

## Utilization of Bread Waste Meal as Replacement for Maize in Diets for Broiler Chickens

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### Abstract

This study was carried out to determine the effects of partial replacement of maize with bread waste meal on broiler chickens. One hundred and twenty day old Marshall broiler chicks were collected from Obasanjo Farm Ltd, Olumore, Abeokuta and used in 56 day feeding trial using Completely Randomized Design (CRD) to assess the effect of 0%, 10%, 20% and 30% inclusion levels of Bread Waste Meal (BWM) on the performance characteristics, carcass characteristics, sensory evaluation, cost benefit analysis and carcass characteristics of broilers chickens. The birds were properly managed and fed *ad libitum* for starter phase (0 – 4 weeks) and finisher phase (5 – 8 weeks). All routine management and practices including drugs and vaccination programmes were administered throughout the experimental period. Results showed that the final weight gain ranged from 1730.20g/bird to 1980.06g/bird, daily weight gain ranged from 30.19g/bird to 34.63g/bird, total feed consumed ranged from 5405.12g/bird to 5801.60g/bird, feed conversion ratio ranged from 2.9 to 3.20 and protein efficiency ratio ranged from 1.57 to 1.74 ratio were significantly different ( $P < 0.05$ ). The results of cost benefit analysis showed that the feed cost, feed cost/live weight gain were significantly different ( $P < 0.05$ ) as well. The sensory evaluation results showed that colour, juiciness, flavor, texture and overall acceptability were not significantly different ( $P < 0.05$ ). It can be concluded that BWM at 0% inclusion as replacement for maize supported improved performance while 30% inclusion level reduced cost of production.

**Keywords:** Bread waste, maize, broiler.

### INTRODUCTION

Poultry refers to all domesticated birds kept primarily for meat and egg production. Examples include: chickens, pigeons, guinea fowls, geese, ducks and turkey etc. The poultry sub sector of the livestock industry is one of the fastest means of bridging the protein gap in the human nutrition especially in a tropical environment like Nigeria. Its products are of amino acid profile which makes it superior to other protein sources.

World poultry meat (chicken, turkey and duck) consumption is of significant economic importance in more than 500 countries. In 1997, worldwide demand for poultry products (around 50 million tons per year) had increased substantially in both developed and developing countries at the expense of beef and pork consumption (Monnikhof, 1997). The price, value and religious acceptability of poultry have been favourable for stimulation of this demand.

Poultry meat is the most important source of affordable protein to population at large and is thus popular especially among lower income groups. It is also popular among the higher income groups due to the attraction to diets that are lower in cholesterol.

Poultry production, being one of the vibrant and viable systems of agriculture, stand out as an unique opportunity for both urban and rural dwellers to take up as an income generating venture. In order to alleviate poor nutrition or malnutrition, small scale poultry production can be done at household level in developing countries.

Feed costs represent 60-80% of the economic inputs in the commercial poultry industry (Kleyn, 1992). Cereal grains, especially maize represent the main energy component of commercial poultry rations. The main problem, however, is that human consumption has priority for the use of cereal and many African Countries are not even self-sufficient in cereal production for human consumption. A surplus of cereals for poultry feeding is therefore, generally not available. Cereals may have to be imported requiring foreign exchange cost of imported feedstuffs rise steadily especially during times of shortage. This has a negative impact on incomes of commercial poultry farmers. Many African countries produce an assortment of both conventional and non-conventional feed ingredient suitable for poultry, which may be underutilized (Eruvbetine and Afolami, 1996). Bread waste from bakery is readily available in Nigeria and its use might result in a significant reduction of feed costs.

### MATERIALS AND METHODS

#### EXPERIMENTAL SITE

The experiment was carried out at Poultry Unit, Teaching and Research Farms Directorate (TREFAD), University of Agriculture, Abeokuta.

#### EXPERIMENTAL MATERIALS

Bread waste meals were sourced from Butterfield Bakery, Abeokuta. The bread waste meals (Table 1) were collected and dried to moisture content of 10% to prevent mouldness and staling, ground before incorporation in

experimental diets. Other feed ingredients were obtained from reputable Commercial feedmiller in Abeokuta.

