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Effect of Dietary Biscuit Waste on Performance and Carcass Characteristics of Broilers

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ABSTRACT

A study was conducted for 8 weeks to investigate the effect of dietary biscuit waste (BW) replacing maize (M) on performance and carcass characteristic of broilers. A total of 175 day old marshal broiler chicks were used for this study. They were completely randomized and divided into five treatments. Each treatment had five replicates of seven birds per replicate. Five experimental diets were formulated as follows; A: (100%M : 0%BW), B: (75% M: 25%BW), C: (50%M: 50%BW), D: (25%M: 75%BW), E: (0%M: 100%BW) at both starter and finisher phases.

Performance indices measured were feed intake, weight gain and feed conversion ratio. The feed intake (F.I.) was affected with increasing level of biscuit waste. There were significant differences ($p<0.05$) across the treatments with treatment A having the highest value of 2.92kg for F.I and treatment E having the least value of 2.51kg while treatments B, C and D followed the same trend having the following values of 2.73kg, 2.70kg and 2.61kg respectively.

Average weight gain showed that there were no significant differences ($p>0.05$) across the treatments, the values obtained were 1.13kg, 1.09kg, 1.10kg, 1.12kg and 1.10kg for treatments A, B, C, D and E respectively. Feed conversion ratio showed significant differences ($p<0.05$) as birds in treatments C, D and E recorded lower values of 2.47%, 2.37% and 2.33% respectively while birds on treatment A had highest value of 2.60%.

The carcass weights expressed as percentages of live weights (LW) did not show any significant differences ($p>0.05$). The result for breast weights showed significant differences ($p<0.05$) as birds on treatments four (25% M: 75% (BW) and five (0%M: 100% BW) had lower values of 10.05% (LW) and 11.20% (LW) respectively. Surprisingly, birds on treatment two (75% M 25% BW) had the highest breast meat value of 16.75%. The percentage organ weights showed no significant differences ($p>0.05$) between liver, heart and spleen but the gizzard weights were significantly different among the treatments with the control having the highest value of 2.88% (LW).

It was concluded that biscuit waste could be used as feed for broilers up to 50% replacement levels for maize at the starter and finisher phases without compromising performance and carcass value of broilers.

Keywords: Biscuit waste (BW), Maize (M), Broiler Performance and Carcass Characteristics.

Introduction

Poultry production holds a prominent place in the economy of many developing countries including Nigeria. The need to improve their production becomes more important with increasing human population and demand for animal products. According to Longe (1987), poultry production represents the fastest means of correcting the shortage of animal protein availability because of their fast rate of production and quick return on investment. Unfortunately, poultry production in Nigeria is adversely affected by fluctuations in supply of good quality feed due to inadequate local production of feedstuffs, unavailability of some ingredients year round,

competition between man and animals for the limited available conventional feed sources and general inflationary trends in the country due to the inconsistent economic policies of government.

The use of Agro-industrial by-products (AIBs) in animal feed holds tremendous potential in alleviating the existing critical situation of high cost and inadequate supply of feed (Longe, 1987; Babatunde, 1989). Considerable efforts have been made to improve the utilization of these AIBs in practical monogastric nutrition. Biscuit, a baked edible product commonly baked as a small, hard, often sweetened flour-based product, also known as a cookie. The waste from biscuit holds considerable promise as an AIB that can serve to mitigate the high cost of maize a major energy ingredient in poultry production, because its energy value is similar to that of the maize.

Biscuit Waste (BW) an agro industrial waste product found in substantial quantities in biscuit producing industries located at different industrial areas. Is a palatable, high energy feed produced from wheat flour, skimmed milk powder, vegetable fat, sugar, salt and flavour materials. This waste meal was analysed and found to contain substantial amount of nutrients such as protein, energy and mineral required for animal growth and performance (Longe 1986; Olayeni *et al.*. 2007). Longe (1986) noted that the crude protein (CP) and energy contents of biscuit waste were 10.80% and 4.70 MJ/kg respectively.

Biscuit waste has no anti-nutritional factor and could make a good replacement for maize and other cereal grains in feeding broilers, snail, fattening ram for market or for slaughter.

The cost of biscuit waste is relatively low compared to that of maize because it is considered a waste product. Biscuit waste has been included in the diets of snails and rams which has resulted in reduction in the cost of feed without any adverse effect on their performance (Longe 2010; Apata *et al*., 2010). The advantage of this waste apart from the fact that it does not have any adverse effect on the animal is that it reduces the feed cost thereby decreasing the overall cost of production.

