GROWTH PERFORMANCE, APPARENT NUTRIENT DIGESTIBILITY & ECONOMICS OF FEED CONVERSION OF PULLETS FED MOLASSES-FLAVOURED SUNDRIED CASSAVA PEEL AND SHEANUT CAKE BASED DIETS

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ABSTRACT

Feeding, accounting for about 70 % of the total expenditure in both animal and fish production, has created a necessity to finding out ways to cut down on production cost, due to competitive usage of grains by man and livestock. The present work evaluated the effect of molasses-flavoured sundried cassava peel (MFSCPM) and molasses-flavoured sheanut cake (MFSNC) based diet on the performance, digestibility and feeding cost of pullets. (The control diet with 0% inclusion level of both MFSNCM and MFSCPM, 10 % MCP was 10% MFCPM inclusion, 20 % MCP was 20% inclusion of MFCPM, 10 % MSN was 10% inclusion of MFSNC and 20 % MSN was 20% inclusion of MFSNC). The MFSCPM and MFSNC groups attained 5% lay at the 4th week which determined the end of the experiment. Data were collected on daily feed intake and weekly weight gain, feed conversion ratio (FCR), protein efficiency ratio (PER) and energy efficiency ratio (EER) and apparent nutrient digestibility were all calculated. The results of all the parameters considered, showed that there was significant (P<0.05) difference between treatments in feed intake, weight gain, FCR, cost/kg feed, total cost of feed intake and all the parameters of apparent nutrient digestibility. In conclusion, the study provided valuable insights to using sun-dried cassava peel meal and sheanut cake as alternative feed ingredients in poultry diets.

Keywords: Shea nut cake, Cassava peel, Molasses-flavoured, Feeding trial, *ad libitum*, Laying chickens

INTRODUCTION

The necessity to finding out ways to cut down on production price has resulted in the exploration of non-conventional ingredients such as processed cassava peel meal and sheanut cake, as partial replacements for maize in animal diets (Anaeto and Adighibe., 2011). These two have to be processed to reduce to a minimal level, the anti-nutritional factors contained in them, for successful utilisation in monogastric animals (Ogunwole, *et al*., 2017). Several processing methods have been tried to help in reducing the HCN contents of the cassava products such as sun-drying, grating and sun-drying, ensiling and fermentation, boiling, oven-drying and gelatinization (Okoli *et al*., 2012), sun-drying alone (Udedibie *et al*., 2012), parboiling and sun-drying (Salami, 2000). Intake of cassava products with high cyanogenic level can lead to acute intoxication with resultant paralytic diseases (Melina *et al.,* 2013). An inclusion level of 5-10 % of cassava peel meal in broiler diets was recommended by Hueze *et al*. (2012). After fat extraction, sheanut kernel cake (SNC) is produced in large quantities as a by-product, the composition of which depends on the method of extraction (i.e industrial or traditional cottage industry method), with the industrial methods tending to be more efficient at fat extraction. Oddoye *et al.* (2012) reported reducing the anti-nutritional contents of SNC by soaking overnight, running through with water and drying, soaking in jute bags, boiling and the use of sodium chloride (NaCl) and hydroxide solutions (NaOH) to minimise the effects of these anti- nutritional factors, thereby allowing increased usage level of SNC in poultry and livestock diets have been carried out by, while Idris *et al*. (2024) reported the use of differently extended aerobic fermentation procedures in reducing the anti-nutrients in the sheanut cake.

MATERIALS AND METHODS

The study was conducted at the Integrated Farm Unit, Research Operations Department, National Institute for Freshwater Fisheries Research (NIFFR), New Bussa, Niger State. New Bussa is located between latitude 9˚52'59.0"North and longitude 4˚30'40.2'' East in the southern guinea savanna zone of north central Nigeria, with the minimum and maximum temperatures of 39 ℃ and 42 ℃, respectively with a mean annual rainfall of about 1000 mm (Raji *et al.,* 2011).

Source of raw materials and Preparation of the test ingredients

Sundried cassava peels and other macro and micro ingredients were purchased within New Bussa town, milled into fine size at the NIFFR feed mill, bagged and stored in sacks. Sheanut cake was obtained from sheabutter cottage producers in Karabonde village, Borgu Local Government Area of Niger State. The sheanut cake was fermented for 72 hours, washed and drained using a mesh size of about 1.2mm and then sundried. Molasses on the other hand was put over a low flame until it melts into liquid form, and then mixed with a part of finely milled sundried cassava peel, and sheanut cake meals differently in order to ensure proper mixture before mixing it with the whole meals, prepared at the ratio of 6:94 of molasses to cassava peel and sheanut cake meals respectively, which were then packed in sacks.

