NUTRITIONAL VALUE OF BISCUIT DOUGH ON PERFORMANCE AND NUTRIENT UTILIZATION OF BROILER CHICKENS

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Abstract
This study was conducted for fifty-two days to investigate the effect of graded levels of biscuit dough (BD) on growth performance, nutrient utilization and carcass characteristics of broilers. A total of 144 day old broilers (Arbor-acre strain) were used for this study. They were completely randomized and divided into four treatment groups. Each group had three replicates of twelve birds per replicate. Four experimental diets were formulated such that control had maize and treatment 2, 3, and 4 had 5, 10, 15% inclusion of BD respectively at both starter and finisher phases. The response of the broilers to dietary treatments were measured by feed intake (kg/bird), final weight (kg/bird), feed conversion ratio (FCR) and nutrients utilization. There were significant differences ($p<0.05$) across the treatments with treatment 3 and 4 (10 and 15%BD) having the highest values of 104.01 g/bird and 104.63 g/bird daily feed intake and treatment 1(T1) having the least value of 98.17 g/bird/day. For the final live weight, treatments 4, 5 had similar ($p>0.05$) weight gain (2.55 kg/bird) while treatment 1 had the least (2.25kg/bird). Addition of BD reduced the cost per kg weight gain by approximately 10% (9.37%) at 15% inclusion level. The nutrient digestibility were not significantly affected ($p>0.05$) across the treatments except the dry matter and nitrogen free extract digestibilities. Treatment 1 (0%BD), 2 (5%BD) and 3 (10%BD) had similar dry matter and nitrogen free extract digestibilities while treatment 4 was significantly ($p<0.05$) lower. It is concluded that biscuit dough can replace 15% maize in finisher diets at both starter and finisher phases without negative effect on performance characteristics of broiler chickens.

Introduction

The scarcity and escalating cost of unconventional feed ingredients have adversely affected the livestock production in Nigeria. In view of this, efforts have been geared towards search for the readily available alternatives (Arowora and Tewe, 2003). Nigeria is blessed with vast range of feed resources such as grains, oilseeds which by-products could be used in the formulation of feed. These locally available feed resources in Nigeria have potential to support a flourishing livestock industry, but are grossly under-utilized and some are not yet given the attention e.g. biscuit dough, thus resulting in a reduced livestock production. Biscuit dough (BD) is a bakery byproduct, found in substantial quantities in biscuit producing industries located at different industrial areas. It's 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 fail the first time biscuit quality, they are yet to undergone baking and therefore scrapped out from the biscuit making machine. 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.

Materials and Methods

Experimental Site: The experiment was carried out at the Broiler Production Unit of Ladoke Akintola University of Technology Teaching and Research Farm, Ogbomoso, Oyo State in the derived savanna zone of Nigeria.

Test Ingredients and Formulation of Experimental diets: Biscuit dough (BD) was obtained from Yale Foods Limited, Oluyole Industrial Layout, Ibadan, Oyo State, Nigeria.It was sun dried and milled into BD meal and then mixed with other feed ingredients to formulate experimental diets. Four experimental diets were formulated at both the starter and finisher phases.

Table 2: Gross composition of broiler finisher diets (g/100gDM)

INGREDIENTS (%)	T1(0%BD)	T2(5%BD)	T3(10%BD)	T4(15%BD)
Maize	60.30	55.30	50.30	45.30
**BD	-	5.00	10.00	15.00
*Fixed ingredients	39.70	39.70	39.70	39.70
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Nutrients				
Feed cost/Kg	90.11	88.36	86.61	84.86
Crude protein (%)	19.13	19.04	19.55	20.07
Metabolizable energy (Kcal /kg)	2848.70	2817.20	2785.70	2754.20
Crude fibre (%)	3.45	3.56	3.67	3.77

**BD=Biscuit Dough, *Fixed ingredients= soy beean:21, wheat offal: 11.5 , fish:3,oyster shell:1.5, DCP:2, salt: 0.5, methionine:0.1, lysine: 0.1, vit. Premix: 0.25

Experimental Birds and Management

A total of 144 day old (Arbor-acre strain) broiler chicks was used for the experiment. Birds were allocated to four dietary treatments with each treatment having three replicates in a completely randomized design. Each replicates had 12 birds to make a total of 36 birds per treatment. The chicks were reared on a deep litter system and offered feed and water *ad-libitum*. Wood shavings were used as litter materials was changed weekly to reduce ammonia build up. The feed offer as well as orts were weighed on daily basis while the birds were weighed on weekly basis throughout the weeks of experiment. Drugs and vaccinations was done in accordance with the prevailing vaccination and medication schedule for broiler in the experimental area. The experiment lasted for eight weeks.

