



GSJ: Volume 10, Issue 6, June 2022, Online: ISSN 2320-9186

www.globalscientificjournal.com

Proximate compositions of bakery bread waste and its feeding value on performance and carcass characteristics of finisher broiler chickens

Nwosu, P. C¹, Anyawu, G.A¹, Uchegbu, M.C¹, Emenalom, O.O¹, and Emenike, H.I².

¹**Federal University of Technology Owerri, Imo State. P.M. B 1526, Owerri. Nigeria.**

²**Advanced unmanned Aerial Vehicle laboratory Uburu, Ebony State. Nigeria**

***Corresponding Author: orlucenter@gmail.com**

Abstract

The current study was conducted to determine the proximate compositions of bakery bread waste and the effect of its graded levels on the performance and carcass characteristics of finisher broiler chickens. Bakery bread wastes were collected from bakeries, processed, analyzed for its proximate compositions and incorporated into the diets of finisher broiler chickens at 0, 25, 50 and 100% levels, respectively. A total of one hundred and twenty (120), 28-day old Anak 2000 broiler chicks were randomly allocated to 4 treatments with 3 replicates containing 10 birds in each replicate. The birds were fed the maize- soybean basal diet (control) or diets containing 25, 50 and 100% of bakery bread waste as a replacement for maize for a period of 28 days. Broiler chickens performance and carcass characteristics were determined at the end of the experiment. Bakery bread waste contains 11.99% crude protein and 3682.91 kcal/kg of energy. Body weight gains of birds were higher in birds fed 100 and 50% bakery bread waste diets than in control and 25% diet groups ($p < 0.05$). Feed consumption was lowest in birds fed the control and 100% diets ($p < 0.05$). Feed conversion ratio was better ($p < 0.05$) in birds fed the 100% bakery bread waste than in 25% diet group. Feed cost and feed cost/kg gain were significantly ($p < 0.05$) lower in birds fed the 100% bakery bread waste than in the control. Carcass yields and internal organs (liver and heart) were not negatively affected by the treatments. Birds fed the 100% bakery bread wastes diet had significantly ($p < 0.05$) decreased relative gizzard weights compared to the 0 and 25% diet groups. The performance enhancing effect of dietary bakery bread waste evening at 100%

warrants further attention into the potential of using it as a functional feed ingredient in poultry feeding

Keywords: Bakery bread waste, Broiler chickens, Carcass characteristics, Performance, Proximate composition

Introduction

Bakery bread waste (BBW) is an industrial waste that little known and used in poultry feeds. It consists of baked and unbaked materials such as burnt bread, dough, mixed and unmixed flour dust, bread that did not rise, rejected, unsold, and returned bread (Singh, 2015). Bakery bread waste is readily available in large quantities in bread bakeries across Nigeria. It is rich in nutrients, cheap, easy to process and are often dumped as waste and littered around bread bakeries where they constitute environmental hazards because not much has been done to explore its potentials. A Personal survey made in 13 different bakeries in Ideato, Orlu and Owerri areas in Imo State, Nigeria showed that each bakery produced up to 50kg of BBW on dry matter basis within two days of production (Nwosu, 2019; unpublished data).

According to NRC (1994), the proximate values of BBW compared to maize, indicates that BBW contains higher energy (3854 Kcal/kg) and crude protein (12.9%) than maize (3470 Kcal/kg; 10%). In addition, its amino acid profile compares favourably with maize, and is complementary to the amino acid profile of soybean meal which is used as a protein source in poultry diets. BBW also contain substantial amounts of fats, protein and vitamins (Al-Ruqaie *et al.*, 2011; Omole *et al.*, 2011; FAO, 2010).

However, despite the large quantities of BBW produced in Nigeria and its high nutritive value, not much has been done to explore its potentials in poultry feeds. Preliminary reports on the use of BBW in the feeding of poultry and other animals such as cattle, steers, rabbits, rats and snail indicate that it could be used as an alternative feed ingredient in animal feed (Nwosu, 2013; Franca *et al.*, 2012; Omole *et al.*, 2011; Shafey, *et al.*, 2011; Torki & Kimiaee, 2011; Afzalzadeh, *et al.*, 2007; Anyanwu & Okoro, 2006; Passini, *et al.*, 2001). Nwosu (2013)

Oke (2013), Shafey *et al.*, (2011), and Longe (1987), reported improved performances in broiler chickens and laying hens fed diets containing 50, 30, 30 and 25% BBW diets, respectively. However, there were no reports on higher dietary inclusion levels of BBW in the diets of broiler chickens. This study was therefore conducted to evaluate the effect of graded levels of Bakery bread waste on performance and carcass characteristics of finishing broiler chickens.

