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# REPLACEMENT OF DIETARY GRAIN BY BISCUIT DOUGH MEAL ON PERFORMANCE AND CARCASS TRAITS OF GROWING RABBITS

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## ABSTRACT

A feeding trial, using forty-five crossbred (New Zealand x California) growing rabbits with an average initial weight range of 1009 – 1093 g and 72 d old, was carried out to investigate the effect of replacing maize with biscuit dough meal (BDM) on performance and carcass characteristics. Five experimental diets were formulated as follows: Diet 1 (control): 36% maize + 0% BDM, Diet 2: 27% maize + 9% BDM, Diet 3: 18% maize + 18% BDM, Diet 4: 9% maize + 27 % BDM and Diet 5: 0% maize + 36% BDM. The rabbits were randomly distributed (after weight balancing) into the five treatment groups of nine rabbits each. Rabbits received feed and water *ad libitum* during the nine weeks of the experiment. The final live weight of rabbits fed 18, 27 and 36% BDM were similar and higher ( $P<0.05$ ) than 0 and 9% BDM groups (2037, 2066 and 2103 vs 1984 and 1928 g) while the growth rate of rabbits fed 27 and 36% BDM were similar and higher ( $P<0.05$ ) than 0, 9 and 18% BDM groups (16.8 and 16.0 vs 15, 13.8 and 15.2 g/d, respectively). Inclusion of BDM reduced ( $P<0.05$ ) the feed to gain ratio, which was higher in the control (7.14) and lower in the other treatments (5.83 on average), but had no influence on dressing out percentage. In conclusion, growing rabbits can tolerate up to 36% of BDM without negative effect on performance and carcass characteristics.

**Key words:** Biscuit dough meal, Carcass characteristics, Daily weight gain, Rabbits

## INTRODUCTION

One sustainable way of meeting the animal protein requirements of the Nigerian populace is through the production and multiplication of small animals like rabbits because of the obvious advantages it has over other livestock (Ojebiyi, 2009). Although rabbit holds high potential in converting feed to meat, the quality of nutrition plays a key role in achieving this. According to FAO (2012), 40% of cereal produced are used for livestock feed in the United States, while only 14% are used in Africa. The high cost of energy feed resources has motivated animal nutritionists and livestock farmers into utilization of cheaper alternatives. In Nigeria, many non-conventional feedstuffs have great potential in sustaining intensive rabbit production and can partly or completely replace the conventional feedstuffs in rabbit diet (Ibitoye *et al.*, 2010). Bakery waste has been used as non-conventional ingredient in the diet of animals on the basis of economic and environmental advantages. For instance, biscuit waste has been used to replace maize in the diet of monogastric animal (Longe, 1987 and Adeyemo *et al.*, 2013).

Apart from the common biscuit waste there is biscuit dough (BD) which is an agro-industrial waste product in biscuit producing industries. BD is a palatable, high energy feed produced from wheat flour, skimmed milk powder, vegetable fat, sugar, and salt and flavor materials. Biscuit dough is made up of biscuit components that do not meet quality assurance tests and are yet to undergo baking (Shittu *et al* 2016). According to the authors, the cost of biscuit dough is comparatively cheaper than maize because it is considered a waste product from the bakery. The use of biscuit dough as

replacement for maize therefore may have potentials to reduce the competition between man and livestock for conventional energy feed sources especially maize. Although biscuit dough has been used in broiler diet (Shittu *et al* 2016), there is paucity of information on the potentials of biscuit dough as alternative feed ingredient in the diets of rabbit.

The aim of this experiment is to evaluate the grain replacement value of biscuit dough meal on growth performance and carcass traits of rabbits.

## MATERIALS AND METHODS

### Experimental site

The experiment was carried out at the Rabbitry Unit of the Teaching and Research Farm, Ladoko Akintola University of Technology, Ogbomoso, Oyo state, Nigeria.

### Source of test ingredients and preparation

Biscuit dough (BD) was procured (in pasty form) from Yale Biscuit Industry in Ibadan, Oyo state, sun-dried to a moisture content of about 10-13% and milled into Biscuit dough meal and preserved until needed.

