PERFORMANCE AND COST-BENEFIT OF NOILER CHICKENS ON DIETARY REPLACEMENT LEVELS OF MAIZE WITH TOASTED BAMBARA NUT SIEVATE-YAM PEEL MEAL COMPOSITE WITH OR WITHOUT LACTIC DRY®

Uza, O.[1*], Onyimonyi, A. E.[2], Adagi, J. M.[3], Tarhemba, F.[4] and Gege, B. M.[1]
[1]Department of Animal production, College of Animal Science, Joseph Sarwuan Tarka University, PMB 2373, Makurdi, Nigeria.
[2]Department of Animal Science, University of Nigeria, Nsukka, Nigeria
[3]Department of Animal Nutrition, College of Animal Science, Joseph Sarwuan Tarka University, PMB 2373, Makurdi, Nigeria.
[4]Department of Animal Health and Production Technology, Akperanorshi polytechnic Yandev, Gboko, Benue State, Nigeria
*Corresponding author: orseeruza@gmail.com; +2348132122542

ABSTRACT
A 16-week feeding trial was conducted to assess performance of noiler birds using 180 of 14-day old chicks. Birds were put in 2 groups of 90 birds which had 3 sub-groups of 30 birds with 3 replicates of 10 birds each. The experiment was laid on 2 x 3 factorial with one of the two groups fed diets: T_1 control, T_2:20 and T_3:40% of TBNS-YPMC replacing maize without Lactic Dry® (LD) while the other group was fed same diets with LD. Results revealed that all parameters were not significantly ($p<0.05$) influenced except age of first egg laid (AFEL) and weight of first egg laid (WFEL). Birds on all diets had highest and similar AFEL (120.67±1.45 days) except birds fed diets containing 20 and 40% TBNS-YPMC without LD (0.00±0.00 day). Birds on control diet without LD, control diet and diet containing 40% TBNS-YPMC with LD had improved (40.00±0.00 g) WFEL while birds on diets containing 20 and 40% TBNS-YPMC without LD had least (0.00±0.00 g). In conclusion, TBNS-YPMC can replace maize in noiler chickens diets up to 40% with LD to improve AFEL and WFEL.
Keywords: Noiler, Growth, Cost, Peel, Sievate

INTRODUCTION

Generally, average animal protein per capita daily consumption of most residence of developing countries like Nigeria is 45.4 g and below compared with the global average of 64 g while the value recommended by FAO is 53.8 g per day per person (Uza *et al.,* 2024). Poverty, high cost of protein-based food stuff, unemployment and lack of awareness have been proven as the major factors responsible for protein deficiency in diets of most inhabitants of the developing countries (Okojie, 2021). Similarly, skyrocketing prices of conventional feed stuff lead to increase in cost of animal production which subsequently translates to high cost of animal protein sources in the country (Oyewole and Omeje, 2022). This calls for urgent interventions to drive down the cost of feed input in Nigeria and make animal protein affordable to households thus, increasing the daily protein intake of the populace. In this regards, agricultural wastes are inexpensive in terms of collection cost and processing for beneficial use could be central in producing affordable poultry meat and eggs (Mamo and Zewide, 2022). Common amongst these agricultural by-products are Bambara nut sievate (BNS); product obtained after milling Bambara nut and sieving it using 2 mm sieve and yam peels (YP) obtained after the outer covering of yam tuber is removed. They can be incorporated in the diets of livestock to boast their performance and reduce cost of their edible products. Similarly, Animashahun *et al*. (2022) opined that noiler birds which are affordable, cheaper to maintain, less dependent on conventional feeding stuffs and capable of scavenging for feed and water is an indispensable species of animal to use in these regards.

MATERIALS AND METHODS

Experimental Site

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 Preparation of Bambara Nut Sievate

Raw bambara nut sievate (BNS) was thoroughly mixed with 500 mls of water and toasted. thematerialwas turned frequently until it turned light-brown with a sweet smell and allowed to cool before use.

Collection and Preparation of Yam Peel

Fresh yam peel was collected from local yam farmers within Makurdi, its environs and sun-dried (5-7 days) until a constant weight was obtained. The dried yam peel was milled for use.

Experimental Diets

Six diets were formulated with toasted bambara nut sievate (TBNS) - yam peel meal (YPM) composite (1:1) replacing maize in the diets at 0, 20 and 40% with or without Lactic Dry®(LD) and denoted as T1, T2 and T3, respectively (Table 1 and 2).