Data Collection

Data were collected on feed intake, weight gain was calculated from weekly weight changes while feed to gain ratio was calculated as average feed intake divided by average weight gain. Feather weights were determine by weight different between bled weight and defeathered weight.

Nutrient Utilization: At the 8th week of the experimental period, two birds were selected per replicate and transferred to metabolic cages for digestibility trial. Weighed feed was given to the birds for 7 days and faeces were collected separately daily for each bird during the last 3days.The collected faecal samples were sun dried, grounded and pooled together per bird and sub sample was taken for determination of proximate composition according to AOAC (2005).

Statistical analysis: All data generated were subjected to one way analysis pf variance (ANOVA) using SAS (2000) package. Means were separated using Duncan;s Multiple Range Test option of the same package.

Results and Discussion

Table 3: Proximate composition and metabolizable energy of Biscuit Dough

Parameters (%)	Biscuit Dough
Dry matter	90.04
Crude protein	19.25
Ether extract	3.64
Ash	7.06
Crude fibre	4.16
Nitrogen free extract	65.89
Metabolizable energy (MJ/kg)	11.71

Table 4: Performance of broiler chickens fed graded levels of Biscuit Dough (BD)

Parameters	T1(0%BD)	T2(5%BD)	T3(10%BD)	T4(15%BD)	SEM
Initial weight/bird (g)	40.36	40.67	40.33	40.69	-
Final live weight (kg/bird)	2.25^{b}	2.46^{ab}	2.55^{a}	2.55^{a}	0.05
Daily weight gain (g/bird)	40.76	44.79	43.80	45.10	0.91
Daily feed intake (g/bird)	98.17^{b}	100.64^{ab}	104.01^{a}	104.63^{a}	0.97
Feed conversion ratio	2.43	2.25	2.38	2.32	0.05
Feather weight(g)	626.67^{b}	796.67^{ab}	903.33^{ab}	907.00^{a}	51.82
Feed cost/Kg (₦)	88.37^{a}	85.52^{b}	83.77^{ab}	79.77^{b}	1.14
Feed cost/kg wt gain (₦)	212.07^{a}	192.42^{c}	199.37^{b}	185.06^{d}	3.04

[a,bc] Means along the same row with different superscript(s) are significantly different ($p<0.05$).
SEM: Standard error of means, BD: Biscuit dough.

Table 5: Nutrient digestibility of broiler chickens fed graded levels of biscuit dough (BD)

Parameters	0%BD)	5%BD	10%BD	15%BD	SEM
Dry matter Digestibility	81.33[a]	79.33[ab]	79.92[ab]	77.37[b]	0.61
Crude protein Digestibility	88.54	86.89	87.41	85.70	0.67
Crude Fibre Digestibility	64.72	58.49	63.35	57.69	1.97
Ether extract Digestibility	97.29	96.71	97.48	97.21	0.19
Ash Digestibility	90.65	90.09	90.91	88.46	0.65
Nitrogen Free Extract Digestibility	71.76[a]	68.20[ab]	67.67[ab]	65.00[b]	0.95

[a,b] Means along the same row with different superscript(s) are significantly different ($p<0.05$).
SEM: Standard error of means, BD: Biscuit dough.

