feed intake was observed to increase with high inclusion level of BDG in the diets with T_4 having the highest ($p<0.05$) feed intake than birds on other treatments followed, by T_5 T_1 had the least ($p<0.05$) feed intake, but with better feed efficiency than T_4 and T_5. Cost effectiveness result showed significant differences ($p<0.05$) among the treatments. Cost of production significantly ($p<0.05$) increased with brewer's spent grain inclusion levels above 50% in laying hens diet. Cost effectiveness was obtained with T_3 (50% BDG). Egg weight value from birds on diet T_1 differed significantly from the egg weight obtained from birds on diet T_5, egg weights from birds on diet T_1 was the heaviest (($p<0.05$) among the egg weights obtained from other treatments, followed by egg weights from T_4 and then T_3, but there was no definite trend on egg weight values among the treatments. Egg weight value obtained from birds on diet T_1 did not differ significantly ($p>0.05$) from the value obtained from T_4 and T_3 (75 and 50%BDG) respectively.

INTRODUCTION
Nigerian livestock industry, especially poultry industry has suffered tremendously and is on the verge of collapse as a result of set-backs arising from high cost of feed in poultry industry. As a result many poultry farmers have abandoned poultry business to more profitable business. This has also caused serious animal protein deficiencies among Nigerians resulting to malnutrition. Ogundipe (1987), Madubuike and Ekenyem (2001) and Anyaehie, (2006) observed that the high cost of poultry feed is attributed to the high cost of conventional feedstuffs such as maize, soyabean and groundnut resulting from the competition between farm animals, humans and industrial processors for the conventional feed stuffs. The high cost and scarcity of conventional poultry feedstuffs in Nigeria have led to the search for and utilization of alternative feed sources and unconventional feedstuffs for poultry. Consequently, adequate information on the nutritional value and suitability for use of these unconventional plant and animal by-products is imperative before incorporation into livestock feed.

Recently, agro by-products which were discarded as waste are now used as poultry feed. For instance, Formunyam (1985), Madubuike (1988) used brewer's dried grain as alternative energy source to maize for pig production and observed good performancs in addition to reduced cost of production. Ekenyem and Madubuike (2006) used wild potato (*Impomoea asarifolia)* leaf meal as alternative to groundnut and observed reduced cost of production. Uko *et. al.,* (2001) used cereal by-products to replace maize in rabbit production and discovered good performance in addition to reduced cost of production.
Energy is the most costly part of poultry diet and constitutes up to 60 to 65% of the total diet (Perrin and Klopfenstein 2000). Dietary energy is the main factor that influences feed intake as birds will under normal circumstance eat to satisfy their energy needs. One of the problems with Agro-by-products in poultry feed is their high fibre content. This results to insufficient or unavailability of their active ingredients to monogastric animals such as poultry and pigs due to their low capability of handling high fibre diets. Sequel to that, efforts are being made to improve nutritional status of some agro by-products such as brewer's spent grain through milling sieving, addition of fat and supplementation with exogenous enzyme and probiotic, to increase its energy and protein content as well as availability (Truinin 2001). Brewers spent grain is the by-product of brewing industry, the residue containing rice, corn grits, corn starch, wheat starch, sorghum grits, oat and barley grits and husks, produced as by-product in the production of beer (Japanese Standard Feed Ingredients, 1987).

Brewers spent grain was found to be a satisfactory source of energy in finishing pigs and poultry rations (Yeong, 1986; Truinin, 2001; Formunyan 1985). Brewer's spent grian inclusion of up to 30% was not observed to decrease performance in broilers age 8 to 12 weeks; and in hen (Deltoro-lopez, 1981). The objective of this study is to assess the value of brewer's dried grain as energy source in the performance of laying hens, with a view to reducing production cost and enhancing profitability. Brewer's spent grain appears to have potentials to replace maize in laying hen diets.