Materials and Methods

Experimental Sites

This experiment was carried out at the poultry unit of the Teaching and Research Farm, School of Agriculture and Agricultural Technology (SAAT), Federal University of Technology, Owerri (FUTO), Imo state, Nigeria. Owerri is located in the South-eastern Agricultural zone of Nigeria. The area lies between latitude 5°16'1.2 "to 5° 22'47.61" N and Longitude 6° 58' 58.8" to 6°58' 24.62" E and an altitude of 59m above sea level. The mean annual rainfall, temperature and humidity are 2500mm, 23.5°C - 32.1°C and 70 – 80%, respectively.

Source and processing of test material

Bakery Bread Wastes (unbaked mixed flour, baked bread which did not rise, burnt breads, returned breads, flour which escaped being mixed,) were used for this study. The bakery bread wastes were collected from bread bakeries in Ideato, Orlu and Owerri Areas of Imo State, Nigeria. The Bakery bread wastes collected were sun dried for 2-3 days to eliminate moisture; ground into meal using a Hammer mill and stored in sack bags.

Chemical analysis

Three samples of the BBW meal were analyzed for their proximate compositions at the Department of Animal Science and Technology, Laboratory, Federal University of

Technology, Owerri, according to the methods outlined by AOAC (1995). The apparent Metabolizable energy of the samples was calculated according to the procedure of Alderman, (1985).

Experimental Diets

Four experimental broiler finisher diets were formulated such that the diets contained 0, 25, 50 and 100% BBW as replacement for maize in the diets. The ingredient compositions of the diets are shown in table 1.

Experimental birds, design and management

A total of 120, 28-day-old unsexed broiler chickens (Anak 2000 strain) were randomly allocated to 4 treatment groups with 3 replicates containing 10 broiler chickens per replicate. The birds were kept in pens measuring 1 x 1m in an open-sided, naturally ventilated poultry building. Wood shavings were used as bedding material. The birds were fed the control diet (0% BBW) or diets containing 25, 50 and 100% BBW, respectively. All the diets were balanced for their nutrient compositions. Birds were fed the experimental diets for 28-days. Water and feed were provided *ad libitum*.

At the end of the feeding trial (8-week of age), 2 birds per replicate (average pen weight) were selected, starved of feed, but not water for 18-hours, killed by severing the jugular vein and draining the blood, and eviscerated. The carcass was dissected according to the method outlined by Hahn and Spindler (2002). Internal organs such as the liver, heart, and gizzards were weighed and expressed as percentages of the live weight.

Table 1 Ingredient composition of broiler finisher diets containing graded levels of bakery bread wastes

Replacement Levels of Bakery bread waste for maize (%)

	T1	T2	T3	T4
Ingredients:	0.00%	25.00%	50.00%	100.00%
Maize	55.00	41.25	27.50	0.00
BBW	0.00	13.75	27.50	55.00
SBM	20.00	20.00	20.00	20.00
Wheat offal	9.00	9.00	9.00	9.00
PKC	5.00	5.00	5.00	5.00
Fish meal	3.00	3.00	3.00	3.00
Blood meal	3.00	3.00	3.00	3.00
Bone meal	4.00	4.00	4.00	4.00
*Vit\	0.25	0.25	0.25	0.25
Min.premix				
Methonine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Crude protein	19.65	19.85	20.04	20.44
Ether Extract	3.96	4.99	6.02	8.08
Calcium	0.60	0.55	0.51	0.41
Phosphorus	1.20	1.20	1.21	1.22
Lysine	1.23	1.20	1.16	1.10
Methionine	0.67	0.64	0.61	0.55
ME(Kcal/Kg)	2995.45	3054.58	3113.70	3231.95

* Formulated to supply per kg diet: Vit A, 9,000iu; Vit D3, 1440iu; Vit E, 2.1-6mg; Vit K, 2.7mg; Vit B1, 1.8mg; Vit B2, 3.6mg; Vit B6, 2.7mg; Niacin, 21.6mg; Pantothenic acid, 9.0mg; Biotin, 0.036mg; Vit B12, 0.018mg; Folic acid, 0.54mg; Cholin chloride, 270mg; Mn, 108mg; Fe, 18mg; Zn, 27mg; Cu, 1.44mg; Iodine, 0.72mg; Co, 0.1mg; Se, 0.1mg; Growth promoter, 14.4mg; Anti-oxidant, 720.

