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Performance, Carcass Characteristics and Economy of Production of Broilers Fed Maize-Grit and Brewers Dried Grain Replacing Maize

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Abstract: A 28-day feeding trial involving ninety-six (96) four weeks old broiler chicks was conducted to investigate the effect of total replacement of maize with different combination ratios of maize grit and Brewers Dried Grain (BDG) on the performance, carcass characteristics and economy of finisher broilers. Four experimental diets were formulated by substituting maize with maize grit and BDG in the ratio of T₁ (0%); T₂ (1:1.45 + 15); T₃ (1:1.30 + 30) and T₄ (1:1.15 + 45) respectively. The birds were randomly assigned to four treatment diets. Each experimental unit of 24 birds was replicated twice giving 12 birds per replicate in a completely randomized design (CRD). Feed and water were provided ad-libitum. Body weight and weight gain per feed intake through higher at high cost with the control diet improved in cheaper diets formulated with maize grit and BDG. There was no consistency in the carcass characteristics of the groups particularly among the internal organs showing that dietary maize grit ad BDG could not pose any discernible nutritional problems that might manifest in the carcass of the broilers. Cheaper feed formulated with maize grit and BDG gave the higher gross margins especially diet 4.

Key words: Performance, carcass, economy of production, maize grit-breeders dried grain, maize, broilers

Introduction
The cost of producing poultry feeds has been on the increase in Nigeria over the last three decades. This is attributable to inadequate production of maize, which is a major energy source in poultry feed, coupled with stiff competition between man and livestock over the available grains. Feed for monogastrics consist of 50-60 percent energy sources and this has remained a major set back in poultry production, since the chief energy source is relatively scarce and expensive. Esonu et al. (2002) had observed that feed alone accounts for 70-80 percent of cost of poultry production in Nigeria. Importing maize into the country could drain much of the scarce foreign exchange. There is therefore the need to embark on intensive research in a bid to discover alternative energy source which are readily available, attracting little or no competition between man and livestock hence encouraging production at reduced cost. Some industrial by-products such as maize grit Brewers’ Dried Grain (BDG), or a combination of them, could serve as the alternative energy source in poultry diet (Olumuyiwa, 1988). These by-products which are not directly utilized by humans are available and are likely to be more available with the increasing number of industries discarding them in Nigeria.

Maize grit and BDG though spent in terms of their starch content, do actually contain proportionately more valuable vitamins, minerals, fat, fibre and protein than were contained in the original cereal grain used (Kingsell et al., 1979; Singh, 1988). This research was therefore to determine the effect of the use of maize grit and BDG as substitutes for maize on performance and carcass characteristics of finisher broilers. It also investigated the cost effectiveness of the use of maize grit and BDG over maize in finisher diets.

Materials and Methods
One hundred (100) day-old chicks of Anak breed raised for five weeks on broiler starter ration, comprising of the same experimental ingredients (proximate composition is shown in Table 2, were used for the study. At the end of the starter phase (five weeks) four mortality was recorded, the remaining ninety-six (96) birds were weighed and randomly distributed into four treatment groups. Thereafter they were fed for nine weeks with four broiler finisher diets formulated with maize, maize grit, and brewers’ dried grain in the ratios of T₁ (0%); T₂ (1:1.45 + 15); T₃ (1:1.30 + 30); and T₄ (1:1.15 + 45) respectively (Table 3).

Each treatment group of 24 birds were replicated two times giving 12 birds per replicate. The birds were managed in a deep litter pen measuring 3.06x3m per pen, in a completely randomized design (CRD). Feed and water were supplied ad-libitum. Necessary vaccines and antibiotics were administered at appropriate period. Litters were change on weekly basis.
Data collection and statistical analysis: Records of feed intake, body weight, weight gain, feed conversion ratio, mortality were maintained. Proximate analysis of maize grit, Brewer’s dried grain and the diets were determined, according to standard methods of AOAC, (1980). Carcass characteristics were determined by weighing live birds, dressed birds and dismembered body parts. All data collected were subjected to Analysis of variance (ANOVA), (Snedecor and Cochran, 1980). The means were separated for test of significance by using Duncan’s Multiple Range Test as outlined by Steel and Torrie (1980).

Results and Discussion
The proximate composition of maize grit and BDG is presented as Table 1, and the proximate composition of starter diets in combination ratios of maize grit and BDG is shown as Table 2. The composition of starter diets in combination ratios of maize grit and BDG is shown as Table 2. The composition of the experimental broiler finishers is shown as Table 3. In Tables 4, 5 and 6 the effect of total replacement of maize with levels of maize grit and BDG on performance, carcass characteristics, and economy are presented respectively.

