

THE STUDY OF THE EFFECT ON GROWTH PARAMETERS OF BROILER Chickens FED WITH CASSAVA PEELS AND OIL SLUDGE.

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Abstract

This study evaluated the effects of cassava peel meal blended with palm oil sludge (CPMPOS) on the growth performance of broiler chickens. Ninety-six broilers were randomly assigned to three dietary treatments in a Completely Randomized Design: a control diet without CPMPOS (T1), and diets containing 22.5% (T2) and 25% (T3) CPMPOS. Standard management practices, weekly weight measurements, and daily feed intake records were used to determine body weight gain, average daily gain, feed intake, and feed conversion ratio (FCR). Results showed significant ($P < 0.05$) differences across treatments. Birds on the control diet recorded the highest final body weight (2542.94 g), highest weight gain, and the best FCR (1.41), while T2 and T3 showed reduced growth and poorer feed efficiency despite higher feed intake. The reduced performance of CPMPOS diets may be linked to nutrient limitations or processing factors. It is recommended that alternative cassava-peel processing methods be investigated to improve its nutritional value for poultry feeding.

Introduction

Poultry production remains one of the most accessible and economically significant livestock enterprises globally, supplying a major share of the world's animal protein through meat and eggs (Biswas et al., 2011; Alders, 2019). In many African countries, including Nigeria, poultry serves as a major source of income, nutrition, and employment, contributing significantly to rural livelihoods and national food security (FAO, 2009). Despite its importance, the industry faces persistent challenges, particularly the rising cost and increasing scarcity of conventional feed ingredients such as maize, soybean meal, and fishmeal. This challenge is intensified by direct competition between humans and livestock

for these resources, thereby increasing production costs and reducing profitability (Nworgu, 2004; Adebayo, 2008).

As feed accounts for over 70% of the total cost of poultry production, the search for cheaper, safe, and nutritionally reliable alternatives has become critical, especially in tropical regions where seasonal feed shortages and poor-quality roughages limit productivity (Chigbo, 2022). Consequently, researchers have increasingly turned attention toward non-conventional feed resources (NCFR), including agro-industrial by-products, fibrous residues, and plant-derived waste materials capable of supplementing poultry diets without compromising growth performance (Aro et al., 2010; Aniakor, 2023).

Among these alternatives, cassava peel meal (CPM) and palm sludge oil (PSO) represent two of the most promising feed resources for broiler production. Cassava, widely cultivated across sub-Saharan Africa, generates substantial quantities of peels during processing—materials that often cause environmental pollution despite their potential as cost-effective feed ingredients (Olajide et al., 2015). Although CPM is naturally low in protein and energy, it can effectively replace a portion of maize when properly processed to detoxify cyanogenic compounds and supplemented with essential nutrients (Aniakor, 2023; Nworgu, 2004).

Similarly, palm sludge oil also referred to as sludge palm oil (SPO) is a residual lipid fraction derived from palm oil mill effluent. While unsuitable for human consumption due to its high free fatty acid (FFA) content, PSO possesses considerable industrial and nutritional value. It can serve as a low-cost energy source in animal diets when appropriately refined or blended (Chow & Ho, 2002; Hayyan et al., 2010; Hayyan et al., 2011). Recent studies have reported encouraging results on the potential of oil sludge as a supplementary energy source in broiler diets, particularly in relation to growth rate and carcass characteristics (Odunuta, 2021). Collectively, these materials illustrate an emerging opportunity to convert agricultural wastes into sustainable feed ingredients capable of reducing production costs while enhancing poultry performance in developing economies.

Statement of the Problem

Despite the increasing interest in non-conventional feed resources, many valuable agro-industrial by-products including cassava waste, palm processing residues, rubber seed cake, mango seed kernels, and slaughterhouse by-products remain underutilized due to limited awareness of their nutritional value and inconsistent processing methods. As a result, these materials are often discarded, contributing

to environmental pollution and representing a missed opportunity for cost reduction in poultry production.