Materials and Method

Location of the Experiment

The experiment was conducted at the Imo State Redemption Farms, Nekede, Owerri, Nigeria lying between latitudes $5^{o}{}_{.}$ 35′N and $6^{o}{}_{.}$ 10′N and longitudes $6^{o}{}_{.}$ 40′E and $7^{o}{}_{.}$ 11′E.

Preparation of Experimental Diets

The brewer's spent grain used was purchased from the Consolidated Breweries Plc, Awo-Omama, Imo State. The spent grain was sundried and passed through a hammer mill and subjected to proximate analysis in the laboratory of School of Agriculture and Agricultural Technology (SAAT), Federal University of Technology, Owerri according to A.O.A.C (1995), and used to replace maize at levels, 0, 25, 50, 75 and 100% respectively as T_1, T_2, T_3, T_4 and T_5. Yellow maize and other feed ingredients were bought from Ceekings Farm Feed Mills, Egbu Owerri, Imo State.

Experimental Birds

A total of one hundred (100), 22 weeks old Nera Black pullets, sourced from Imo State Redemption Farms, Nekede, Owerri were used. The birds were brooded and raised with commercial grower mash until 18 weeks old, then commercial layer mash was fed until 22 weeks before the commencement of the feeding trials. The birds were divided into five treatment groups of twenty (20) birds per treatment. Each treatment group was further replicated four times in a completely randomized design of 5 birds per replicate. The birds were placed in their respective treatment diets for seven days stabilization and thereafter, initial live weights were measured and weighing was done on weekly basis. Appropriate medication and other standard poultry management measures were adopted.

Data collection and Analysis

Initial live weight of the birds were measured at the beginning of the experiment and final live weights were measured at the end of the experiment with salter weighing scale. Feed intake was calculated by subtracting daily left over feed from the amount of feed supplied each day. Eggs were collected two times daily and were used to determine hen day egg production. All eggs collected from each replicate group were weighed daily with saltorius electronic digital scale to determine average egg weight. Cost benefit analysis was also calculated.

All data were subjected to one-way analysis of variance, (Steel and Torrie, 1980) while significant means were separated using the Duncan's Multiple range test as outlined by (Onuh and Igwemma, 2000).

Results

Table 1: Proximate Composition of Brewer's Dried Grain

Nutrient	Value
Dry matter %	91.5
Gross Energy (kcal/kg)	2230.0
Crude protein	18.38
Ether extract	6.00
Crude fibre	15.50
Nitrogen free Extract (NFE)	50
Mineral composition	
Calcium	0.08
Phosphorus	0.10
Magnesium	0.06
Ash	6.0

Table 2: Ingredient composition of the experimental laying hen diets

Ingredients %	T_1	T_2	T_3	T_4	T_5
Maize	50.0	37.5	25.0	12.5	0
Brewers dried grain(BDG)	0	12.5	25.0	37.5	50.0
Palm kernel cake (PKC)	10.3	10.3	10.3	10.3	10.3
Fish meal	6	6	6	6	6
Oyster shell	5	5	5	5	5
Bone meal	4	4	4	4	4
Groundnut cake (GNC)	14	14	14	14	14
Common salt	0.3	0.3	0.3	0.3	0.3
Layer premix	0.25	0.25	0.25	0.25	0.25
l-lysin	0.09	0.09	0.09	0.09	0.09
DL-methionine (HCL)	0.06	0.06	0.06	0.06	0.06
Calculated Nutrient Composition of the diets					
Crude protein (%)	17.80	18.81	19.81	20.81	21.25
Crude fibre	4.55	6.85	9.05	11.30	13.55
Calcium	3.0	3.1	3.1	3.11	3.14
Phosphorus	0.89	0.90	0.91	0.92	0.92
ME (Kcal/kg	2753.05	2653.00	2550.80	2450.80	2256.50

*The premix per kg of feed contains vit. A 10,000iu, vit. D_3, 2,000iu, vit. E 5iu, Vit. K, 2mg, riboflavin 4.20mg, Vit. B_{12}, 5mg nicotinic acid 20mg, folic acid, 0.5mg, choline 3mg, mg 56mg, fe, 20mg, cu, 10mg, Zn 50mg, co 125mg, iodine 0.8mg.

