

COMPARATIVE PERFORMANCE AND COST-BENEFIT ANALYSIS OF DIETARY REPLACEMENT LEVELS OF MAIZE WITH YAM PEEL MEAL, TOASTED BAMBARA NUT SIEVATE AND THEIR COMPOSITE ON BOILER CHICKENS

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ABSTRACT

A 56-day study to evaluate performance and cost-benefit analysis of dietary replacement levels of yam peel meal (YPM), toasted bambara nut sievate (TBNS) and their composite (TBNS-YPMC) using 165 broiler chicks of 7-day old was conducted. The birds were divided in five groups of 33 chicks, replicated thrice with 11 birds each and offered diets; T1: control, T2: 20 YPM, T3: 20% TBNS, T4: 20% of TBNS-YPMC and T5: 40% TBNS-YPMC replacing maize, respectively. The experiment was a complete randomized design which lasted 49 days. Data collected was analysed using SPSS (2015) version 23.00. Results revealed that birds fed diets containing TBNS and 40% TBNS-YPMC had improved daily feed intake (DFI) of 111.02 g/bird, those fed diets containing 0 and 20% TBNS-YPMC had least and similar DFI (82.70 g/bird). Daily body weight gain (DBWG) was improved for birds fed diets containing TBNS and 40 TBNS-YPMC (30.15 g/bird), those fed other diets had least and similar DBWG (21.93 g/bird). Final body weight (FBW) improved (1833.33g/bird) for birds fed diets containing TBNS and 40% TBNS-YPMC. Feed conversion ratio was best for birds fed diets containing TBNS (2.95), though with the highest mortality (24.24%). Diet containing 40% TBNS-YPMC and 0 had least (₦634.75) and highest (₦721.99) feed cost per kg diet, respectively. Total production cost was highest (₦4,899.65) and least (₦3,984.83) for birds fed diet containing 20 and 40% TBNS-YPMC, respectively. Gross profit was highest (₦2,015.17) and least (₦1,100.35) on diet containing 20 and 40% TBNS-YPMC, respectively. It was concluded that birds fed diet containing TBNS and 40% TBNS-YPMC had improved FBW. Bird fed diet containing TBNS-YPMC improved gross profit (₦2,015.17).

Keywords: Peel, Sievate, Composite, Cost-benefit, Growth

INTRODUCTION

In developing countries like Nigeria, poultry account for more than 30% of all animal protein consumption and provide economic means of sustenance to the populace. Globally, sustainable poultry meat and egg production are vital in the provision of safe and quality dietary protein in human nutrition. It also plays roles by generating employment and income generation (Nasiru *et al.*, 2023). It is now clear that rapid growth in the poultry industry is having a profound effect on the demand for feed and raw materials on high prices of conventional feedstuffs leading to exorbitant production cost of bird. Hence, feed accounts for 70-80% of total cost of poultry production in Nigeria and this is largely due to the high cost of conventional feed stuffs stemming directly from high demands as staple foods by humans (Harande *et al.*, 2023). In Nigeria, the poultry feed industry is heavily dependent on conventional feedstuffs (Harande *et al.*, 2023). It has therefore, imperative to explore cheap agricultural by-products which have been successfully used in livestock feed to drive down the cost of production and hence, cost of edible animal products (Uza *et al.*, 2024). Yam peel meal has been used up to 50% as replacement for maize in broiler chickens' diets at both starter and finisher phases without negative effects on their growth performance and also drastically reduced their cost of production ((Uza *et al.*, 2024). Similarly, Tuleun *et al.* (2020) reported that inclusion of 30% Bambara nut offal in enzymes supplemented broiler chickens' diets had no adverse effect on performance and reduce in feed cost per kg weight gain of broiler finisher chickens.

MATERIALS AND METHODS

Location of Study

The study was conducted at the Poultry Unit of the Livestock Teaching and Research Farm, Joseph Sarwuan Tarka University, Makurdi, Benue State, Nigeria.

Collection and processing of Bambara Nut Sievate and Yam Peel

Five (5 kg) kilogramme of raw BNS was thoroughly mixed with 500 mls of water and toasted. The toasting was done until the material turned light-brown with a sweet smell and was allowed to cool before use.

Fresh yam peel was sun-dried (5-7 days) until a constant weight was obtained before milled for use.

Experimental Diets

Five diets were formulated with zero, 20% yam peel meal (YPM), toasted bambara nut sievate (TBNS) replacing maize, while 20 and 40% toasted bambara nut sievate - yam peel meal composite [1:1] (TBNS-YPMC) replacing maize in the diets and denoted as T1, T2, T3, T4 and T5, respectively (Table 1 and 2).