Table 1: Nutrients Composition of Noiler Chicks' Starter Diets Containing Graded Replacement of Maize with BNS-YPM Composite

	Dietary replacement levels of Maize with TBNS-YPM Composite (%)					
	No Lactic Dry®			Lactic Dry®(0.25 g/ kg diet)		
Ingredients (Kg)	**0**	**20**	**40**	**0**	**20**	**40**
Maize	31.33	25.06	18.80	31.33	25.06	18.80
BNS-YPMC	00.00	6.27	12.53	00.00	6.27	12.53
FFSB	54.27	54.27	54.27	54.27	54.27	54.27
Maize Offal	10.00	10.00	10.00	10.00	10.00	10.00
Bone ash	3.50	3.50	3.50	3.50	3.50	3.50
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
`Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Vit. Premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**	**100**
	Calculated Proximate Nutrients Composition					
Crude protein	24.00	24.21	24.40	24.00	24.21	24.40
Crude fibre	4.54	5.18	5.83	4.54	5.18	5.83
Ether extract	2.51	2.38	2.24	2.51	2.38	2.24
Ash	2.99	3.13	3.25	2.99	3.13	3.25
ME (Kcal/Kg)	3116.16	3071.99	3027.90	3116.16	3071.99	3027.90

TBNS-YPMC= Toasted Bambara nut sievate-Yam Peel Meal Composite, FFSB= Full Fat soybeans, ME= Metabolisable Energy and Kcal= Kilocalories. **Vitamin premix contains B1, 1g; B2,6g; B12,0.02g; K3,3g; E,3g; Biotin,0.05g; Folic acid,1.5g; Cholinechloride,250g; Nicotineacid,30g; Ca- 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 Noiler Chickens Finisher Diets Containing Graded Replacement of Maize with BNS-YPM Composite

	Dietary replacement levels of Maize with TBNS-YPM Composite (%)					
	No Lactic Dry®			Lactic Dry® (0.25 g/ kg diet)		
Ingredients (Kg)	**0**	**20**	**40**	**0**	**20**	**40**
Maize	51.49	41.19	30.89	51.49	41.19	30.89
BNS-YPMC	00.00	10.30	20.60	00.00	10.30	20.60
FFSB	28.96	30.03	30.03	30.03	30.03	30.03
Maize Offal	15.00	15.00	15.00	15.00	15.00	15.00
Bone ash	3.50	3.50	3.50	3.50	3.50	3.50
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Vit. Premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**	**100**
	Calculated Proximate Nutrient Composition					
Crude protein	17.00	17.34	17.67	17.00	17.34	17.67
Crude fibre	4.28	5.33	6.40	4.28	5.33	6.40
EE	3.02	2.80	2.59	3.02	2.80	2.59
Ash	1.79	2.02	2.23	1.79	2.02	2.23
ME (Kcal/Kg)	3,097.82	3,025.26	2,952.71	3,097.82	3,025.26	2,952.71

Birds, diets and rearing management

A total of one hundred and eighty 14-day old noiler chicks were selected, weighed and divided in two main groups of 90 chicks each. Each group was sub-divided into 3 sub-groups of 30 birds and then replicated thrice with 10

birds each. The first group was offered diets; T1: 0, T2:20 and T3:40% of TBNS-YPMC replacing maize, respectively without LD while the second group was offered the same diets with LD. The experiment was a 2 x 3 factorial in arrangement. The study lasted four months while feed and water were offered *ad-libitum*. vaccination scheduled and drugs were administered appropriately.

Data Collection

Feed intake- Quantity of feed offered minus quantity of feed leftover. **Weight gain-** Final body weight minus initial body weight. **Feed conversion ratio** (FCR)-$\frac{Total\ feed\ intake}{Total\ weigh\ \ gained}$

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

Age at first lay and weight of first egg of birds were determined by recording date first egg was laid from a particular replicate, identified and weighed using a sensitive electronic weighing scale.

Statistical Analysis

Data generated were subjected to two-way analysis of variance (ANOVA) in a 2 x 3 factorial arrangement. Duncan Multiple Range Test (DMRT) was used to separate means that differed significantly ($p<0.05$) as contained in Statistical analysis software (SAS, 2000) package (version 9.1.3).