### Experimental diets

Five experimental diets were prepared by mixing the BD with other ingredients (Table 1). The diets were pelleted using 5 mm pelleting die through the extrusion method.

**Table 1:** Ingredient and chemical composition of experimental diets

Ingredients (%)	Replacement of maize with BDM (%)				
	D1 (0)	D2 (9)	D3 (18)	D4 (27)	D5 (36)
Maize	36.0	27.0	18.0	9.00	0.00
Biscuit dough	0.00	9.00	18.0	27.0	36.0
Fixed ingredients	64.0	64.0	64.0	64.0	64.0
Determined analysis					
Crude protein (%)	16.1	16.6	16.5	16.4	16.7
Gross Energy (kcal/kg)	2502	2533	2563	2594	2624
Crude fat (%)	5.21	5.09	4.98	4.87	4.75
Crude fibre (%)	11.5	11.6	11.7	11.8	11.9
Feed cost/kg (₦)	65.6	63.3	61.0	58.7	56.5

Fixed ingredients: Corn bran 7.00%, Wheat offal 10.0%, Rice husk 26.0%, Soybean 20.0%, Methionine 0.25%, Lysine 0.25%, Premix 0.25% (composition per kg diet: vitamin A, 200,000 IU; vitamin D3, 4,000 IU; vitamin E, 60 mg; vitamin K3, 40 mg; B1 60 mg, B2 120 mg, Niacin 1000 mg, Calcium Panthothenate 200 mg, Vitamin B6 100 mg, b12 5 mg, Folic acid 2000mg, Zinc 1600 mg, Copper 170 mg, Iodine 30 mg, Cobalt 6 mg, Selenium 24 mg, Anti-oxidant 2400 mg), Salt 0.25%.

### Animals and experimental design

Forty-five (45) growing rabbits of mixed breeds (New Zealand x California) and sexes with an average initial weight of 1055 g were used for the experiment. The rabbits were randomly distributed into five treatment groups of nine rabbits each. Each rabbit served as a replicate in a complete randomized design experiment. The rabbits were housed individually in wood-wire cages measuring 44 x 34 x 44 cm. The drinking and feeding troughs made of earthen pot re-enforced with cement to prevent tipping off were of removable types for easy cleaning. A total of 100 g of feed divided into two portions of 50 g in the morning 8.00 hour and 50 g in the evening 16:00 hour were supplied to each rabbit per day. Feed leftover were collected and weighed the following morning in order to determine feed intake. Water was provided *ad libitum*.

The rabbits were weighed at the start of the experiment and thereafter they were weighed weekly to determine weight gain. Records of actual feed intake and weight changes were kept for further analyses. The experiment lasted for nine weeks. At the 9th week of the experiment, 4 rabbits per

treatment were randomly selected for carcass analysis. The rabbits were slaughtered after been starved of feed overnight for carcass analysis.

### Chemical analysis

Representative samples of the test ingredient, as well as the experimental diets were analyzed for their chemical constituents using the method of AOAC (2003).

### Statistical analysis

All data collected were subjected to analysis of variance using the general linear model (GLM) according to SAS (2000) and means were separated using Duncan's Multiple Range Test of the same statistical package at  $\alpha_{0.05}$ .

## RESULTS AND DISCUSSION

The proximate composition of biscuit dough shows that protein content is 9.24%, which is similar to 9.56% obtained for biscuit waste by Ajasin (2010). This is comparable with the crude protein normally used for maize. The gross energy of biscuit dough (11.7 MJ/kg) was higher than 3.20 MJ/kg of biscuit waste a by-product from already baked biscuit, as reported by Adeyemo *et al.* (2013). Growth performance of rabbits fed biscuit dough as replacement for maize is presented in Table 2.