**TABLE 1: Chemical composition of maize and bread waste meal (dm - basis)**

Parameter	Maize	Bread Waste Meal
Dry matter (%)	93.00	90.18
Crude protein (%)	10.00	12.38
Crude fibre	2.70	1.04
Ether extract (%)	4.00	2.14
Ash (%)	1.30	0.64
Nitrogen free extract (%)	75.00	73.98
Metabolisable energy (MJ/Kg)	14.41	12.35

## MANAGEMENT OF BIRDS AND EXPERIMENTAL DESIGN

A total of one hundred and twenty day-old Marshall broiler chicks were purchased and transported early in the morning from Obasanjo Farm Ltd, Olomore, Abeokuta with good foundation stock and track record to an environmentally controlled poultry pen. The deep-litter broiler pens were prepared for the chicks with the following practices which will include; good sanitation, disinfestations of the pens with Morigad and allow 2-3 days resting period before the introduction of day-old chicks. The brooder temperature was checked at least twice and maintained between 33- 35<sup>0</sup>C. Birds were fed with experimental starter and finisher diets from day old till eight weeks old. The Birds were fed *ad libitum*. All routine management and practices including drugs and vaccination programmes were administered throughout the experimental period with regular changing of wood shavings. The experimental layout was shown below:

### EXPERIMENTAL DIETS

The bread waste meal (BWM) was incorporated into the experimental diets at the rate of 0%, 10%, 20% and 30% to replace maize to obtain diets 1, 2, 3, 4 respectively. The compositions of experimental starter (0 – 4 weeks) and finisher (5 – 8 weeks) diets were shown on Table 2 and 3 below.

### DATA COLLECTION

#### PERFORMANCE CHARACTERISTICS

The body weight, feed consumption and mortality rate were monitored and recorded for each replicate at weekly intervals to determine average feed intake, average body weight gain and feed conversion ratio.

Average feed intake: this is the difference between feed administered and left over divided by the number of birds.

$$\text{Average body weight gain} = \frac{\text{final body weight gain (g)} - \text{Initial body weight gain(g)}}{\text{Number of birds}}$$

$$\text{Feed conversion ratio} = \frac{\text{Feed intake (g)}}{\text{Body weight gain (g)}}$$

$$\text{Protein Efficiency Ratio} = \frac{\text{Weight Gain (g)}}{\text{Protein intake (Feed intake (g) x Crude Protein of the feed)}}$$

$$\text{Mortality} = \frac{\text{Number of dead birds}}{\text{Initial number of birds}} \times \frac{100}{1}$$

#### CARCASS EVALUATION

At the end of the experiment, one bird per replicate whose weight was a true representative of the replicate was selected. Prior to slaughtering the sampled birds were starved overnight, they were scarified by cervical dislocation, plucked and eviscerated to determine the plucked and dressed weight. The weight of the cut part (thigh, drumsticks, breast, back, wings, head, neck and shanks), gastro intestinal tract, organs (gizzard, liver, lung and kidney) and abdominal fat were measured using a sensitive scale. Weight of the cut parts were expressed as percentage of live weight. The dressing percentage was calculated as a ratio of dress weight and live weight multiplied by 100

$$\text{Dressing percentage} = \frac{\text{Dress weight}}{\text{Live weight}} \times \frac{100}{1}$$

#### SENSORY EVALUATION

The meat from different treatments were cooked to determined organoleptic assessment buy a 10 members students staff panel using questionnaire contain a 9- point Hedonic scale (Williams and Damron, 1998). The following parameters were sought for colour, flavor, texture, Juiciness and overall acceptability of the meat.

#### COST BENEFIT ANALYSIS

Cost analysis was carried out using the current cost of feed ingredient, total feed consumed by broiler chickens and cost of matured broiler. This was be done to determine the following cost of feed per weight gain

(N/kg), cost/kg feed, total cost of feed/bird(N/kg).