RESULTS AND DISCUSSION

Results on main effect of diets containing replacement levels of maize with TBNS-YPMC with or without LD on performance of noiler chickens (Table 4) revealed that diets with or without LD did not significantly influence performance indices. Sirovnik *et al.* (2021) reported no effect of probiotic supplementation on broiler body weight gain which corroborates the findings of this study. The difference in these results could be imputed to the variation in breeds of chicken used, test ingredients, duration of the studies and type of probiotic used. Results on replacement levels of maize with TNBS-YPMC showed that weight of first egg laid (WFEL) was significantly influenced. Noiler chickens fed diets containing 40% TBNS-YPMC had improved WFEL while birds fed 20% TNBS-YPMC had least WFEL.

Table 3: Effect of Diets Containing Replacement Levels of Maize with TBNS-YPMC Supplemented with or without Lactic Dry® on entire growth performance and egg lay of noiler chickens

Replacement levels of maize with TBNS-YPMC							
Parameters	**No Lactic Dry®**	**Lactic Dry®**	**p-values**	**0**	**20**	**40**	**p-values**
Main effect of dietary replacement levels of maize with TBNS-YPMC with or without Lactic Dry®							
IBW (g/b)	188.33±1.32	190.00±00.00	0.0651	188.50±0.67	190.00±0.00	189.00±0.44	0.0752
FBW (kg/b)	2.04±0.05	2.15±0.07	0.8756	2.19±0.09	2.11±0.06	2.00±0.05	0.9604
TBWG (kg/b)	1.86±0.05	1.96±0.07	0.8845	2.00±0.09	1.92±0.06	1.81±0.05	0.9579
DBWG (g/b)	16.57±0.41	17.54±0.63	0.6574	17.85±0.82	17.17±0.57	16.14±0.46	0.9575
TFI (kg/b)	9.80±0.17	10.04±0.17	0.5143	9.88±0.29	9.81±0.20	10.07±0.15	0.4939
DFI (g/b)	87.50±1.49	89.65±1.56	0.5213	88.24±2.55	87.57±1.76	89.93±1.30	0.4942
FCR (g/b)	5.32±0.18	5.15±0.16	0.7945	4.98±0.49	5.59±0.22	5.59±0.12	0.9087
Mortality (%)	13.33±3.33	21.11±3.51	0.6754	15.00±2.24	16.67±4.22	20.00±6.32	0.7431
AFEL (day)	120.67±1.18	120.44±1.17	0.06345	119.83±1.56	123.33±1.86	119.10±1.54	0.0634
WFEL (g)	35.67±2.73	35.89±2.75	0.0564	37.50±3.23^{b}	28.33±0.33^{c}	40.10±1.58^{a}	0.0001

Table 4: Interaction effect of dietary replacement levels of maize with TBNS-YPMC with or without Lactic Dry®

	No Lactic Dry® supplementation			**Lactic Dry® supplementation**			
Parameters	**0**	**20**	**40**	**0**	**20**	**40**	**p-Values**
IBW (g/b)	187.00±0.00	190.00±0.00	188.00±0.00	190.00±0.00	190.00±0.00	190.00±0.00	0.0756
FBW (kg/b)	2.13±0.07	2.04±0.11	1.96±0.05	2.24±0.19	2.18±0.07	2.04±0.10	0.4504
TBWG (kg/b)	1.94±0.07	1.85±0.11	1.77±0.05	2.05±0.19	1.99±0.07	1.85±0.10	0.4565
DBWG (g/b)	17.36±0.60	16.55±0.95	15.79±0.43	18.33±1.67	17.80±0.59	16.49±0.87	0.4576
TFI (kg/b)	9.76±0.40	9.46±0.21	10.10±0.14	10.00±0.48	10.12±0.23	10.00±0.29	0.6815
DFI (g/b)	87.19±3.61	84.76±1.90	90.54±1.26	89.29±4.27	90.37±2.01	89.31±2.55	0.6818
FCR	5.04±0.26	5.17±0.42	5.74±0.16	4.93±0.36	5.09±0.27	5.43±0.15	0.4122
Mortality (%)	13.33±3.33	13.33±6.67	13.33±8.82	16.67±3.33	20.00±5.77	26.67±8.82	0.6541
AFEL (days)	120.67±1.45^{a}	0.00±0.00^{b}	0.00±0.00^{b}	119.00±3.06^{a}	123.33±0.88^{a}	119.00±0.00^{a}	0.0001
WFEL (g)	35.00±1.20^{ab}	0.00±0.00^{c}	0.00±0.00^{c}	39.33±6.89^{a}	28.33±0.33^{b}	40.00±0.00^{a}	0.0001

$^{a, b, c}$ = Means in the same row with different superscripts are significantly different ($p<0.05$). TBNS-YPMC =toasted Bambara nut sievate -yam peel meal composite, IBW= Initial body weight, FBW= final Body weight,

TBWG= Total body weight gain, DBWG=Daily body weight gain, TFI=Total feed intake, DFI=Daily feed intake, FCR=Feed conversion ratio, AFEL= Age at first egg laid and WFEL= Weight of first egg laid.