Experimental Design and Management

A total number of 300 Isa Brown breed of pullets, aged 17 weeks, were used for this study. Completely randomized design (CRD) was used for this study. Upon arrival, the birds were weighed and then randomly divided into five groups (treatment) with each group having three replicates (20 chickens /replicate) in 15 locally constructed cages with a stocking capacity of 10 birds m^{-2}. The birds were allowed to rest and acclimatize for a period of one week, before introducing them to the diets formulated based on the recommendations of (NRC, 1994), for grower (16 % crude protein and 2,700 kcal/kg metabolisable energy), with the addition of the prepared (MFSCPM) and (MFSNCM) at five varying levels of inclusion. The birds were fed the formulated grower ration, until 5 % egg production was attained. Data was collected on; daily feed intake (g) = feed given - feed refused (using a KERRO BL50001 electronic compact digital scale) and weekly weight gain in (kg) using 30 kg Camry digital weighing balance and the following were calculated;

Weight gain = final weight – initial weight, feed conversion ratio (FCR) = $\frac{\text{Total feed intake}}{\text{Total Weight gain}}$ and feed cost / kg weight gain = FCR x cost / kg of diet. A seven (7) days feeding trial was conducted on the fourth week from the beginning of the experiment, and data obtained was used to calculate apparent nutrient digestibility for each group (AOAC, 1995). Data collected were analyzed using one-way analysis of variance (ANOVA) at 0.05 significant level, using statistical package for social sciences SPSS (version 23). Where means were significant, they were separated using the Duncan multiple range test as contained in the package.

RESULTS AND DISCUSSION

Growth performance of pullets fed molasses-flavoured sundried cassava peel and sheanut cake meal diets

Feed intake (FI), was significantly ($p<0.05$) different with the highest being pullets fed 20 % MSN diet, while that of 10 and 20 % MCP and 10 % MSN, and control diet were similar, respectively. Final weight (FW), of the pullets in the treatment groups was higher ($P<0.05$) than the control group. Weight gain (WG) of pullets fed 10 % MCP was higher ($P<0.05$) than those fed the control diet, with 20 % MCP, 10 % MSN and 20 % MSN having intermediate values between the control and 10 % MCP. Feed conversion ratio (FCR), was highest ($P<0.05$) for pullets fed control and 20 % MSN, that of 20 % MCP and 10 % MSN diets were similar, and higher ($P<0.05$) than that of 10 % MCP. The highest and lowest feed intake observed in the 20% MSN and 10 % MSN diets, respectively, could be an indication, that dietary inclusion levels of sheanut cake had influence on how much feed the pullets consume. This is in agreement with the result obtained by Zanu *et al.* (2012) where the higher sheanut cake inclusion level resulted in higher feed intake recorded in cockerels. 10% MCP diet had the highest weight gain and best feed conversion ratio (FCR), which could be an indication that it is the most efficient at converting feed into weight gain and also more economical.

Economy of feed conversion of pullets fed molasses-flavoured sundried cassava peel and sheanut cake meal diets

Cost per kg of the control diet was highest ($P<0.05$), followed by that of 10 % MCP, 20 % MCP and 10 % MSN, which were similar, while that of 20 % MSN was lowest ($P<0.05$). Total cost of feed intake was highest ($P<0.05$) for pullets fed control diet, those of 10 % MCP, 20 % MCP and 20 % MSN were similar and higher ($P<0.05$) than that of 10 % MSN. Feed cost per kg weight gain was highest ($P<0.05$) for pullets fed control diet (₦622.92), followed by those of 10 % MSN and 20 % MSN, which were similar, and higher than that of 20 % MCP, with 10 % MCP (346.5) having the lowest cost per kg. Including molasses-flavored sheanut cake meal at 20% best reduced feed cost, and could be attributed to the lower cost of sheanut cake compared to other ingredients. Total cost of feed intake was highest for the control and lowest for the 10% MSN diet, which is consistent with the cost per kilogram of feed, as lower feed costs directly translate to lower total costs. The result of this analysis shows the cost advantages of using molasses-flavored sheanut cake meal, especially at the 20% inclusion level, noting that cost per kilogram of weight gain is most favorable for the 10% MCP diet. The result agrees with Nsa *et al.* (2009), who stated that the replacement of expensive conventional feed ingredients in feed formulation would be the best strategy to reduce the poultry production feed cost in Nigeria. Apparent nutrient digestibility of pullets fed molasses-flavoured sundried cassava peel and sheanut cake meal diets