Cost/kg feed=Summation of proportion of each ingredient in the diet × Cost per kg of ingredient/100

Feed cost/live weight gain= Cost/kg feed × Feed to gain ratio

(Ukechuku and Anugwu, 2005).

### STATISTICAL ANALYSIS

All the data obtained in this study was subjected to analysis of variance in a Completely Randomized Design (CRD) as outline by steel and Torrie (1980).Significant means were compared using Duncan Multiple Range Test (Duncan, 1995).

**Table2: Composition of experimental broiler starter diets (0 – 4 Weeks)**

Ingredients	0%	10%	20%	30%
Maize	50.00	40.00	30.00	20.00
Bread waste meal	0.00	10.00	20.00	30.00
Soybean meal	20.00	20.00	20.00	20.00
Groundnut cake	15.00	15.00	15.00	15.00
Fish meal (72%CP)	3.00	3.00	3.00	3.00
Wheat offal	7.20	7.20	7.20	7.20
Bone meal	2.50	2.50	2.50	2.50
Oyster shell	1.50	1.50	1.50	1.50
Premix (starter)	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00
Calculated Analysis				
Crude protein (%)	23.13	23.37	23.64	23.85
Metabolizable Energy (MJ/kg)	11.93	11.82	11.62	11.42
Crude Fibre (%)	3.86	3.70	3.52	3.37
Ether extract (%)	4.63	4.44	4.25	4.07
*Methionine (%)	0.57	0.55	0.53	0.51
*Lysine (%)	1.26	1.23	1.21	1.18
Calcium (%)	1.26	1.64	1.66	1.68
Phosphorus (%)	0.72	0.74	0.69	0.68

\*Excluding the lysine and methionine contents of bread waste meal

**Table 3: Composition of experimental broiler finisher (5 – 8 Weeks)**

Ingredients	0%	10%	20%	30%
Maize	58.00	48.00	38.00	28.00
Bread waste meal	0.00	10.00	20.00	30.00
Soybean meal	15.00	15.00	15.00	15.00
Groundnut cake	10.00	10.00	10.00	10.00
Fish meal (72%CP)	1.50	1.50	1.50	1.50
Wheat offal	10.70	10.70	10.70	10.70
Bone meal	2.50	2.50	2.50	2.50
Oyster shell	1.50	1.50	1.50	1.50
Premix (Finisher)	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00
Calculated Analysis				
Crude Protein (%)	19.20	19.44	19.68	19.91
Metabolisable Energy (MJ/kg)	10.15	11.94	11.75	11.55
Crude Fibre (%)	3.85	3.68	3.51	3.35
Ether Extract (%)	4.29	4.10	3.91	3.75
*Methionine (%)	0.51	0.49	0.47	0.45
*Lysine (%)	1.00	0.97	0.94	0.92
Calcium (%)	1.85	1.60	1.62	1.62
Phosphorus (%)	0.66	0.65	0.63	0.62

\*Excluding lysine and methionine contents of bread waste meal

**RESULT AND DISCUSSION**

**Table 4: Performance Characteristics Of Broiler Fed Experimental Diets**

PARAMETERS	%Inclusion of Bread Waste Meal				S SEM
	0%	10%	20%	30%	
	D 1	I 2	E 3	T 4	
Initial Weight Gain(g/bird)	40.70	40.00	40.00	39.50	0.15
Final Live Weight Gain(g/bird)	1980.06 <sup>a</sup>	1890.40 <sup>b</sup>	1835.20 <sup>c</sup>	1730.20 <sup>d</sup>	27.31
Daily Weight Gain(g/bird)	34.63	33.04	32.01	30.19	27.18
Total Feed Consumed(g/bird)	5801.60 <sup>a</sup>	5588.80 <sup>b</sup>	5493.60 <sup>c</sup>	5405.12 <sup>d</sup>	44.47
Daily Feed Intake(g/bird)	103.60 <sup>a</sup>	99.80 <sup>b</sup>	98.10 <sup>c</sup>	96.52 <sup>d</sup>	0.80
Feed Conversion Ratio	2.90	3.02	3.07	3.20	0.04
Protein Efficiency Ratio	1.74	1.70	1.66	1.57	0.07
Mortality(%)	0.00	0.00	0.00	0.00	0.00

abcd Mean on the same row having different superscripts are significantly(P<0.05) different  
SEM- Standard Error of Mean