Economics of production

The cost/kg feed was calculated by summing the cost of feedstuffs used in producing a kilogram of feed. The cost of feed consumed was determined by multiplying the total feed consumed/bird by the cost per kg feed while feed cost per kg weight gain was determined by

dividing the total cost of feed consumed (₦) by the body weight gain. The cost analysis was based on the prevailing market prices at the time of the experiment.

Statistical analysis

All the data collected for all the parameters were subjected to analysis of variance (ANOVA) as outlined by Little and Hills (1978). Differences between treatment means were separated using the Duncan's New Multiple Range Test as outlined by Obi (1990).

Results and Discussion

The proximate compositions of bakery bread waste are shown in table 2. The crude protein (11.99%) value was higher than 9.5% reported by Olafadehan *et al.*, (2010) and Saleh *et al.*, (1996) but similar to the values reported by NRC (1994) Nwosu (2013) and Al-Tulaihan *et al.*, (2004). The crude fibre and ether extract contents were lower than values reported by Aduku (2005) and Carneiro *et al.* (2006). Similarly, the Metabolizable energy was lower than 3859 kcal/kg (Al-Tulaihan *et al.*, 2004) and 3740 kcal/kg (Nwosu, 2013) The variations in the proximate compositions and energy values of BBW could be attributed to source, processing methods, diversity of ingredients and storage, and mycotoxin levels in different bakery materials (Carneiro *et al.*, 2006; Al-Tulaihan *et al.*, 2004; Saleh *et al.*, 1996).

Table 2 Proximate Compositions of Bakery Bread Waste

Parameter (%)	Bakery Waste
Crude protein	11.9909
Crude Fibre	2.4150
Ether Extract	3.5427
Ash	0.9326
Nitrogen Free Extract	66.2515
Metabolizable Energy (Kcal/kg)	3682.9103

Data on the performance of finisher broiler chickens fed diets containing graded levels of bakery bread waste are shown in table 3. Body weight gain and average feed intake of birds fed BBW diets were significantly ($p<0.05$) affected by the treatments. Birds fed the 100% BBW diet had the highest body weight gain, followed by the 50% and control diet groups. Birds fed the 25% BBW diet recorded the lowest body weight gain ($p<0.05$). Nwosu (2013) and Anyanwu and Okoro (2006) both reported higher body weight gains in finisher broiler chickens fed diets containing 0 - 75% and 0 – 50% BBW, respectively in line with the findings of this study. The higher body weight gain recorded in broiler chickens fed 50% and 100% BBW diets more than the control is an indication that the diets had sufficient nutrient to sustain growth of broilers.

Feed intake was significantly ($p<0.05$) decreased in birds fed the control and 100% BBW diets than those fed the 25 and 50% BBW diets. Birds fed the 25 and 50% BBW diets had statistically similar and higher feed intake values that differed significantly ($p<0.05$) from those of the control and 100% BBW diet groups. The result contradicted the findings of Oke (2013) and Ayanrinde *et al.* (2014). Both authors reported no significant ($p>0.05$) differences in feed intake among birds fed 30 and 100% BBW diet. The reason for the increased feed intake in birds fed the 25 and 50% BBW diets contrary to the decreased feed intake of 100%BBW diet group is not known and needs further investigation.

The feed conversion ratio of birds fed 100% BBW diets had the best feed conversion ratio (2.63) followed by 0% when compared with birds fed 25% and 50% BBW diets. However, FCR values of the broiler finisher birds fed BBW diet were statistically similar to birds fed control diet. The result showed that 100% BBW diet inclusion was effectively utilized by the birds giving rise to decreased feed intake and increased body weight again. This observation agreed with the findings of Ayanrinde *et al.* (2014) and Al-Ruqaie *et al.* (2011), who reported similar values on broiler chicken fed 100% BBW diets but contradicted the finding of Oke

(2013) who reported higher value of FCR of 3.02 for broiler chicken fed 100% BBW diet. The variations may be attributed to the compositions of the bakery bread waste used in the different diets.