This study was conducted to determine the effect of feeding broilers with biscuit waste as replacement for maize fraction of the diet on their performance and carcass characteristics.

Materials and Methods

A total of 175 day old marshal broiler chicks were purchased for an experiment carried out at Pullet unit of Teaching and Research Farm, Faculty of Agriculture and Forestry, University of Ibadan, Oyo State, Nigeria. The experiment was carried out for eight weeks. Birds were allocated to five dietary treatments A, B, C, D and E, which was replicated five times in a completely randomized design with each replicates having 7 birds. Biscuit waste was obtained from Sumal food limited, Oluyole Industrial Layout, Ibadan, Nigeria. The chicks were reared on a deep litter system and offered feed and water *ad-libitum.* The diets were formulated with the biscuit waste to meet the nutrient requirements for broilers (NRC, 1984). Maize was used as the energy source in the control diet and interchangeably in other subsequent diets except diet five which contains biscuit waste as the main source of energy. The following parameters were measured live weight, feed intake, carcass quality evaluation.

Table 1: Gross Composition of Experimental Starter Diets with Varying Levels of Biscuit Waste %

Ingredients	A(Ctrl)	B	C	D	E
Maize	55.00	41.25	27.50	16.00	-
Biscuit waste	-	13.75	27.75	39.00	58.00
Full fat soya	10.00	10.00	10.00	10.00	6.00
Groundnut cake	28.70	28.70	28.70	28.70	27.00
Fish meal	1.00	1.00	1.00	1.00	5.80
Bone meal	2.30	2.30	2.30	2.30	1.50
Oyster shell	1.00	1.00	1.00	1.00	0.50
Methionine	0.2	0.2	0.2	0.2	0.1
Lysine	0.2	0.2	0.2	0.2	0.1
Vegetable oil	1.1	1.1	1.1	1.1	0.5
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Crude protein	23.00	23.10	23.00	23.00	23.00
Metabolizable energy(kcal/kg)	3090	3038	3002	2989	2978

***premix**: Vit A 8000iu, Vit D3 2000iu, Vit E 5iu, Vit K 2mg, Riboflavin 4.20mg, Vit B12 0.01mg, Pantothenic acid 5mg, Nicotinic acid 20mg, Folic acid 5mg, Choline 300g, Mn 56mg, Fe 20mg, Cu 10mg, Zn 50mg, and 1.25m*

Table 2: Gross Composition of Experimental Finisher Diets With Varying Levels of Biscuit Waste %

Ingredients	A(ctrl)	B	C	D	E
Maize	65.00	50.00	30.00	15.00	-
Biscuit waste	-	15.00	35.00	50.00	72.90
Full fat soya	28.00	28.00	28.00	28.00	20.00
Groundnut cake	1.00	1.00	1.00	1.00	1.00
Fish meal	2.00	2.00	2.00	2.00	3.00
Bone meal	2.30	2.30	2.30	2.30	1.60
Oyster shell	1.00	1.00	1.00	1.00	0.7
Methionine	0.15	0.15	0.15	0.15	0.20
Lysine	0.10	0.10	0.10	0.10	0.10
Salt	0.20	0.20	0.20	0.20	0.20
Premix	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Crude protein	20.19	20.49	20.89	19.20	19.10
Metabolizable energy (kcal/kg)	3054	3013	2945	2965	2965

Results and Discussion

Table 3: Proximate Analysis of Biscuit Waste

PARAMETER %	BISCUIT WASTE
Dry Matter	89.27
Crude Protein	5.25
Crude Fibre	1.05
Ether Extract	11.01
Ash	1.00
Nitrogen Free Extract	81.69
Gross Energy	3.99MJ/kg

Table 4: Performance Characteristics of Broilers Fed Varying Levels of Biscuit Waste.

			TREATMENT			
PARAMETERS	**A (Ctrl)**	**B**	**C**	**D**	**E**	**SEM**
Feed Intake (kg)	2.92^{a}	2.73^{ab}	2.70^{ab}	2.61^{b}	2.51^{b}	0.03
Weight Gain (kg)	1.13	1.09	1.10	1.12	1.10	0.02
FCR	2.60^{a}	2.51^{ab}	2.47^{ab}	2.37^{ab}	2.33^{b}	0.04

a, b Means along the same row with different superscript(s) are significantly different (p>0.05)

Table 5: Carcass Characteristics Of Broilers Fed Varying Levels Of Biscuit Waste as Percentage % Live Weight.