Results of total replacement of maize with combinations of maize grit and Brewers’ Dried Grain on the performance of finisher broilers are presented in Table 4. Performance indices showed that body weight and weight gain of birds placed on the control diet were significantly (P < 0.05) higher, compared to the other treatment groups (T1, T2, T3), which were not significantly (P > 0.05) different in weight gain. The higher body weight gain observed with the control diet could be due to high energy value of the diet accruing from full starch content of pure maize. This could perhaps be a level where the caloric to protein ratio is balanced to enhance performance (Bartov et al., 1974).

Depression in growth in terms of body weight ad weight gain recorded in T1 might be the result of high protein level with low energy density of the diet. This is in agreement with Sunda (1956) that rations low in energy and high in protein content reduced growth and efficiency of feed utilization. Feed intake was significantly (P < 0.05) higher in treatments 3 and 4, but lower in the control (T1). This reduction in feed intake observed in the control group could be traceable to the high metabolizable energy (ME) concentration of the diet which reduced feed intake but improved feed utilization. This observation upholds the report of the Dean (1985) that feed intake reduced and feed conversion ratio (FCR) improved as the energy density of diets increased.

Similarly, increase in feed intake recorded in treatment 4 could have arisen from the high fibre content with low energy density of the diet accruing from high level inclusion of BDG. Increase in fibre content of a feed leads to reduction in energy compelling birds to eat as much as they can to satisfy their energy requirements. This is in line with the view of Moran (1977) that high fibre diets tend to increase feed intake in birds. The best feed to gain ratio was recorded from birds fed the control diet. This may be attributed to low fibre content of the diet since fibre in the diet of monogastrics impairs utilization of other nutrients especially crude protein (Deloreme and Wojcik, 1982). Treatments 3 and 4 had the highest value of feed to gain ratio. This poor utilization of feed could also be due to high fibre inclusion. This agrees with the work of Babatunde et al. (1975) who showed that values of feed to gain ratio increased with increase in fibre in diets.

The effects of replacement of maize with maize grit and BDG on the carcass characteristics of broilers are
shown in Table 5. The carcass characteristics used to assess the effect of replacement of maize with maize grit and BDG are dressed weight as percentage of live weight, the breast muscles, the thigh muscles and the neck. The internal organs evaluated were the gizzard, the kidney, liver, heart, and the abdominal fat. The results show the following values for live weight: 2.26, 2.22, 2.21 and 2.20 kg for T1, T2, T3, and T4 respectively. There was no significant difference between the live weight of T3 and T4 (P < 0.05) but there was significant difference in live weight between T1 and the other treatments (P < 0.05).

The dressed weight (%) were 66.65, 76.03, 66.97, and 67.05 for T1, T2, T3, and T4 respectively. There was a significant difference (P < 0.05) between T1 and the other treatments while T1, T2, and T3 were similar (P > 0.05).

The thighs (%) were 18.35, 19.32, 18.46, and 18.17 for T1, T2, T3, and T4 respectively. There was a significant difference (P < 0.05) between T1 and other treatments (T2, T3, and T4) which did not differ. The breast (%) were 38.61, 37.46, 36.50 and 37.84 for T1, T2, T3, and T4 respectively. There was a significant difference between T2 and other treatments (P < 0.05) and the other treatments did not differ significantly (P < 0.05). The necks (%) were 2.31, 2.84, 2.26 and 2.51 for T1, T2, T3, and T4 respectively. There was a significant difference between T1 and T4 (P < 0.05) and T2 did not differ from T1 (P < 0.05); T1, T2, and T3 were also not significantly different (P < 0.05). The Gizzard (%) were 2.17, 2.21, 2.21 and 2.31 for T1, T2, T3, and T4 respectively. There was significant difference between T1 and T4, T2, T3, and T4 (P < 0.05). The kidneys (%) were 0.14, 0.12, 0.09 and 0.06 for T1, T2, T3, and T4 respectively. There was a significant difference (P < 0.05) between T1 and T4 and T2 and T4 but T1 was the same with T2. Also T1 was the same with T4 the livers were 2.41, 2.54, 2.88 and 1.60 for T1, T2, T3, and T4 respectively. There was a significant difference between T1 and T4 and also between T1 and T2 (P < 0.05) although T1 and T2 were the same but T4 did not also differ from T1 and T4 (P < 0.05). The hearts (%) were 0.39, 0.36, 0.45 and 0.39 for T1, T2, T3, and T4 respectively. There was a significant difference between T1 and the other treatments (P < 0.05). The abdominal fat (%) were 0.54, 0.26, 0.46 and 0.38 for T1, T2, T3, and T4 respectively. There was a significant different between T1 and the other treatments (P < 0.05) which did not differ among themselves.