The cost/kg feed decreased with increasing levels of BBW across the treatment diets. The highest cost/kg feed of N121.73 was recorded in the control diet while the lowest cost/kg feed of N110.73 was recorded in the 100% BBW diet. The reduction in the cost of the broiler finisher feed as the BBW replacement level increased from 0 to 100% was as a result of the low cost of the BBW when compared to the high cost of maize which is one of the major and costly cereal grains in the poultry feed. This result agrees with the report of Oke (2013) and Nwosu (2013) who reported that BBW at 30 and 50% inclusion levels reduced the cost of broiler feeds.

There were significant ($p < 0.05$) differences in the cost of feed consumed and feed cost/kg weight gain across the treatment diets. Birds fed the 100% BBW diet had the lowest (N548.18) cost/kg feed consumed and feed cost/kg weight gain (N290.97) and both were significantly ($p < 0.05$) higher than the control. The control and the 25% BBW diet groups had significantly ($p < 0.05$) higher values than that of the 100% diet group. The significant ($p < 0.05$) differences in feed cost per kg weight gain agrees with the reports of Ayarinde *et al.*, (2014), Nwosu (2013) and Anyanwu and Okoro (2006). The significant drop in feed cost per kg weight gain as the BBW inclusion level increased shows that BBW is cheap and its inclusion in broiler feeds can result in reduction in the cost of broiler production, hence maximising the farmers' profit. No mortality was recorded in the course of the feeding trial.

Table 3 Growth performance of finisher broiler chickens fed diets containing graded levels of bakery bread waste (29- 56 days of age).

Parameters (%)	Dietary	Levels(%)	SEM
0.00	25.00	50.00	100.00

Initial weights(g)	730.33	737.67	780.67	752.34	25.00
Final weights (g)	2570.00	2556.67	2636.67	2636.67	28.28
Total body wt gain (g)	1839.67 ^c	1819.00 ^d	1856.00 ^b	1884.33 ^a	24.94
Total feed intake (g)	4967.73 ^b	5007.23 ^a	5026.57 ^a	4950.60 ^b	9.76
FCR	2.70 ^{ab}	2.77 ^a	2.71 ^{ab}	2.63 ^b	0.04
Feed cost (₹/kg)	121.73	119.98	116.23	110.73	
Cost of feed consumed (₹/kg)	604.72 ^a	600.77 ^b	584.24 ^c	548.18 ^d	6.74
Feed cost per kg (N/kg) weight gain	328.94 ^a	332.22 ^a	315.10 ^{ab}	290.97 ^b	6.61
Mortality %	0.0	0.0	0.0	0.0	0.0

abc: means within a row with different superscripts are significantly different (P<0.05)

Data on carcass and internal organ characteristics of finisher broiler chickens fed diets containing graded levels of bakery bread wastes are presented in table 4. There were no significant ($p>0.05$) difference in dressed carcass, neck, breast, thigh, shank and drumstick weights of finisher broiler chickens fed graded levels of BBW diets. Birds fed the 50 and 100% BBW diets had significantly ($p<0.05$) lower relative head weights than the control. Except for the gizzard weights that decreased ($p<0.05$) in the 100% BBW diet group, all the relative organ weights weighed were not affected by the treatments. The dressing percentage was unaffected by the treatments.

Ayanrinde *et al.* (2014) who observed no significant differences in the carcass drum stick, neck, wing, shank, head, liver, thigh, breast, gizzard, heart and spleen weights of broilers fed diets containing 70.72% BBW in line with the present study expect for the head and gizzard weights. The reason(s) for the significantly ($P<0.05$) depressed head weights of birds fed the 100% BBW diet when compared with the control is not known and needs further

investigation. On the other hand, the decreased gizzard weight with increasing dietary inclusion levels of BBW is in agreement with the findings of Aduku and Olukosi (2000) who reported highest gizzard size of 2.46g at 0% BBW and lowest size of 1.43g at 78% BBW dietary level. According authors the higher gizzard size obtained from the 0% BBW diet may be due to inclusion of maize that allowed muscular function (grinding) of the gizzard. The significant lower gizzard weight observed in birds fed 100% BBW diet, confirms the report of Onimisi *et al*, (2008) that differences in gizzard weight seem to correlate with feed consumption hence the low feed consumption and low gizzard weights of birds fed the 100% BBW diet relative to the control.