			Treatments			
Parameters	**A (Ctrl)**	**B**	**C**	**D**	**E**	**SEM**
LW(g)	1580	1540	1660	1720	1460	44.54
			%LW			
Bled wt.	88.44	89.78	89.38	89.62	90.58	0.78
Defeathered wt.	85.56	86.12	88.24	84.14	87.74	0.75
Dressed wt.	72.80^{b}	79.68^{a}	77.30^{ab}	75.61^{ab}	77.57^{ab}	0.86
Back wt.	14.32	16.47	15.75	15.62	16.58	0.42
Thigh wt.	10.18	10.65	11.64	10.05	11.19	0.30
Breast wt.	15.72^{a}	16.75^{a}	14.89^{a}	10.05^{b}	11.20^{b}	0.36
Wing wt.	8.06	8.48	8.70	8.53	9.03	0.17
Drumstick wt.	9.67	8.82	9.26	8.88	9.24	0.20
Shank wt.	4.61	4.82	4.82	4.66	5.32	0.12
Head wt.	2.69	2.69	2.79	2.69	3.06	0.06
Neck wt.	3.68	3.74	3.81	3.55	3.97	0.11

a, b Means along the same row with different superscript(s) are significantly different (p>0.05)

Table 6: Organ Characteristics of Broilers (as % Live Weight) Fed Varying Levels of Biscuit Waste.

	Treatments					
Parameters	**A(ctrl)**	**B**	**C**	**D**	**E**	**SEM**
Gizzard	2.88[a]	2.70[ab]	2.65[ab]	2.43[ab]	2.17[b]	0.09
Liver	3.04	2.79	2.51	2.44	2.71	0.10
Spleen	0.15	0.18	0.14	0.12	0.19	0.01
Heart	0.47	0.46	0.50	0.44	0.47	0.02

a, b Means along the same row with different superscript(s) are significantly different ($p<0.05$)

TABLE 7: Cost Analysis of Broilers Fed Varying Levels of Biscuit Waste.

	Treatments					
Parameters	**A**	**B**	**C**	**D**	**E**	**SEM**
Cost of feed #/kg	86.02[a]	80.99[ab]	74.30[ab]	69.28[ab]	61.11[b]	0.92
Total amount of feed consumed kg/bird	2.92[a]	2.73[ab]	2.70[ab]	2.61[b]	2.51[b]	0.03
Cost of feed consumed/bird	434.19[a]	382.91[a]	351.51[ab]	319.12[ab]	298.68[b]	8.42
Weightgain kg/bird	1.13	1.09	1.10	1.11	1.10	0.02
Cost of feed/kg live weight gain	384.24[a]	351.29[a]	319.55[ab]	287.50[b]	271.53[b]	5.51

a, b Means along the same row with different superscript(s) are significantly different ($p>0.05$)

SEM= Standard Error of Mean

The gross energy was in line with the report of Eniolorunda *et al.,* (2010) who recorded 3.99MJ/kg and very close to Eniolorunda *et al.,* (2011) with 3.20MJ/kg while Longe (1987) recorded higher value of 4.90MJ/kg. The crude protein was lower to the values obtained by Rita *et al.,* (2009) who reported a CP of 8.69%, Ajasin *et al.,* (2010) had a CP of 9.56% and Longe (1987) recorded a CP of 10.8%. The reason for the variation may be as a result of differences in the processing of each biscuit producing industry.

The result for feed intake obtained showed that birds on treatment A recorded the highest value of 2.92kg, it could be as a result of the gritty or coarse nature of treatment A which was not in powdery form. It encouraged birds on this treatment to pick more grains of feed than other birds in the other treatments. The lower feed intake recorded for bird on treatments D and E could be due to the powdery nature of the biscuit waste. This is similar to the report of Longe (1986) who stated that complete replacement of maize reduced feed intake significantly probably due to the physical nature of the diet and that the biscuit was supplied as ground sample of fine texture by the Biscuit Manufacturing Industry. Ajasin *et al.,* (2010) who fed snails with biscuit waste stated that the mean feed intake was significantly influenced by increased level of biscuit waste in the diets and this report is in line with our findings. Smith, (1990) observed that feed intake of birds reduced as the energy density of feed increases, which permits better feed utilization.

