



GROWTH PERFORMANCE OF BROILER CHICKENS FED GRADED LEVELS OF CORN HOMINY MEAL AS REPLACEMENT FOR MAIZE

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ABSTRACT

An eight-week feeding trial was conducted to evaluate the growth performance of broiler chickens fed graded levels of corn hominy meal (CHM) as a replacement for maize. One hundred and forty-four day-old Anak 2000 broiler chicks were randomly assigned to four dietary treatments in a completely randomised design (CRD). Each treatment had three replicates of twelve birds each. Corn hominy meal replaced maize at 0, 20, 40 and 60% in diets 1, 2, 3 and 4, respectively. All diets were isonitrogenous and isocaloric. At the starter phase, average daily feed intake was significantly ($P < 0.05$) influenced by dietary treatment, with birds on 60% CHM recording the highest intake (38.41 g/bird/day), while average live weight, daily weight gain, feed conversion ratio (FCR) and protein efficiency ratio (PER) were not significantly ($P > 0.05$) affected. At the finisher phase, average live weight, daily weight gain, FCR and PER were significantly ($P < 0.05$) influenced by treatment diets. Birds maintained on 40% CHM recorded the highest live weight (2.60 kg/bird) and best PER (3.22), while those on 60% CHM had the highest FCR (2.70), indicating poor feed utilisation at that level. Mortality was zero across all treatments. It is concluded that CHM can replace maize at up to 40% inclusion level in broiler diets without adverse effects on growth performance.

Keywords: Corn-hominy, Meal, Broiler, Chickens, Growth, Performance

INTRODUCTION

The cost of conventional feed ingredients remains a major constraint to profitable poultry production in Nigeria and other sub-Saharan African countries. Maize, which constitutes 50–65% of broiler diets, competes directly with human food demand, driving its price to levels that erode profitability for smallholder and commercial producers alike (Durunna *et al.*, 2006). This situation has intensified research interest in alternative energy sources that are abundant, affordable and nutritionally adequate for broiler production. Agro-industrial by-products represent a promising class of alternative feed ingredients because they are often available at lower cost, require minimal processing, and reduce dependence on staple grains in livestock feeding systems (Egbunike and Ikpi, 2005; Onuh, 2005). Previous studies have demonstrated acceptable performance in broilers fed various by-products including indomie waste (Eniolorunda *et al.*, 2007), cornflakes waste meal (Omoikhoje *et al.*, 2010), cassava root meal (Okereke, 2012) and pineapple crush meal (Lamidi *et al.*, 2008), among others.

Corn hominy meal (CHM) is a by-product of dry milling of maize, comprising an inseparable mixture of germ, pericarp and endosperm fractions and accounting for approximately 35% of the maize grain by dry weight (Stock *et al.*, 2000). Published values indicate a proximate composition of 15.0–16.5% crude protein, 6.5–6.9% crude fibre, 4.0–7.9% ether extract and a metabolisable energy of 2,450–3,300 kcal/kg DM (Leeson *et al.*, 1988; Feedipedia, 2023), making it nutritionally comparable to maize grain and potentially suitable as a partial or complete maize substitute in poultry rations. Its inclusion at 10% had no deleterious effect on cattle performance (Troy, 1969), but information on its optimal inclusion level for broiler chickens, particularly under tropical conditions in Nigeria, remains limited.

The objective of this study was therefore to determine the growth performance of broiler chickens fed diets in which CHM replaced maize at graded levels of 0, 20, 40 and 60%.



MATERIALS AND METHODS

Location and Duration of the Experiment

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Ambrose Alli University, Ekpoma, Edo State, Nigeria (latitude 6.44°N, longitude 6.80°E). The farm is located in the transitional zone between the tropical rainforest and derived savannah, with a mean annual rainfall of approximately 1,556 mm and ambient temperatures ranging from 26°C in December to 34°C in February. The study lasted eight weeks (June to July).

Experimental Animals and Management

One hundred and forty-four day-old (144) Anak 2000 broiler chicks of uniform weight were used. The house, feeders and drinkers were thoroughly cleaned and disinfected prior to the experiment. Birds were brooded for two weeks on a commercial starter diet for acclimatisation. Thereafter, they were randomly allotted to four treatment groups of 36 birds each in a completely randomised design (CRD), with three replicates of 12 birds per treatment. Birds were housed under a deep litter system and had unrestricted access to experimental feed and clean water throughout the study. Routine vaccination, medication and management practices were observed.

Experimental Diets

Corn hominy meal was sourced from Okpella local market, Edo State, while other feed ingredients were purchased from ingredient stores in Benin City and Ekpoma. Four broiler starter (weeks 1–4) and four finisher (weeks 5–8) diets were formulated, in which CHM replaced maize at 0% (Diet 1, control), 20% (Diet 2), 40% (Diet 3) and 60% (Diet 4). All diets were formulated to be isonitrogenous (22% CP starter; 19% CP finisher) and isocaloric (2,800 and 3,000 kcal ME/kg, respectively). The proximate composition of CHM used in this study was consistent with published reference values of 15.0–16.5% crude protein, 6.5–6.9% crude fibre and 4.0–7.9% ether extract on a dry matter basis (Leeson *et al.*, 1988; Feedipedia, 2023). Ingredient and calculated nutrient composition of experimental diets are presented in Tables 1 and 2.