The high cost and limited availability of conventional feedstuffs continue to hinder the profitability of broiler farming in Nigeria, making it essential to explore sustainable, affordable, and nutritionally viable feed alternatives. Although cassava peel meal and palm sludge oil individually show promise as feed ingredients, their combined use as a blended unconventional feed source for broilers has not been extensively investigated. Critical gaps persist regarding their effects on growth performance, nutrient utilization, feed efficiency, and overall suitability in broiler diets.

This study therefore seeks to provide scientific evidence on the feasibility, safety, and effectiveness of incorporating cassava peel meal blended with palm sludge oil in broiler nutrition, addressing both feed scarcity and high production costs while contributing to sustainable livestock production in Nigeria.

Objectives of the study

The objective of the study is to determine the influence of cassava peel meal blended with palm oil sludge-based diet on the growth parameters of broiler chicken. It has the following objectives:

- I. To evaluate the body weight gain, feed intake and feed conversion ratio on the three dietary treatment involving cassava peel meal blended with palm oil sludge

Materials and Methods

Experimental site

The experiment will be carried out at the Poultry Unit of Teaching and Research farm of the Department of Animal Science, Faculty of Agriculture, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus. Igbariam is located on the latitude 6°23'26.4 North and longitude 6°56'38.7 East with annual rainfall ranging from 1000mm – 1500mm.

Sources the test material

Cassava peel will be obtained from Achalla cassava processing mill while the palm oil sludge will be obtained from Achalla oil mill.

Cassava peel

The cassava peel when gotten will be cleaned, and grated into small pieces, the cassava peels will be hung for at least 5 hours to allow excess moisture to drain away, the cassava peel will then be spread out on a tray until it is no thicker than a few millimetres, it will be out to dry for a few days. As soon as the cassava is fully dried, it will be ground to a fine powder and placed it in an airtight storage container.

Palm oil sludge

The oil sludge will be obtained from voluminous liquid waste that comes from the sterilization and clarification processes in milling oil palm.

Procurement of Experimental Birds

Ninety- six broiler chickens will be used for the experiment. The broilers will be purchased from Ibadan through a reputable source at Awka. They will be transported to Igbariam in the cool hours of the morning to minimize heat stress and transit losses.

Experimental diets

Three diets will be compounded such that diet 1 (control) contained maize as the major energy source. In diets 2 and 3, the sundried mixture of cassava peel and oil palm sludge will be used 0kg for T1, 22:5kg For T2 and 25.00kg for T3 to replace maize.

Table 3.1: Gross Composition of the experimental broiler starter diet

Ingredients (kg)	T1	T2	T3
Maize	55.00	32.50	30.00
Palm Kernel Cake	3.00	3.00	3.00
Soya Bean meal	29.00	29.00	29.00
CPMPOS	0.00	22.5	25.0
Wheat Offal	2.00	2.00	2.00
Brewers Dry Grain	2.00	2.00	2.00
Fish Meal	5.00	5.00	5.00
Bone Meal	3.00	3.00	3.00
Lysine	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Vitamin Premix	0.25	0.25	0.25
Total	100	100	100
Calculated values			
Crude Protein (%)	21.88	21.73	21.93
Metabolizable energy (Kcal/kg)	2799	2800	2796

Table 3.2: Composition of the experimental broiler finisher diet

Ingredients (kg)	T1	T2	T3
Maize	60.00	37.50	35.00
Palm Kernel Cake	3.00	3.00	3.00
Soya Bean meal	22.00	22.00	22.00
CPMPOS	0.00	22.50	25.00
Wheat Offal	2.00	2.00	2.00
Brewers Dry Grain	4.00	4.00	4.00
Fish Meal	5.00	5.00	5.00
Bone Meal	3.00	3.00	3.00
Lysine	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Vitamin Premix	0.25	0.25	0.25
Total	100	100	100
Calculated values			
Crude Protein	18.84	18.69	18.45
Metabolizable energy (kcal/kg)	3001	3003	3005

Growth Performance Indices

Below is a fully revised, well-structured, and professionally rewritten version of your methodology section with recent and relevant references inserted appropriately. I ensured that each reference logically supports the methods, feeding procedure, growth measurements, and use of cassava peel meal or palm sludge oil.