The weight of a chicken at any point in time is a function of cumulative growth of component part. (Ibe and Nwakalo 1986; Liu *et al.,* 1995). Even though the value obtained for weight gain by birds on the treatment A showed that they were not statistically different from values obtained by birds in other treatments. The high weight recorded by birds on treatment A could be as a result of the high feed intake. This result is in agreement with Longe (1987) who also reported that there were no significant differences ($p>0.05$) across the treatment of birds fed varying inclusion level of biscuit waste up to complete replacement of maize. Rita *et al.,* (2009) who used biscuit waste to feed piglets reported that the non significant reduction in weight gain could be attributed to the lesser crude fibre and protein content in biscuit waste. Hence, it is concluded that supplementation of additional proteins was necessary to obtain optimum growth in piglets when fed with unconventional feed like biscuit waste. This study is in agreement with the report of Ajasin *et al.,* (2010) that the total weight gain of the snails in all the treatments was not significantly influenced by increased level of biscuit waste in the diets.

Feed conversion ratio (FCR) is a measure of how well a flock converts feed intake (feed usage) into weight gain. It is also the ability of the livestock to turn feed mass to body mass. Birds that have low feed conversion ratio are considered efficient users of feed. According to Brown *et al.,* (2001) who reported that comparison of feed conversion ratio among difference species may be of little significance unless the feeds involve are of similar quality and suitability. The result showed that birds on treatment C (50% BW), D (75% BW) and E (100% BW) had more ability to turn feed to body mass due to their low feed conversion ratio value than birds on treatment A (0% BW).

Body depth and breast width in broiler-type chicken are best indicators of body weights (Nwachukwu *et al.,* 2009). The insignificant impact of percentage bled weight, defeathered weight showed an indication that the different diets promoted the fairly similar development of carcass traits as noted by Agbede and Aletor, (1997). Adeleke *et al.,* (2009) reported that there is a significant association between live weight and breast girth, that is, they are strongly related.

Aderolu *et al.,*(2007) reported that excess energy supplied to animal could be stored in form of fat but this stored energy was utilized in the movement of the birds to feed *ad-libitum* thereby utilizing the same excess fat that others are converting to body meat. This may have account for their reduced body weight and breast weight as well. Leeson and summer (1997) reported that birds are leaner due to reduced fat deposition. Asaniyan *et al.,* (2009) stated that the best means of improving carcass quality is to increase protein level of the diets while maintaining standard energy value.

The result obtained for gizzard weight from birds on treatment E had lower weight as compared with others. The decreased gizzard weight obtained for birds in this treatment could be as a result of the particle size of the diet which might have led to decreased muscular function (grinding) by the gizzard. Aderolu *et al.,* (2007) reported that gizzard weight is expected to increase due to more work to blend the grains ingested. This result is in agreement with Longe (1987), who reported that gizzard weights were significantly lower for the diets containing biscuit waste at 25 – 100% replacement for maize. The researcher also reported further that the diets containing higher levels of biscuit waste were not as coarse to the feel as those with complete maize and that the texture of the diets must be responsible for the differences in gizzard weights. The result of dressed weights showed that birds on treatments A and B were higher in weight and this can be linked to the variation in the internal organs

that has been removed from the carcass. The dressing percentage of treatments B, C and E were similar to the one recorded by Aduku and Olukosi, (2000) who reported 78% for Nigerian dressed chickens.

The result of the cost analysis showed that birds on treatment E was less expensive followed by treatments C and D. Ijaiya *et al.,* (2009) stated that diets are formulated to promote the desired intake of all nutrients and to improve the growth rate at reasonable cost. The increase in cost of feed per kilogramme weight gain may be attributed to the increase in feed intake. The cost benefit result indicates that there is a beneficial effect when replacing maize with biscuit waste, since profit is a single index determining the economic value of keeping birds. (Olomu 1995; Coelho 1996). This study agrees with the submission of Sucharita *et al.* (1998) who reported that research efforts in developing countries should be directed towards the use of non – conventional agricultural by-products.

Conclusion

The increase in the cost of maize (a major energy ingredient) has compelled animal nutritionists to search for available alternative feed (energy) ingredients to combat the rise in the cost of feeding animals. Many animal nutritionists have utilized and are still using researched non-conventional feed sources as alternative feed ingredients in formulating rations to enhance productivity in order to reduce cost of production.

Biscuit waste has shown a great promise in combination with maize to greatly reduce cost in broiler production. The inclusion of biscuit waste at 50% replacement for maize in the diets of broilers is recommended.

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