Dry matter (DM), crude protein (CP) and Crude fibre (CF) had similar results across all the treatments ($P<0.05$). Ether extract (EE) had intermediate values between 20 % MCP (65.30) and 10 % MSN (43.28), the difference was significant ($P<0.05$). Ash was highest ($P<0.05$) for pullets fed 20 % MCP (67.33), followed by that of 10 % MCP (24.47), which was higher ($P<0.05$) than those of control, 10 % MSN and 20 % MSN, which were similar. Nitrogen free extract (NFE) was highest for 20 % MSN (71.15), then that of control (68.31), with those of 10 % MCP, 20 % MCP and 10 % MSN having similar values ($P<0.05$). Total digestible nutrient (TDN) had the same pattern as NFE. The dry matter (DM) content of 20% MCP and 10% MSN diets that were highest, and it could be an indication that these diets have a lower moisture content compared to the control and others, while, 10% MCP diet that had lowest DM, could meaning that it has more moisture, which could affect the stability and storage of the feed. The inclusion of molasses-flavored cassava peel meal (MCP) and sheanut cake meal (MSN) significantly affects the nutrient digestibility and nutritive value of the diets. The 10% MCP diet provides the

highest ME but the lowest TDN, this probably means that it is energy-dense but not as efficient in digestible nutrients, while 20% MSN diet provides the highest TDN and good ME, making it a balanced choice for digestibility and energy. In conclusion, the study revealed that (MFSCPM) and (MFSNC) enhances the growth performance and feed efficiency of poultry and therefore, viable and cost-effective alternatives to conventional poultry feeds.

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Table 1: Growth performance, nutrient digestibility and economy of feed conversion of pullets fed molasses-flavoured sundried cassava peel and sheanut cake meal diets

Parameter	Control	10%MCP	20%MCP	10%MSN	20%MSN	SEM	P-value	L/SIG
F I (kg)	0.77^{cd}	0.79^{bc}	0.83^{b}	0.74^{d}	0.91^{a}	0.01	0.00	*
IW (kg)	0.88	0.89	0.88	0.93	0.90	0.01	0.06	Ns
FW (kg)	1.26^{c}	1.31^{ab}	1.35^{a}	1.32^{a}	1.31^{ab}	0.01	0.03	*
WG (kg)	0.37^{b}	0.50^{a}	0.46^{ab}	0.39^{ab}	0.41^{ab}	0.02	0.04	*
FCR	2.08^{a}	1.58^{c}	1.80^{b}	1.91^{b}	2.22^{a}	0.03	0.00	*
Cost/kg feed (₦)	299.48^{a}	211.51^{b}	207.58^{c}	209.26^{bc}	191.84^{d}	5.81	*	0.00
TCFI (₦)	230.61^{a}	173.27^{b}	172.29^{b}	154.85^{c}	174.57^{b}	3.89	*	0.00
FC/kg WG (₦)	622.92	346.54	373.64	399.69	425.88	14.81	-	-
DM (%)	61.49^{ab}	53.24^{b}	64.63^{a}	65.61^{a}	61.21^{a}	1.41	0.04	*
CP (%)	73.33^{ab}	77.29^{ab}	78.57^{a}	71.68^{ab}	69.59^{b}	6.15	0.00	*
CF (%)	5.56^{b}	7.83^{ab}	6.87^{a}	14.38^{a}	12.26^{ab}	1.17	0.03	*
EE (%)	58.11^{ab}	46.24^{bc}	65.30^{a}	43.28^{c}	57.09^{ab}	2.24	0.00	*
ASH (%)	17.68^{c}	24.47^{b}	67.33^{a}	27.60^{c}	10.85^{c}	8.76	0.00	*
NFE (%)	68.31^{b}	41.26^{c}	43.28^{c}	36.06^{c}	71.15^{a}	5.71	0.00	*
TDN	54.07^{b}	43.29^{c}	45.51^{c}	47.16^{c}	58.12^{a}	1.18	0.00	

^{abcd} : means along the rows with different superscript are significantly ($P<0.05$); *: NS: not significant, 10%MCP = 10% inclusion of molassesflavoured cassava peel meal, 20%MCP = 20% inclusion of molasses-flavoured cassava peel meal, 10%MSN = 10% inclusion of molasses-flavoured sheanut cake, 20%MSN = 20% inclusion of molasses-flavoured sheanut cake, FCR= feed conversion ratio, FI=feed intake, IW= initial weight, FW= final weight, WG= weight gain, PER= protein efficiency ratio EER= energy efficiency ratio, PER= protein efficiency ratio, EER=energy efficiency ratio, TCFI= total cost of feed intake, FC/kg WG= feed cost per kg weight gain. DM= dry matter **NFE:** nitrogen free extract, CF = crude fibre, CP = crude protein, EE = ether extract, TDN= total digestible nutrients, ME= metabolizable energy

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