Table 1: Ingredients and Proximate Nutrient Composition of Broiler Chicks Diets Containing Graded Replacement of Maize with BNS-YPM Composite

Ingredients	Replacement levels of maize with YPM, TBNS and TBNS-YPMC (%)				
	0	20 YPM	20 TBNS	20 TBNS-YPMC	40 TBNS-YPMC
Maize	37.27	26.97	26.97	26.97	16.67
FFSB	46.83	46.83	46.83	46.83	46.83
YPM	-	10.30	-	-	-
TBNS	-	-	10.30	-	-
BNS-YPMC	-	-	-	10.30	20.60
Maize Offal	12.00	12.00	12.00	12.00	12.00
Bone ash	3.50	3.50	3.50	3.50	3.50
Salt	0.30	0.30	0.30	0.30	0.30
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Vit. Premix	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Calculated Proximate Nutrient Composition					
Crude protein	22.00	22.24	22.24	22.24	22.48
Crude fibre	4.74	4.79	4.79	4.79	4.83
ME (Kcal/Kg)	3142.00	3142.00	3142.00	3142.00	3142.00

*TBNS-YPMC= Toasted Bambara nut sievate-Yam Peel Meal Composite, FFSB= Full Fat soybean, ME= Metabolisable Energy, Kcal= Kilocalories, Kg= Kilogramme. **Vitamin premix contains B1, 1g; B2, 6g; B12, 0.02g; K3, 3g; E, 3g; Biotin, 0.05g; Folic acid, 1.5g; Cholinechloride, 250g; Nicotinic acid, 30g; Calcium pantothenate, 15g; Co, 0.4g; Cu, 8g; Fe, 32g; I, 0.8g; Zn, 40g; Mn, 64g; Se, 0.16g, BHT, 5g

Table 2: Ingredients and Proximate Nutrient Composition of Broiler Chickens Finisher Diets Containing Graded Replacement of Maize with BNS-YPM Composite

Ingredients	Replacement levels of maize with YPM, TBNS and TBNS-YPMC (%)				
	0	20 YPM	20 TBNS	20 TBNS-YPMC	40 TBNS-YPMC
Maize	40.83	32.66	32.66	32.66	24.50
FFSB	39.68	39.68	39.68	39.68	39.68
YPM	-	8.17	-	-	-
TBNS	-	-	8.17	-	-
TBNS-YPMC	-	-	-	8.17	16.33
Maize Offal	14.00	14.00	14.00	14.00	14.00
Bone ash	3.50	3.50	3.50	3.50	3.50
Salt	0.30	0.30	0.30	0.30	0.30
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Vit. Premix	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Calculated Proximate Nutrient Composition					
Crude protein	20.00	20.21	20.21	20.21	20.43
Crude fibre	4.77	4.85	4.85	4.85	4.92
ME (Kcal/Kg)	3085.00	3071.99	3071.99	3071.99	3027.90

Experimental Design and Management of Birds

A total of one thousand sixty-five 7-day old unsexed broiler chicks were weighed and divided in five groups of 33 chicks and replicated thrice with 11 birds each. Each group was offered diets; T1: control, T2: 20 YPM, T3: 20% TBNS, T4: 20% of TBNS-YPMC and T5: 40% TBNS-YPMC replacing maize, respectively. The experiment was

a complete randomized design (CRD) that lasted eight weeks while feed and water were offered *ad-libitum*. Vaccination scheduled and drugs administration were strictly adhered to

Data Collection

Performance

Feed intake = Weekly feed offered – weekly feed leftover

Weight gain = Final body weight – initial body weight.

Feed conversion ratio = $\frac{\text{Total feed intake}}{\text{Total weight gain}}$

Mortality rate = $\frac{\text{Number of dead birds}}{\text{Total number of birds stocked}} \times 100$

Cost-benefit Analysis

Cost (₦) per kg diet = cost contribution of feed ingredients used to formulate 100kg diet / 100.

Total production cost (₦) = total cost (₦) of all operations **Gross profit** = difference between price per bird and total production cost per bird.

Statistical Analysis

Data generated were subjected to analysis of variance (ANOVA) in a completely randomized design. Duncan Multiple Range Test (DMRT) was used to separate means that differed significantly ($p < 0.05$) as contained in SPSS package.