Interaction effect of diets containing replacement levels of maize with TBNS-YPMC with or without LD revealed that age at first egg laid (AFEL) and WFEL were significantly influenced. Birds on all diets had improved AFEL except birds fed diets containing 20 and 40% TBNS-YPMC without LD which did not lay egg throughout the duration of the study. Weight of first egg laid in this study is comparable to WFEL of 40.20 to 45.30 g of noiler egg reported by Adetunji and Ola (2020) when they compared productive performance of three plumage varieties of noiler hens. AFEL of birds in this study is in consonant with the work of Jefferson (2023) who observed that prolific birds begin to lay at the age of 120 days. Jefferson (2023) reported that a hen needs a lot of nutrients in the diets to lay an egg which is in harmony with findings of the present study. The inability birds to utilize these diets has impacted adversely on the development and maturation of their reproductive system. Early lay of birds on TBNS-YPMC with LD may be due the presence of beneficial bacteria which could have play a vital role of competitive exclusion of the harmful bacteria in the gastro-intestinal tract thus, improve the health and nutrients absorption necessary for growth, sexual maturity and reproduction which agrees with the work of Magee *et al.* (2022) who reported that beneficial microflora present in the host intestine plays a vital role in digestion by secreting digestive enzymes, promoting the production of digestive enzymes, inhibit the growth and adhesion of pathogens, preserve the integrity of the gut flora and epithelial barrier.

CONCLUSION

Noiler chickens fed diet containing 40% replacement level maize with TBNS-YPMC with LD improved AFEL and WFEL.

REFERENCES

Adetunji, P. O. and Ola, S. I. (2020). Comparative productive performance among three plumage varieties of noiler hens. *Sarhad Journal of Agriculture*, 36 (4): 1079-1087. DOIhttp://dx.doi.org/10.17582/journal.sja/2020/36.4.1079.1087.

Animashahun, R. A., Alabi, O. O., Okeniyi, F. A., Olawoye, S. O., Shoyombo, J. A. and Falana, B. M. (2022). Performance and blood profile of noiler chickens fed diets containing graded levels of *Parkia biglobosa* leaf meal. *Food Research*, 6 (5):256-265.

Jefferson, N. (2023). How old do chickens have to be to lay egg? -Kalmbach feeds. https:www.kalmachfeed.com

Magee, C. L., Olanrewaju, H. A., Campbell, J. and Purswell, J. L. (2022). Effect of photoperiod on live performance in broiler chicks from placement to 14-days-of-age. *Journal of Applied Poultry Research,* 31(4): https://doi.org/10.1016/ japr.2022.100295.

Mamo, W. and Zewide, I. (2022). Review on agricultural waste utilization. *British Journal of Earth Science Research,* 10(1): 25-34.

Okojie, J. (2021). Poverty, high cost seen as main drivers of protein deficiency in Nigeria-Report. https://businessday.ng/health/article/poverty-high-cost-seen-as-main-drivers-of-protein- deficiency-in-nigeria-report

Oyewole, B.O. and Omeje, A. (2022). Nutritional evaluation of toasted bambaranut waste with starter broiler chicks. *Himalayan Journal of Agriculture*, 3(2):29-37.

SAS (2000). Institute Incorporation SAS Technical Report Package 234 SAS/STAT Software. The GEMOD Procedure. SAS Institute Incorporation, Cary, USA.

Sirovnik, J., Euteneuer, P. and von Borstel, U. K. (2021). An attempt to use soundimprinting to attract broilers onto elevated platforms for night-time roosting. *Applied Animal Behaviour Science*, 243: https://doi.org/10.1016/j. applanim.2021.105448.

Uza, O., Onyimonyi, A.E., Gege, B.M., Aorga, G.A., Adagi, J.M. and Yainjo, G.A. (2024). Assessment of dietary replacement value of maize with toasted bambara nut sievate-yam peel meal composite with or without Lactic Dry® on growth performance of Noilers. Proceedings of the 29th Conference of Animal Science Association of Nigeria, 8 – 12 September 2024, Lagos, Nigeria. Pp 481 -484