Table 4 Carcass and Internal Organ characteristics of finisher broilers fed diets containing graded levels of bakery bread wastes.

Parameters (g)	Dietary Level (%)				*SEM
	(0%)	(25%)	(50%)	(100%)	
Live weight(kg)	2.40 ^b	2.65 ^b	2.65 ^b	3.10 ^a	89.35
Plucked weight (%)	90.91	89.61	88.45	83.77	1.59
Head	3.34 ^a	3.04 ^{ab}	2.40 ^b	2.39 ^b	0.16
Neck	4.11	3.35	3.83	3.10	0.20
Breast	14.39	14.73	15.63	14.44	0.60
Thigh	12.06	10.78	10.27	10.72	0.55
Shanks	4.09	3.69	3.32	3.45	0.26
Intestine	3.90	4.56	4.28	3.44	0.24
Abdominal fat	0.98	0.16	0.16	0.20	0.21
Proventriculus	0.40	0.40	0.41	0.29	0.03
Gizzard	2.59 ^a	2.63 ^a	2.14 ^{ab}	1.85 ^b	0.13

Empty gizzard	1.71 ^a	1.80 ^a	1.43 ^{ab}	1.26 ^b	0.09
Heart	0.48	0.39	0.37	0.44	0.02
Liver	1.39	1.47	1.37	1.53	0.06
Spleen	0.12	0.14	0.10	0.11	0.01
Pancreas	0.23	0.19	0.15	0.16	0.02
Drumstick	10.91	9.93	9.86	9.65	0.44
Carcass	75.60	72.06	67.19	66.66	2.06

abc: means within a row with different superscripts are significantly (P<0.05) different SEM: Standard Error Mean

Conclusion

The results of this study indicate that bakery bread wastes contains 11.99% crude protein and when fed up to 100% can beneficially enhance the performance of finisher broiler chickens to reduce feed cost and cost/kg weight gain. Dietary BBW had no negative effect on carcass yield and internal organ characteristics irrespective of dietary inclusion level. BBW is a non-food item and considering the lack of competition of BBW for human food uses, its potential to develop as a functional poultry feed for food enrichment as well as poultry health deserves further research.

References

- Aduku, A. O., & Olukosi, J. O. (2000). Animal products, processing and handling in the tropics. Livng Books Series. G. U. Publications, P. O. Box 2280, Abuja.
- Aduku, A.O. (2005) Tropical feed stuff analysis table. Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Samaru-Zaria
- Afzalzaden, A., Boorboor, A., Ghandi, D., Fazaeli, H., & Kashan, N. (2007). Effect of feeding bakery waste on sheep performance and the carcass fat quality. *Journal of Animal and Vetrenary Advances*, 6:559-562.