**Table 5: Carcass Characteristics of Broilers Fed Experimental Diet**

PARAMETERS	% Inclusion of Bread Waste Meal				S SEM
	D	I	E	T	
	1	2	3	4	
<b>CARCASS YIELD</b>					
Final Live Weight(g)	1980.06 <sup>a</sup>	1890.04 <sup>b</sup>	1835.80 <sup>c</sup>	1730.20 <sup>d</sup>	27.29
Plucked Weight(g)	1796.73	1773.73	1702.47	1596.87	28.85
Dressing Percentage(%)	65.09	81.97	69.02	74.87	2.66
Dressed Weight(g)	1288.70	1549.70	1267.00	1295.40	49.99
<b>CUT PARTS(% live weight)</b>					
Head	31.52	32.15	31.80	36.26	1.6
Thigh	59.02	11.78	11.01	9.84	0.50
Breast	16.73	21.07	16.15	18.38	0.26
Back	14.71	18.93	15.45	16.00	0.69
Shanks	3.83	4.48	4.65	5.05	0.40
Drumstick	10.08	12.42	11.15	11.92	8.07
<b>OFFAL AND ORGANS(% live weight)</b>					
Whole Gizzard	3.25	3.92	3.21	4.00	0.21
Empty Gizzard	2.21	2.04	1.96	2.46	0.10
GIT	6.47	8.98	7.05	7.27	0.51
Proventriculus	0.50	0.67	0.61	0.68	0.04
Liver	2.44	3.22	2.17	2.98	0.14
Lungs	0.62	0.80	0.77	0.84	0.04
Kidney	0.60	0.65	0.62	0.63	0.03
Heart	0.39	0.51	0.45	0.54	0.02
Abdominal Fat	1.24	2.13	1.93	0.83	0.21

abcd Means on the same row having different superscripts are significantly(P<0.05) different

**Table 6: Sensory Evaluation of Broilers Fed Experimental Diet**

PARAMETERS	% Inclusion of Bread Waste Meal				S SEM
	0%	10%	20%	30%	
	D 1	I 2	E 3	T 4	
Colour	7.33	7.47	7.60	7.07	0.10
Flavour	6.57	7.07	7.23	7.00	0.13
Texture	6.97	7.00	7.17	7.27	0.08
Juiciness	6.97	7.00	7.23	7.13	0.64
Overall acceptability	7.53	7.20	7.67	7.23	0.11

Means on the same row having the same superscripts are not significantly different (P>0.05)

**Table 7: Cost Benefit Analysis of Broiler Fed Experimental Diet**

PARAMETERS	% Inclusion of Bread Waste Meal				
	0%	10%	20%	30%	
	D	I	E	T	S
	1	2	3	4	SEM
Feed Conversion Ratio	2.90	3.02	3.07	3.20	0.04
Feed Consumed(kg/bird)	5.80	5.59	5.49	5.41	0.04
Feed Cost(₦/kg)	72.35 <sup>a</sup>	69.65 <sup>b</sup>	66.95 <sup>c</sup>	65.25 <sup>d</sup>	0.91
Feed Cost/bird(₦/kg)	419.63	389.34	367.56	347.59	11.57
Feed Cost/Live Weight Gain(₦/kg)	216.81	210.34	205.81	205.54	2.67

<sup>abcd</sup>Means on the same row having different superscripts are significantly(P<0.05) different