The proximate compositions of biscuit dough (Table 3) obtained were greater than that of biscuit waste as reported by Adeyemo *et al.* (2013), Longe (1987), Ajasin *et al.* (2010) except ether extract. The gross energy was higher (11.71MJ/kg) than that of biscuit waste as recorded by these researchers. Adeyemo *et al.* (2013) obtained 3.20MJ/Kg, Eniolorunda *et al.* (2011) and Longe (1987) reported 3.20MJ/Kg and 4.90MJ/kg gross energies respectively. Also crude protein (19.25%CP) was higher compared to values obtained by Longe (1987) (10.8% CP) while Ajasin *et al.* (2010) recorded 9.56% CP. This may be because biscuit dough has not been exposed to heat through baking. Heat processing according to Eugene *et al.* (2008) generally decreased dry matter, crude protein, ash, crude fat, total carbohydrate and calorific values. Table 4 shows the growth performance of experimeSSntal birds. The pattern of weight gain indicates a higher utilization of biscuit dough (BD) containing diet compared to control diet (0%BD). Dietary treatment had no significant effect on all parameters except average daily feed intake (g/bird) and average final live weight (Kg/bird). The similarities among all treatments in the feed conversion ratio (FCR) imply that the biscuit dough-based diets favourably compared with control (0% BD) with zero replacement of maize (Ngiki *et al.*, 2014). The average daily feed intakes were similar compared with the control except diets T3 and T4 which were significantly higher. This might be as a result of taste and smell of the biscuit dough. This was contrary to the report of Peter and Abel (2006) that smell and taste have lower effect on the feed intake. The powdery nature of the BD also seems to haste the uniform consumption each component of feed ingredients, this was contrary to the report of Adeyemo *et al.* (2013) when biscuit waste was included in the diet of broilers. The final live weights were similar. Treatments T2, T3 and T4 are similar. Also treatment T1 and T2 are similar but there was a significant different between treatments T1 (control diet) compared to treatment T4. Control diet (0%BD) had the least (2.25kg/bird) final live weight compared to 2.55Kg/bird of the treatment T4 (15%BD). The highest weight recorded by the birds on treatment T4 (15%BD) could be as a result of the high feed intake. The productivity of poultry is ultimately governed by the bird's daily feed intake because unless the bird eats to expectation, productivity will suffer (Steven, 2011). The results of these study were not in accordance with the report of Longe (1998) who reported that there were no significant different ($p>0.05$) across the treatment of birds fed varied inclusion levels of biscuit waste. This result has revealed the quality nature of BD compared to biscuit waste in the diet of broiler chicken.

The result of the cost analysis showed that birds on treatment T4 was less expensive followed by treatments T2 and T3 and control diets was most expensive. Addition of biscuit dough reduced the cost per unit weight gain by 3.63, 5.21 and 9.73% for 5, 10 and 15% inclusion levels of biscuit dough respectively. This is an indication of economic benefit of biscuit dough when incorporated in the diet of broilers. It has been stated by Hossain *et al.* (2003) that poultry production may not be remunerative if costly conventional feeds cannot be replaced by the cheaper unconventional feeds in the poultry diets. Poultry production represents the most vertical, integrated, rapidly growing and highly globalized animal production industry (Thobela, 2003). Therefore reduced cost of feed ingredients will improve production by resource poor farmers and impact significantly on the will to purchase poultry meat and eggs by consumers (Thobela, 2014).

It is also of interest that feather weight increase with increase inclusion level of BD and control diet (0%BD) had significantly ($p<0.05$) lower feather weight compare to other treatments. This might be as a result of good nutrients derived from the BD. This agreed with the report of Kazok (2011) and Fuller and Wilcke, (1942), that nutrition plays important role in the development

of feather. Feather weight increase with increase body weight of this experimental birds and this was also in line with the report of Kazok (2011) that body weight significantly influences the quantity of feather. Lack of feather development is of considerable economic important, particularly in the broiler industry where the occurrence of "bareback" presents a serious problem (Fuller and Wilcke, 1942).Table 5 shows the nutrient digestibility of broilers fed varied inclusion levels of biscuit dough (BD) compared with maize. Biscuit dough inclusion in the diets of broilers up to a level of 15% had no significant ($p>0.05$) effect on the digestibilities of crude protein, crude fibre, ether extract and ash except the dry matter and nitrogen free extract digestibilities. Dry matter and nitrogen free extract digestibilities decreased with increasing inclusion levels of BD. The Control diet recorded the highest values of 81.33% (dry matter digestibility) and 71.76% (nitrogen free extract digestibility. From this study, the reason of non-significant difference of nutrient utilization may be that dietary inclusion of biscuit dough did not significantly affect the activity of digestive enzyme and intestinal integrity.

Conclusions

Utilization of biscuit dough up to 15% of diet as corn replacement has significant increase effect on the growth performance and nutrient digestibility of broilers. It is seen that utilization of biscuit dough (up to 15%) in poultry diet is possible since there are various biscuit producing industries across the country because biscuit is well accepted by many people especially children. This will make BD more readily available and incorporating it in the diets of animal will be an added advantage to both the industry producing biscuit and the poultry farmers.

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