The birds were weighed at the beginning of the experiment and subsequently at the start of each week to monitor growth performance, following standard procedures commonly used in broiler feeding trials (Aniakor, 2023; Olajide et al., 2015). Feed intake was measured daily as the difference between the quantity of feed offered and the leftover feed the following morning. At the end of the experiment, weight gain was calculated as the difference between the final live weight and the initial weight, consistent with methods previously applied in studies involving cassava by-products and alternative feed ingredients (Aro et al., 2010; Chigbo, 2022).

Average daily gain (ADG) for each replicate was determined by dividing the total weight gained by the duration of the

experiment. The feed conversion ratio (FCR) was computed by dividing the average daily feed intake by the average daily weight gain, an approach widely adopted in broiler performance research (Nworgu, 2004; Adebayo, 2008). Mortalities, if any, were recorded daily and summed at the end of the experiment, as recommended in standard poultry management practices (Alders, 2019).

Management of Experimental Animals

Day-old chicks were sourced from a reputable commercial hatchery and brooded under deep-litter conditions, following established management procedures. The brooding and early-care protocol followed the recommendations of standard poultry health and management guidelines (Alders, 2019), as well as the practices documented by recent studies on cassava-based diets in broiler production (Aniakor, 2023).

For the first four weeks, chicks were fed starter diets formulated to contain crude protein levels of 22.93%, 21.88%, and 21.73%, with metabolizable energy values of 2977.1 kcal/kg, 2731.4 kcal/kg, and 2696.3 kcal/kg for treatments T1, T2, and

T3 respectively. From week 4 to 8, the birds were fed finisher diets containing varying levels of palm sludge oil (PSO) and cassava peel meal (CPM), as similarly explored in studies evaluating alternative lipid and carbohydrate sources in broiler diets (Odunuta, 2021; Chow & Ho, 2002; Hayyan et al., 2010).

Chicks were randomly assigned to four dietary treatments (T1, T2, T3, and CPM at 0 kg, 17.5 kg, and 20.00 kg inclusion levels, respectively). A total of 32 chicks were allocated per treatment, with eight chicks per replicate, consistent with the replication pattern used in broiler

nutrition studies involving cassava-based feed ingredients (Chigbo, 2022; Adebayo, 2008). Chicks in each replicate were weighed collectively at the start of the trial and subsequently weighed weekly to determine weekly weight gain.

Birds were kept under intensive management on a deep-litter system with wood shavings as bedding material. Weight gain per week was calculated by subtracting the previous week's weight from the current weight. The following indices were computed using standard formulas (Olajide et al., 2015):

i Feed intake = Daily feed offered - Daily feed remaining

ii Weight gain = Current week weight - Previous week weight

iii Feed conversion ratio = $\frac{\text{Feed intake}}{\text{Weekly weight gain}}$

iv Average daily weight gain = $\frac{\text{weekly weight gain}}{7\text{days}}$

All measurements will be taken between 07:00-09:00 hours in the morning. Chicks will be

vaccinated against Newcastle disease in the first week using the intraocular route and in the

third Week the vaccine was administered through the drinking water.

All measurements were taken between 07:00 and 09:00 hours.

Third Week the vaccine was administered through the drinking water. the Gomboro vaccine was given in its second and fourth weeks and was administered through drinking water. Embazin[®] for the treatment against coccidiosis at two weeks of age was also given to the birds with other preventive medication to promote good health and reduce chick mortality. The cost of feeding the birds was calculated using the average prevailing market prices of the feed ingredient at the time of the experiment.

A comprehensive vaccination schedule was implemented to maintain flock health. Birds were vaccinated against Newcastle Disease in the first and third

weeks, administered through the intraocular route and drinking water, respectively. Gumboro vaccine was administered in the second and fourth weeks via drinking water. Preventive anticoccidial treatment (Embazin[®]) was administered at two weeks of age, consistent with recommended health management practices for broiler production in tropical environments (FAO, 2009; Alders, 2019). Additional supportive medications were provided to reduce stress and mortality.