Table 1: Proximate Composition of Corn hominy Meal (CHM)

Nutrient	Value (% DM)
Dry matter	91.0
Crude protein	15.0 – 16.5
Crude fibre	6.5 – 6.9
Ether extract	4.0 – 7.9
Nitrogen-free extract	58.9
Total ash	6.0 – 9.8
ME poultry (kcal/kg DM)	2,450 – 3,300

Source: Leeson *et al.* (1988); Feedipedia (2023)



Table 2: Percentage Composition and Calculated Nutrient Content of Experimental Broiler Starter Diets

Ingredient (kg/100 kg)	Diet 1 (0%)	Diet 2 (20%)	Diet 3 (40%)	Diet 4 (60%)
Maize	58.79	46.99	35.19	23.39
Corn hominy meal	0.00	11.80	23.60	35.40
Soyabean meal	31.27	31.64	31.69	31.74
Wheat bran	2.64	2.14	2.13	2.12
Palm kernel cake	2.44	2.33	2.29	2.25
Fish meal	1.74	2.00	2.00	2.00
Bone meal	2.50	2.50	2.50	2.50
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Broiler premix	0.30	0.30	0.30	0.30
Salt	0.30	0.29	0.29	0.29
Total	100.00	100.00	100.00	100.00
Calculated composition (%)				
Crude protein	23.00	23.37	22.51	22.64
Crude fibre	3.50	3.82	4.17	4.51
Ether extract	3.30	3.49	3.67	3.84
Calcium	1.00	1.00	1.00	1.00
ME (kcal/kg)	2800	2846	2885	2824



Table 3: Percentage Composition and Calculated Nutrient Content of Experimental Broiler Finisher Diets

Ingredient (kg/100 kg)	Diet 1 (0%)	Diet 2 (20%)	Diet 3 (40%)	Diet 4 (60%)
Maize	61.30	49.04	36.78	24.52
Corn hominy meal	0.00	12.26	24.52	36.78
Soyabean meal	28.16	28.23	28.27	28.31
Wheat bran	3.00	3.00	3.00	3.00
Palm kernel cake	2.41	2.37	2.33	2.29
Fish meal	1.97	2.00	2.00	2.00
Bone meal	2.50	2.50	2.50	2.50
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Broiler premix	0.30	0.30	0.30	0.30
Salt	0.30	0.29	0.29	0.29
Total	100.00	100.00	100.00	100.00
Calculated composition (%)				
Crude protein	21.00	21.16	21.30	21.44
Crude fibre	3.38	3.74	4.09	4.45
Ether extract	3.36	3.55	3.73	3.92
Calcium	1.00	1.00	1.00	1.00
ME (kcal/kg)	2819	2755	2692	2628

Performance Measurements

Feed intake was recorded weekly by subtracting leftover feed from feed offered. Individual bird weights were taken weekly after overnight fasting. Feed conversion ratio (FCR) and protein efficiency ratio (PER) were calculated as:

$FCR = \text{Total feed intake (g)} / \text{Total weight gain (g)}$

$PER = \text{Total protein intake (g)} / \text{Total weight gain (g)}$

Statistical Analysis

Data were subjected to a one-way analysis of variance (ANOVA) using IBM SPSS version 20. Treatment means that were significantly different were separated using Duncan's Multiple Range Test (Steel and Torrie, 1990). Significance was declared at $P < 0.05$.

RESULTS AND DISCUSSION

Starter Phase Performance

The performance characteristics of broiler chickens at the starter phase are presented in Table 4. Initial live weights were uniform across all treatment groups, confirming that random allocation was unbiased. Average live weight, daily weight gain, FCR and PER were not significantly ($P > 0.05$) affected by dietary treatment at the starter phase. The highest average live weight was recorded in birds fed Diet 2 (741.67 g/bird), though this did not differ significantly from other treatments. The similarity in growth parameters at this phase suggests that CHM at up to 60% replacement level adequately supported early growth, and this is consistent with the report of Okereke (2012) that cassava root meal can replace up to 30% maize in broiler starter diets without adverse effects.



Average daily feed intake was significantly ($P<0.05$) highest in birds fed 60% CHM (38.41 g/bird/day), but the values for 20% and 40% CHM groups (37.02 and 36.69 g/bird/day, respectively) were statistically similar to the 60% CHM group and were not significantly different from the control (34.07 g/bird/day). The increased feed intake at higher CHM inclusion levels may reflect compensatory eating behaviour in response to the slightly higher fibre content of CHM-based diets, a finding consistent with Hedge *et al.* (1978), who reported that fibrous feedstuffs promote feed consumption in broiler chicks.