**Table 2:** Growth performance of growing rabbits fed biscuit dough

Parameters	Replacement of maize with BDM (%)					SEM	P value
	D1 (0)	D2 (9)	D3 (18)	D4 (27)	D5 (36)		
Initial weight (g)	1041	1053	1079	1009	1093	15.7	0.98
Final weight (g)	1984 <sup>b</sup>	1928 <sup>b</sup>	2037 <sup>a</sup>	2066 <sup>a</sup>	2103 <sup>a</sup>	81.7	0.05
Daily weight gain (g)	13.3 <sup>b</sup>	13.5 <sup>b</sup>	15.2 <sup>b</sup>	16.8 <sup>a</sup>	16.0 <sup>a</sup>	1.26	0.02
Daily feed intake (g)	94.2 <sup>b</sup>	98.2 <sup>a</sup>	98.2 <sup>a</sup>	101 <sup>a</sup>	98.7 <sup>a</sup>	0.62	0.01
Feed conversion ratio (g feed/g gain)	7.14 <sup>a</sup>	6.09 <sup>b</sup>	5.40 <sup>b</sup>	5.88 <sup>b</sup>	5.95 <sup>b</sup>	0.11	0.05
Feed cost/kg (₺)	75.4 <sup>a</sup>	73.6 <sup>b</sup>	71.8 <sup>c</sup>	69.6 <sup>d</sup>	65.5 <sup>e</sup>	0.35	0.01
FCt/KgWG (₺)	539 <sup>a</sup>	448 <sup>b</sup>	426 <sup>b</sup>	409 <sup>b</sup>	360 <sup>c</sup>	10.94	0.03

<sup>abcde</sup> Means along the same row having different superscripts are significantly ( $P<0.05$ ) different. SEM: standard error of means (n=9). FC/KgWG= Feed cost/kg weight gain

**Table 3:** Carcass traits of growing rabbit fed biscuit dough

Parameters	Replacement of maize with BDM (%)					SEM	P value
	D1 (0)	D2 (9)	D3 (18)	D4 (27)	D5 (36)		
Final weight (g)	1985 <sup>b</sup>	1928 <sup>b</sup>	2037 <sup>a</sup>	2066 <sup>a</sup>	2102 <sup>a</sup>	11.71	0.05
Carcass weight, g	1168 <sup>a</sup>	1101 <sup>b</sup>	1163 <sup>a</sup>	1184 <sup>a</sup>	1206 <sup>a</sup>	8.05	0.05
Dressing out, %	58.8	58.1	57.2	57.0	57.7	0.33	0.11
Shoulder, %LW	14.6	14.0	15.2	11.8	14.1	0.25	0.12
Rack, %LW	16.3 <sup>c</sup>	16.9 <sup>c</sup>	19.9 <sup>a</sup>	19.6 <sup>a</sup>	18.1 <sup>b</sup>	0.26	0.05
Loin, %LW	24.0 <sup>b</sup>	30.0 <sup>a</sup>	28.1 <sup>a</sup>	30.4 <sup>a</sup>	30.2 <sup>a</sup>	0.47	0.01
Thigh, %LW	25.6 <sup>a</sup>	24.2 <sup>bc</sup>	25.3 <sup>ab</sup>	23.5 <sup>c</sup>	23.9 <sup>bc</sup>	0.22	0.05
Flank, %LW	9.42 <sup>a</sup>	8.47 <sup>bc</sup>	9.13 <sup>ab</sup>	8.43 <sup>bc</sup>	8.12 <sup>c</sup>	0.13	0.03
Neck, %LW	4.82	4.68	5.08	4.61	5.12	0.07	0.06

<sup>abc</sup> Means along the same row having different superscripts are significantly ( $P<0.05$ ) different. SEM: standard error of means (n=4). LW: live weight.

Final weights of rabbits fed Diet 3, Diet 4 and Diet 5 (2037, 2066 and 2103 g, respectively) were higher ( $P<0.05$ ) than the final weights of the rabbits fed control diet (1984 g) and D2 (1928 g). Feed cost/kg as well as feed cost/kg weight gained decreased with the inclusion of BDM. This result was similar to the progressive reduction in feed cost observed by Ibrahim and Olaniyi (2018). The average daily gain of the animals fed the control, D2 and D3 (15.0, 13.89, and 15.2 g/d, respectively) was

lower than those fed D4 (16.8 g/d) and D5 (16.0 g/d). This trait was higher than the values reported (13.98 – 14.97 g/d) by Ojebiyi *et al.* (2012). Inclusion of BDM significantly ( $P < 0.05$ ) affected the feed conversion ratio which was higher in the control (7.14) but lower in other treatments (6.09, 5.40, 5.88 and 5.95 for rabbits fed diets 2, 3, 4 and 5, respectively). The carcass traits of the rabbits fed Biscuit dough are shown in Table 3.