RESULTS AND DISCUSSION

Growth performance and cost benefit analysis of broiler chicks fed dietary replacement levels of maize with yam peel meal, toasted bambara nut sievate and their composite (Table 3) showed that birds fed diets containing TBNS and 40% TBNS-YPMC had highest and similar daily feed intake (DFI) of 111.02 g/bird while those fed diets containing 0%, YPM and 20% TBNS-YPMC had least and similar DFI (82.70 g/bird). High daily feed intake of birds fed diet containing 40% TBNS-YPMC replacing maize could be due to high fibre content of the diet with low energy which made the birds to consumed a large quantity of the feed until their daily energy requirement is met. Daily body weight gain (DBWG) was highest and similar for birds fed diets containing TBNS and 40 TBNS-YPMC (30.15 g/bird) while those fed other diets recorded least and similar DBWG (21.93 g/bird). Higher daily weight gains and final body weight of birds on diet containing 40% TBNS-YPMC could be attributed to the fact that this diet provided the basic nutrients required for nourishment of their body leading to tissue accretion compared to birds on other treatment groups. Final body weight (FBW) was highest and similar (1833.33 g/bird) for birds fed diets containing TBNS and 40% TBNS-YPMC while birds on other treatment groups recorded least and similar FBW (1300.00 g/bird). This implies that these diets which gave the best growth performance contain nutrients needed for body tissue accretion.

Table 3: Growth performance and cost benefit analysis of broiler chicks fed dietary replacement levels of maize with yam peel meal, toasted bambara nut sievate and their composite

Parameters	Replacement levels of maize with YPM, TBNS and TBNS-YPMC (%)					SEM
	0	20 YPM	20 TBNS	20 TBNS-YPMC	40 TBNS-YPMC	
IBW (g/bird)	145.33	142.00	145.00	145.00	145.00	1.11
DFI (g/bird)	82.70 ^c	100.29 ^{ab}	88.81 ^{bc}	79.80 ^c	111.02 ^a	3.46
DBWG (g/bird)	23.60 ^b	21.93 ^b	30.15 ^a	20.62 ^b	30.15 ^a	1.17
FBW (g/bird)	1466.67 ^b	1466.67 ^b	1833.33 ^a	1300.00 ^b	1833.33 ^a	62.64
FCR	3.51 ^{bc}	4.57 ^a	2.95 ^c	3.95 ^{ab}	3.68 ^{bc}	0.17
Mortality (%)	9.09 ^b	18.18 ^{ab}	24.24 ^a	18.18 ^{ab}	12.12 ^b	1.82
Feed cost/kg (₦)	721.99	677.81	663.23	678.37	634.75	
Production cost (₦)	4,297.01	4,760.07	4,251.81	3,984.83	4,899.65	
Gross profit (₦)	1,702.99	1,239.93	1,748.19	2,015.17	1,100.35	

^{a,b,c} = Means with different superscript differ significantly ($p < 0.05$). YPM= Yam peel meal, TBNS= toasted bambara nut sievate and TBNS-YPMC= yam peel meal, toasted bambara nut sievate composite.

This result agrees with the findings of Udeh *et al.* (2018) who reported that inclusion of 10% toasted bambara nut offal in broiler chickens' diets enhanced optimum performance. Similarly, Oguntoye *et al.* (2018) observed significant ($p < 0.05$) influenced on all growth parameters measured except FCR when broiler chickens were fed diets containing 0, 15 and 30% yam peel meal with or without enzymes as replacement for maize which aligns with the findings of the present study. Feed conversion ratio was best for birds fed diets containing TBNS (2.95), though with the highest mortality (24.24%) compared to birds on other treatment groups. Diet containing 40% TBNS-YPMC and control had least (₦634.75) and highest (₦721.99) feed cost per kg diet, respectively. Finding of the

present study aligns with the earlier report of Amaefule *et al.* (2011) who observed lower values for cost per kg weight gain on rabbits fed diets containing BGO. Total production cost was highest (₦4,899.65) and least (₦3,984.83) on diet containing 20 and 40% TBNS-YPMC, respectively. Uza *et al.* (2021) also reported a reduction in total production cost when rabbits were fed dietary inclusion of raw and toasted Bambara nut sievate which is in line with the results of the present study. Gross profit was highest (₦2,015.17) and least (₦1,100.35) on diet containing 20 and 40% TBNS-YPMC, respectively. This present finding buttress the report of Amaefule *et al.* (2011) who observed a reduction in feed cost due to inclusion of BGO that increased farmers' income and profit.

CONCLUSION

Birds fed diet containing TBNS and 40% TBNS-YPMC had improved FBW. Bird fed diet containing TBNS-YPMC improved gross profit.

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