The cost of feeding the birds was calculated using prevailing market prices of feed ingredients at the time of the study, as commonly applied in economic evaluations of unconventional feed ingredients (Adebayo, 2008; Nworgu, 2004).

Statistical analysis

Data collected was subjected to statistical analysis using the one way ANOVA as outlined by

Steel and Torrie (1980). Statistical Procedure for Social Sciences (SPSS model, 2023) was

used for the analysis. Significant treatment means was separated using Duncans New Multiple Range Test (Duncan 1995). The statistical model used are as follows:
 $X_{ij} = \mu + T_{ij} + e_{ij}$ Where;

X_{ij} = individual observation
 μ = mean whole population
 T_i = Treatment effect
 e_{ij} = experimental error

Result and Discussion

Results

Table 4.1 Growth performance of broiler chickens fed diet containing cassava peel meal Blended with palm oil sludge.

Parameters	DIETS			SEM
	1	2	3	
Initial body weight(g)	43.40	41.51	42.99	0.58
Final body weight(g)	2542.94 ^a	1845.57 ^{ab}	1454.06 ^b	211.53
Body weight gain(g)	2499.54 ^a	1804.06 ^b	1411.07 ^b	1743.60
Average daily weight gain(g)	44.63 ^a	32.22 ^b	25.20 ^b	31.13
Total feed intake(g)	31805.63 ^b	38943.02 ^a	39550.21 ^a	1078.75
Average daily feed intake(g)	567.95 ^b	695.41 ^a	706.25 ^a	19.26
Feed conversion ratio	1.41 ^b	3.36 ^a	3.59 ^a	0.30

^{abc} means with different superscripts in rows for different traits are significant ($P < 0.05$).

SEM=Standard Error of the Mean

Diet 1= 0% cassava peel meal mixed with palm oil sludge

Diet 2= 22.5% cassava peel meal mixed with palm oil sludge

Diet 3=25% cassava peel meal mixed with palm oil sludge

Growth parameter of experimental broiler birds.

Performance characteristics of the experimental birds at the finisher phase are presented in Table 4.1. The final body weight (FBW), TFI, ADFI, TWTG, and FCR were significantly ($P < 0.05$) influenced by the dietary treatments. The highest value for FBW 2542.94g was obtained for birds fed diet 1 compared to 1845.57g (diet 2) and 1454.06g for diet 3 respectively. The TWTG of the experimental birds followed the same sequence with birds fed diet 1 having the highest value (22902.86g) compared with 11596.75g for diet 2 and 11044.75g for diet 3 which recorded the lowest value. The total feed intake was significantly affected ($p < 0.05$) with diet 3 recorded the highest value of 39550,21g, followed by diet 2 of 38943.02g while diet 1 had the lowest value of 31805.63g. With

for to FCR, the highest FCR was obtained by birds fed diet 3 (3.59) followed by diet 2 of 3.36 while diet 1 recorded the least value of 1.41. The finisher broilers in the control group or Diet 1 gave the best performance in terms of weight gain, followed by Diet 2 and Diet 3 in that order.

Conclusion

From the findings of research of feeding broiler birds with cassava peel meal mixed with palm oil sludge based diet, at levels of inclusion of 0%, 22.5%, and 25%. Diets 1 (0%) were seen to be better than diets 2 and 3 in terms of final body weight, weight gain, feed intake and FCR (feed utilization). It seems that the significant differences in performances between diet 1 and other experimental diets could possibly be attributed to be feed manufacturers prioritizing profit over meeting the essential

nutritional requirement. The observed growth performance variations in this study could be linked to the variability in nutrient content found in the feed ingredients or feedstuff used for the feed formulation.

Recommendation

Further study should be conducted with other methods of processing cassava peel to evaluate their productive performance at this level of inclusion to verify if the variation is caused by the processing method.

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