- Alderman, G. (1985). Prediction of the energy value of compound feeds. In: Recent advances in animal nutrition-1985. Haresign, W., & Cole, D. J. A. (Eds.), pp.3–52. Butterworths, London.
- Al-Tulaihan, A. A., Najib H., & Al-Eid, S.M. (2004). The nutritional evaluation of locally produced dried bakery waste (DBW) in the broiler diets. *Pakistan Journal of Nutrition* 3(5): 294–299
- Al-Ruqaie, I. M., Swillam, S. A., Al-Batshan, H. A., & Shafey, T. M. (2011). Performance, nutrient utilization and carcass characteristics and economic impact of broiler chickens fed extruded bakery waste. *Journal of Animal and Veterinary Advances*, 10(16):2061–2066.
- Anyanwu, G. A., & Okoro, V. M. O. (2006). Performance of finishers broilers fed graded level of bread waste. In: The new challenge in animal production: The way forward. Raji, A. M., Oluokun, J. A., & Odukoya, S. O. (Eds.). *Proceedings of 11th Animal Conference of Animal Science Association of Nigeria*, Sept. 18-21, 2006, Ibadan, Nigeria, pp. 138-140.
- AOAC (1995). Association of Official Analytical Chemists. Official methods of analysis. 18th Edition. Washington, D.C. USA.
- Ayarinde, O. J., Owosibo, A. O., & Adeyemo, A. A. (2014). Performance characteristics of broilers fed bread waste based diets. *International Journal of Modern Plant & Animal Sciences* 2(1):1-11
- Carnerio, M. S. S., Oliveira, A. H., & Sales, R. O. (2006). Valor nutritivo de ração para ovinos com quatro níveis do resíduo de panificação. In: reunião anual da sociedade brasileira zootecnia, 43. , joão pessoa.
- FAO. (2010). Poultry Meat and Eggs: Agric business Hand book. Investment Centre Division, FAO, Rome, Italy, p. 77.
- Franca, Almira Biazon., Morenz, Mirton Jose Frota., Lopes, Fernando cesar Ferraz., Madeiro, Afranio Silva., Morenz, Danilo Antonio., Faria, Bruna Moscat de., ... Carlos Elcio Moreira da. (2012). Bakery waste in sheep diets: intake, digestibility, nitrogen balance and ruminal parameters. *Revista Brasileira de zootecni*, 41(1): 147–153.
- Hann, G., & Spindler, M. (2002). Methods of dissection of turkey carcass. *Worlds Poultry Science Journal*, 58:179-201

- Little, T. M., & Hills, J. F. (1978). *Agricultural experimentation: Design and analysis*. London, John Wiley and sons.
- Longe, O. G. (1987). Replacement value of biscuit waste for maize in broiler diets. *Nigeria Journal of Animal Production*, 13:70-78.
- NRC. (1994). National Research Council. Nutrient requirements of domestic animals, nutrient requirement of poultry, 9th revised edition, National Academy press, Washington DC, p. 155.
- Nwosu, P. C. (2013). Effects of graded level of bread waste on broiler performance, internal organ characteristics and economics of production. M.Sc. Thesis, Federal University of Technology, Owerri.
- Obi, I. U. (1990). Statistical methods of detecting differences between treatment means. 2nd edition, Snaap Press Enugu, Nigeria.
- Oke, O. S. (2013). Utilization of bread waste meal as replacement for maize in diets for broiler chickens. *Journal of poverty, investment and development – An open access international journal*. Vol.1. Retrieved from <https://core.ac.uk/download/pdf>.
- Olafadehan, O. O., Olafadehan, O. A., & Fahunda, J. B. (2010). Performance and economics of production of laying hens fed dried bakery waste. *Animal Nutrition and Technology*, 10(2):169–175.
- Omole, A. J., Fayenuwo, J. A., & Adejuyigbe, A. D. (2011). Nutritional evaluation of bread waste as a replacement for maize in the diet of growing snails. *Journal of Central European Agriculture*, 12 (3).
- Onimisi, P.A.2008. Growth performance ,carcass characteristics and haematological parameters on broiler finisher chickens fed graded level of ginger waste meal .*Nigerian poultry sci.J.* 5(1): 11-17
- Passini, R., Spers, A., & Lucci, C. S. (2001). Effects of partial replacement of corn by bakery waste in the diet on performance of Holstein Steers. *Pesquisa Agropecuaria Brasileira*, 36(4):689–694.
- Saleh, E. A., Watkins, S. E., & Waldroup, P. N. (1996). High-level usage of dried bakery product in broiler diets. *Journal of Applied Poultry Science*, 5:33–38.

- Shafey, T. M., Al-Batshan, M. A., Abouheif, M., Alamri, M., & Al-Ruqaie, I. M. (2011). Performance, egg characteristics and economic impact of laying hens fed extruded bakery waste. *Journal of Animal and Veterinary Advances*, 10(17):2248-2252
- Singh, S. K. (2015). Bakery industry – Bakery waste and its disposal management. Bakery bazaar.com, retrieved 31st March, 2017 from <http://www.bakerybazar.com>.
- Torki, M., & Kimiaee, V. (2011). Effects of dietary replacement of corn with bakery by-product with or without enzyme supplementation on performance of laying hens. Razi University, Imam Avenue, kermanshas, Iran.

© GSJ