The cost of feed consumed by birds to obtain a unit of product (marginal cost in production) and/or the Gross margin values have been suggested by Ukachukwu and Anugwa (1995) to be useful in assessing the bioeconomics of feed in poultry production. This and other economic indices are shown in Table 6, the table shows that the cost of diet containing conventional maize (T1 or control) was significantly higher (P < 0.05) than the cost of diets containing graded levels of maize.
Table 6: Economic Indicators from Broilers Fed Maize Grit and Brewers’ Dried Grain as Substitutes for Maize

<table>
<thead>
<tr>
<th>Economic indices</th>
<th>T₁</th>
<th>T₂</th>
<th>T₃</th>
<th>T₄</th>
<th>P</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of diets (N/kg)</td>
<td>48.06&lt;sup&gt;a&lt;/sup&gt;</td>
<td>26.49&lt;sup&gt;b&lt;/sup&gt;</td>
<td>27.00&lt;sup&gt;c&lt;/sup&gt;</td>
<td>24.69&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.0001</td>
<td>1.268</td>
</tr>
<tr>
<td>Cost per wt gain (N/kg)</td>
<td>112.50&lt;sup&gt;a&lt;/sup&gt;</td>
<td>70.75&lt;sup&gt;b&lt;/sup&gt;</td>
<td>67.73&lt;sup&gt;c&lt;/sup&gt;</td>
<td>61.73&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.0001</td>
<td>2.750</td>
</tr>
<tr>
<td>Av. Variable Cost (N/Bird)</td>
<td>216.37&lt;sup&gt;a&lt;/sup&gt;</td>
<td>132.71&lt;sup&gt;b&lt;/sup&gt;</td>
<td>121.91&lt;sup&gt;c&lt;/sup&gt;</td>
<td>111.11&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.0001</td>
<td>5.710</td>
</tr>
<tr>
<td>Av. Wt at point of sale (kg)</td>
<td>2.28&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.22&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.21&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2.20&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.0001</td>
<td>0.007</td>
</tr>
<tr>
<td>Av. Revenue* per kg</td>
<td>80.75&lt;sup&gt;a&lt;/sup&gt;</td>
<td>60.50&lt;sup&gt;b&lt;/sup&gt;</td>
<td>60.75&lt;sup&gt;c&lt;/sup&gt;</td>
<td>60.00&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.0001</td>
<td>4.659</td>
</tr>
<tr>
<td>Gross margin (N/Bird)</td>
<td>405.13&lt;sup&gt;a&lt;/sup&gt;</td>
<td>477.79&lt;sup&gt;b&lt;/sup&gt;</td>
<td>485.64&lt;sup&gt;c&lt;/sup&gt;</td>
<td>489.89&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>0.0001</td>
<td>4.655</td>
</tr>
</tbody>
</table>

<sup>a b c</sup> Means bearing superscripts in the same row are significantly different (P < 0.05). * Price of chicken = N275/kg

The difference arose from the costs of maize, maize grit and BDG. While maize was purchased at N53.00 per kg, maize grit was bought at N26.00 per kg and the BDG bought at N10.00 per kg. Diet T₁ was significantly lower in cost (P < 0.05) than the other diets with graded levels of maize grit and BDG (T₃ and T₄). The cost per weight gain and the average variable costs were highest in the maize-based diet (T₄) and significantly (P < 0.05) different from the values in the other (maize grit, BDG-based) diets (T₃, T₂, and T₁).

The average weight of birds fed the different diets at the point of sale differed significantly. However, birds fed diets T₁ and T₄ were significantly lower in weights (P < 0.05) than birds fed commercial feed (T₃). The weight of birds fed diets T₃ and T₄ were not different from each other.

The revenue differed between the different diets. This was because the costs affected the gross margins negatively. The highest gross margin was recorded with diet T₃. Diets T₃ and T₄ equally gave high gross margins but their values were not statistically different from each other. These were significantly (P < 0.05) higher than the gross margin recorded with maize-based diet (control).

In terms of economy of feed, substituting maize with maize grit and BDG at various ratios gave cheaper rations in treatments 2, 3 and 4 with improved weight gains. This observation is in line with the report of Okerie et al. (1998) that replacing maize with wet-milling byproducts proved more efficient in the performance of broilers with reduced cost compared to the control diet. Since most broiler farmers are in commercial production with the aim of making good profit, it is advisable for them to formulate their diets substituting maize with maize grit and BDG, preferably as in T₄.

**Conclusion:** Maize grit and brewers’ dried grain can be used to formulate poultry diets in which maize is completely replaced. The performance of birds fed diet 2 compared very closely with the birds fed the control diet and therefore a good formulation for finishing broilers. There was no consistency in the carcass characteristics of the groups particularly among the internal organs showing that dietary maize grit and BDG could not present any discernible nutritional problems that could clearly manifest in the carcass of the broilers. It is cheaper to finish on diets formulated with maize grit and BDG than with maize-based Commercial feed, in Nigeria. The lower diet cost of such formulation with high feed to weight gain ratio guaranteed higher gross margins.

**References**


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