FCR values were numerically similar across all treatment groups (1.03, 1.03, 1.23 and 1.18 for diets 1, 2, 3 and 4, respectively), indicating that birds were able to utilise the CHM-based diets as efficiently as the maize control. The similarity in PER further confirms adequate protein utilisation at all inclusion levels, in agreement with Zanu and Foroudi (2011), who reported no significant variation in PER of broilers fed corn snack waste meal.

Table 4: Performance Characteristics of Broiler Chickens Fed Graded Levels of CHM at the Starter Phase

Parameter	Diet 1 (0%)	Diet 2 (20%)	Diet 3 (40%)	Diet 4 (60%)	SEM
Initial live weight (g/bird)	0.53	0.52	0.53	0.53	-
Average live weight (g/bird)	720.83	741.67	704.16	708.33	28.71
Average daily feed intake (g/bird)	34.07 ^b	37.02 ^{ab}	36.69 ^{ab}	38.41 ^a	1.19
Average daily weight gain (g/bird)	33.93	35.81	30.36	33.33	3.27
Feed conversion ratio	1.03	1.03	1.23	1.18	0.10
Protein efficiency ratio	1.48	1.56	1.32	1.45	0.14
Mortality	0.00	0.00	0.00	0.00	-

ab Means in the same row bearing different superscripts differ significantly ($P<0.05$); SEM = Standard error of mean

Finisher Phase Performance

The performance characteristics at the finisher phase are shown in Table 5. At this phase, average live weight, FCR and PER were significantly ($P<0.05$) influenced by dietary treatment. Importantly, birds on 40% CHM recorded the highest average live weight (2.60 kg/bird), which compared favourably with birds on the control (2.43 kg/bird) and 20% CHM (2.48 kg/bird) diets but was significantly higher than birds on 60% CHM (1.85 kg/bird). This depression in live weight at the 60% replacement level may be attributed to the elevated crude fibre content (4.45%) of the finisher diet at that inclusion level, which can reduce nutrient digestibility and depress growth in broilers (Iyayi *et al.*, 2005).

Average daily feed intake showed no significant ($P>0.05$) difference among birds fed 0, 20 and 40% CHM, with values of 107.67, 105.58 and 100.46 g/bird/day, respectively. Birds on 60% CHM had the highest intake (108.53 g/bird/day), suggesting compensatory feed consumption to meet energy requirements from the higher fibre diet.

FCR was significantly ($P<0.05$) worst in birds fed 60% CHM (2.70) compared to statistically similar values of 1.76, 1.71 and 1.49 in birds on diets 1, 2 and 3, respectively. Birds fed 40% CHM had the numerically best FCR (1.49), indicating superior feed utilisation efficiency at this level. This supports findings by Okpanachi *et al.* (2014) and aligns with the report of Omoikhoje *et al.* (2010) that appropriately included agro-industrial by-products can match conventional maize-based diets in supporting broiler performance.

PER was significantly highest in birds on 40% CHM (3.22), followed by statistically similar values for the control (2.93) and 20% CHM (2.95), with the lowest PER in birds on 60% CHM (1.94).



The significantly lower PER at 60% replacement suggests suboptimal protein utilisation, likely a consequence of the higher fibre load impairing amino acid absorption at that level. This finding corroborates results by Nworgu *et al.* (2000) and Odoguwa *et al.* (2004). No mortality was recorded in any treatment group throughout the finisher phase.

Table 5: Performance Characteristics of Broiler Chickens Fed Graded Levels of CHM at the Finisher Phase

Parameter	Diet 1 (0%)	Diet 2 (20%)	Diet 3 (40%)	Diet 4 (60%)	SEM
Average live weight (kg/bird)	2.43a	2.48a	2.60a	1.85b	0.06
Average daily feed intake (g/bird)	107.67ab	105.58b	100.46b	108.53a	2.40
Average daily weight gain (g/bird)	60.92	61.96	67.71	40.77	5.60
Feed conversion ratio	1.76b	1.71b	1.49b	2.70a	0.16
Protein efficiency ratio	2.93ab	2.95ab	3.22a	1.94b	0.08
Mortality	0.00	0.00	0.00	0.00	-

ab Means in the same row bearing different superscripts differ significantly ($P < 0.05$); SEM = Standard error of mean

CONCLUSION AND RECOMMENDATION

The results of this study demonstrate that corn hominy meal can effectively replace maize at up to 40% inclusion level in broiler diets without adverse effects on growth performance. At 40% CHM replacement, birds recorded comparable or superior live weight, FCR and PER relative to the maize control at both starter and finisher phases. Inclusion at 60% impaired performance at the finisher phase, likely due to elevated fibre content. Poultry farmers in Nigeria are encouraged to adopt CHM at 40% maize replacement as a cost-effective and nutritionally appropriate strategy for broiler production. Further studies examining the full proximate and amino acid profile of locally sourced CHM, carcass characteristics and haematological responses are recommended.

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