Although there were differences in the final weights, the dressing percentage was not affected ( $P > 0.05$ ) by treatments. This result was similar to that reported by Shaahu and Tiough (2019), who obtained similar dressing percentage when maize was replaced with graded levels of Sweet Potato vine – cassava composite meal – in rabbit diets.

## CONCLUSION

Biscuit dough, an inedible cheaper bakery byproduct and a good source of energy, can be used as a total replacement for maize in growing rabbit rations without any negative effect on performance.

## REFERENCES

- Adeyemo, G.O., Oni, O.R. and Longe, O.G., 2013. Effect of dietary biscuit waste on performance and carcass characteristics of broilers. *Food Science and Quality Management*, 12: 1-9.
- Ajasin, F.O., Omole, A.J., Fapohunda, J.B. and Obi, O.O., 2010. The feeding value of biscuit waste as replacement for maize in the diet of growing snails (*Archachatina marginata*). *Journal of Animal Science*, 6: 1-5.
- AOAC, 2005. Official Methods of Analysis. 18th Edn. Association of Official Analytical Chemists, Washington, DC., USA., pg 66-88.
- FAO, 2012. Conducting National feed assessments by Coughenour, M. B. , Makar H .P. S..FAO Animal Production and Health Manual No 15, Rome Italy.
- Ibitoye, E.B., Olorode, B.R., Jimoh, A.A., Suleiman, N., 2010, The rabbit industry and alternative feedstuffs: A Review. *Proc. 35th Conf. Nig. Soc. For Anim. Prod. 14-17 March, University of Ibadan, Nigeria. Pp. 207-211.*
- Ibrahim H. , Olaniyi O. J. 2018. Effect of Sweet Potato (*Ipomoea batatas* Lam) peel meal as replacement for maize on growth performance and cost of feeding weaner rabbits. *Nig.J.Anim.Prod.* 45(5): 100-106.
- Longe, O.G., 1987. Replacement value of biscuit waste for maize in broiler diets. *Nigeria Journal of Animal Production*, 13 (1-2): 70-78.
- Murin, P.A., Njoka, E.N., Tuitoek, J.K. , Nanua, J.N., 2002. Evaluation of sorghum as replacement for maize in the diets of growing rabbits. *Swedish Journal of Animal Science*, 15(4): 565-569
- Ojebiyi, O.O., 2009, Evaluation of the nutritive value of cassava (*Manihot esculenta* Crantz) peels-blood meal mixtures on the performance of rabbits bucks. *PhD Thesis submitted to the Department of Animal Production and Health, Ladoko Akintola University of Technology, Nigeria.*
- Ojebiyi O. O., Aderinola O. A., Adeojebi A. Ayangbenro A. O. 2012. Nutritional Evaluation of Cassava(*Manihot esculenta* crantz) peel meal improved by rumen filtrate fermentation on performance of growing rabbits, *Trop.Agric.Trinidad* 89(3): 181-188
- Shaahu D. T. , Tiough S. M. 2019. Effect of replacing maize with graded levels of Sweet Potato wine – cassava composite meal in growth performance, nutrient digestibility, carcass characteristics and economics of production of weaned rabbits. *Nig.J.Anim.Prod.* 46(1) : 116-123.
- SAS, 2003. Statistical Analysis System. Users Guide Statistics *SAS Inst. Incorporated Cary, NC.27513.*
- Shittu M.D., Ojebiyi O.O., Ademola S.G. , Ojediran T.K. , 2016. Replacement value of Biscuit dough for maize on performance and nutrient utilization of broiler chickens. *International Journal of Science, Environment and Technology*, 5(3):1057 – 1065