#### Performance Characteristics of Broiler

The effect of dietary treatment on performance characteristics of broilers were presented in Table 4. The result obtained from the study showed that the growth in terms of body weight of the birds were significantly different (P<0.05). Birds fed with 0%BWM having the highest daily weight gain of 34.63g/bird while the least value of 30.19g/bird was obtained from birds fed with 30%BWM. This was in agreement with the report of Leeson et al;(1996)that the increased growth rate of broiler chicken is achieved by increase in feed intake .Total feed consumed varied significantly (P<0.05) with birds fed 0%BWM having the highest value of 5801.60g/bird while in (diet 4)having 30% inclusion level of BWM consumed the lowest quantities feeds.Final weight gain ranged from 1730.20g/bird to 1980.06g/bird with control diet having the highest value and 30% BWM having the least value . The depression in growth rate, which is as a result of high FCR in birds on 30%BWM inclusion diets, and the inconsistency in feed intake values for the treatment suggested poor utilization of this diet. In contrast, Kouhkan *et a.*,(2003) reported lower weight gain when 20% of bread waste was added to the diet. The differences found in the literature could be related to the BWM composition. The feed conversion ratio was significantly different (P<0.05) and control diet had the best value of 2.9 while the least value 3.02 was recorded from bird fed 30%BWM.Protein efficiency ratio ranged from 1.57 to 1.74 with control diet having the highest value and 30%BWM having the lowest value

#### Carcass Characteristics of Broilers

Table 7 showed the results of carcass characteristics obtained from carcass yields, cut parts, offals and organs were expressed in gram and as percentage of live weight respectively .The result of carcass characteristics was significantly different(P<0.05) . Live weight ranged from 1730.20g to 1980.06g . The control diet had the highest weight while 30% BWM diet had the lowest value. The plucked weight value ranged from 1596.87g to 1796.73g. The control diet had the highest weight while 30% BWM inclusion level had the lowest value. The differences in the plucked weight as compared to live weight was due to the loss of some parts like feathers, claws, and perhaps blood during slaughtering while reduction in plucked weight as compared to dressed weight was due to the removal of head ,shank and visceral organs like intestine, gizzard, lung, kidney and liver e.t.c. The shanks ranged from 3.83 to 5.05 with 0% BWM having the highest value while 30% BWM inclusion level had the lowest value. Higher levels of BWM inclusion resulted in decreased carcass yield.

#### Sensory Evaluation of Broilers

Table 5 showed the result of Sensory Evaluation of BWM obtained from the experiment. The colour, flavour, texture, juiciness, and overall acceptability were not significantly different(P>0.05). Colour ranged from 7.07 to 7.60, flavour ranged from 6.57 to 7.23, texture ranged from 6.97 to 7.17, juiciness ranged from 6.97 to 7.23 and the values of overall acceptability ranged from 7.20 to 7.67. This indicated that control and varying level of bread waste meal used did not affect flavour, texture, juiciness and overall acceptability.

#### Cost Benefit Analysis of Broiler

The cost benefit analysis of experimental diet fed to broiler was shown in Table 6 and total feed consumed ranged from 5.41kg/bird to 5.80kg/bird with control diet having the highest and 30%BWM inclusion having the least value. The feed cost was significantly difference (P<0.05). The feed cost ranged from ₦65.25kg to ₦72.35kg with control diet having the highest and 30% BWM having the least value.

Furthermore, feed cost/bird ranged from ₦ 347.58kg to ₦ 419.63kg with control diet having the highest value and 30% BWM having the least value. Feed cost / live weight gain ranged from ₦205.54kg to ₦ 216.81kg with control diet having the highest and 30%BWM having the least value .Broiler fed dietary treatment at 30% BWM was relatively cheap compared to other diets. Evidently inclusion of BWM resulted in reduced feed cost because of the unit price of BWM compared with maize. This was in agreement with Adegbola ( 1977) report.

#### CONCLUSION

It was observed in this study that broiler fed 0% inclusion of BWM showed the highest performance when compared with others. The sensory evaluation of broiler meat was not affected by dietary treatment. Lowest feed consumed, feed cost, feed cost/bird, feed cost/live weight gain were obtained with 30% inclusion of bread waste meal on the growth rate of the broiler study.