Table 3: Performance Characteristics of Laying hens Fed BDG as energy source

Parameters: Initial live weight, daily feed intake, feed conversion ration, hen-day egg production, egg weight and cost benefit analysis, and final live weights of the experimental birds

Parameters	Percentage Brewers Dried Grain replacement					
	T_1 0%	T_2 25%	T_3 50%	T_4 75%	T_5 100%	SEM
Initial live weight (Kg)	1.53[ab]	1.60[a]	1.52[ab]	1.56[ab]	1.55[ab]	0.01
Daily feed intake (gm)	114.50[d]	115.00[d]	130.50[c]	142.00[a]	132.50[b]	2.06
Feed conversion ratio	2.28[d]	2.58[cd]	2.73[c]	4.02[b]	6.39[a]	0.08
Hen-day egg production (%)	82.10[a]	74.95[b]	80.00[a]	58.60[c]	35.00[d]	9.31
Egg weight (gm)	68.13[a]	66.41[abc]	67.02[abc]	67.70[ab]	66.33[bc]	1.06
Final live weight (kg)	1.68[a]	1.65[ab]	1.67[a]	1.66[ab]	1.65[ab]	0.01
Total feed cost (N)	9387	7832	9299	6755	6211.5	28.83
Cost/kg feed N	93.87	78.32	72.99	67.55	62.12	2.36
Feed cost/kg egg weight (N)	214.01[c]	202.10[d]	199.30[e]	271.55[b]	396.94[a]	12.93

*Means in the same column, having the same letter(s) are not significantly different (p>0.05)

The results of the feeding trials show that the initial live weights of the birds on different treatment groups were statistically (p>0.05) the same. Table 3 is the perform characteristics of laying hens fed BDG as energy source. Parameters such as feed intake, feed conversion ratio, hen-day egg production and cost of feed/kg egg weight showed significant differences (p<0.05) between treatments but birds fed 0 and 50% spent grain diet were not significantly different (p>0.05) from each other. The value of each parameter reduced with higher inclusion levels of brewers dried grain in their diets.

Discussion

Higher feed intake, reduced feed efficiency and depressed egg production of birds on high levels BGD diets could be attributed to high fibre in the diets. High fibre diets could result to less availability of active ingredients of the diets to the birds placed on such. The birds therefore ate more to satisfy their energy requirement for production and maintenance. It was observed too that higher feed intake of birds on high levels BDG did not support higher egg production. Birds on high level fibre diets consumed much feed but produced lesser number of eggs. This also demonstrated that lower fibre diets supported better utilization of feed for higher egg production and increased feed efficiency. This also attributed to the effect of high fibre in the diets of monograstric animals such as pig and poultry for they have low capability of handling high fibre diets.

It was observed that the performances of birds placed on 50% BDG diet came closer to the performances of control T_1, this showed that certain quantity of fibre is necessary to all animal species including monogastrics for proper functioning of gastro-intestinal track and production efficiency. It was indicated that at even 100% level in the diets of laying hens, brewer's dried grain was well accepted by the laying hens irrespective of high fibre content.

Feed cost per kg egg weight was best cost effective from 50% BDG and above 50% BDG in diet of laying hens, egg number was drastically reduced and cost of production became very high. This showed that 50% BDG can economically reduce level of maize in laying hen ration. Higher fibre diets in monogastric animal nutrition could result to higher feed consumption, reduced egg number and increased cost of production. Egg weights and number are the major cost indices in egg production because they determine to large extent the price of eggs in poultry industry.

Conclusion

The laying hens were able to tolerate up to 100% level brewer's dried grain in their diets. However, egg production and feed utilization declined and cost of production was very high. In terms of cost effectiveness, 50% brewer's dried grain was the optimum for energy source in laying hens diet.

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