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PERFORMANCE, CARCASS CHARACTERISTICS AND BLOOD PROFILES OF BROILER CHICKENS FED DRIED BAKERY WASTE BASED DIETS

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ABSTRACT

This study was carried out to assess the growth performance, carcass characteristics, serum biochemical and haematological profiles of broiler chickens fed dried bakery waste (DBW)-based diets. A total of 240 day old bird was randomly assigned to six dietary treatments of 40 birds per treatment and 10 birds per replicate in a Completely Randomized Design experiment. The experiment was divided into two phases: the starter phase (from day-old to 4weeks of age) and the finisher phase (from 5weeks to 8 weeks of age). Two standard diets were formulated to meet the nutrient requirements of broiler chickens both at starter and finisher phase. At each phase, maize was replaced with DBW in the diets at 0, 10, 20, 30, 40 and 50% respectively. Dietary garlic supplementation was at 5 g/kg diet. Data were collected on feed intake, weight gain and feed conversion ratio. At the end of the finisher phase, 2 birds per replicate making 8 birds per treatment were randomly selected, tagged, weighed and sacrificed for carcass characteristics. Blood samples were collected for haematological and serum biochemical variables determination. Results revealed that there were significant ($P \leq 0.05$) differences among the levels of inclusion. The live weight, dressed weight and eviscerated weight were not significantly ($P \geq 0.05$) influenced except at 10% DBW replacement level. The results show that there were significant ($P \leq 0.05$) differences between the thighs, drumsticks, wings, shanks, heads, chests and backs. Organs show significant ($P \leq 0.05$) difference in the spleen, gizzard and proventriculus. However, the liver, heart, kidney, lungs and pancreas were not significant ($P \geq 0.05$). It was concluded that dried bakery waste up to 50% level of inclusion in the feed of broiler chickens does not have any harmful effect on the haematological and biochemical profiles of broiler chickens and it will also reduce the cost of production as maize replacement deficit.

Keywords: Broiler chickens, Dried bakery waste, Starter phase, Finisher phase

1. INTRODUCTION

The ever increasing demand for poultry meat in Nigeria has made industry to be faced with challenges of quality and quantity feed to adequately meet the demand. This nutrition challenge has culminated in the high cost of production vis a vis the products and this has made Animal Nutritionist to be researching into suitable alternative feed resources to ensure sustainability of the industry (Najib et al., 1994 and Al- Batshan et al., 2001).

Broiler chickens are well known for meat production, because of their genetic make-up and require adequate feeding for optimum performance. Feeding accounts for about 70% of the total cost of production under intensive system of production. Meanwhile, The American Association of Feed Control Officials identifies dried Bakery Waste Products (BWP) as an animal feed ingredient (Al Rugajeet al., 2011). Dried bakery product (DBP) has only recently become available in commercial quantities for animal feeding, and very little research has been conducted on its use. Morrison (1959) reported that bakery wastes could be used in place of part of the grain usually fed. Since bread is about 30% water, the waste's feeding value is only 75% of corn or other grain. Morrison indicated that kiln-dried bakery waste is similar to grain in composition, except it is lower in fibre and may be higher in fat. Grimes (1927) found that kiln-dried stale bread, moistened with water, was almost equal to corn when fed to pigs on pasture, but was constipating unless fed with some laxative feed. Stale crackers were somewhat less valuable. Thus, this study aimed at assessing the growth performance, carcass quality and health status of broiler chickens fed dried bakery waste-based diets.

2. MATERIAL AND METHOD

This experiment was conducted at the poultry section of the Teaching and Research Farm of the Federal University of Technology Akure, Ondo State, Nigeria. The experimental setup involved a total number of two hundred and forty day old Arbor Acre breed of broiler chicks of mixed sexes were purchased from a reputable hatchery (Farm Support Hatchery Limited, Ibadan, Oyo State). Feed and water was ad libitum, and were raised for eight (8) weeks which was the period of this study. Brooding of the birds was carried out using deep litter system. Routine management practice and vaccinations were maintained while the study lasted on the farm. Dried bakery wastes (DBW) were collected from different bakeries located in Ondo and Ekiti States. Other feed ingredients were sources from a reputable feed mill in Akure and six diets were formulated to meet the nutritional requirements (NRC, 1994) of broiler chickens at starter and finisher stage (Table 1 and 2 respectively). DBW were added to the experimental diets at 0, 10, 20, 30, 40 and 50% replacing maize in the diet. The birds were randomly distributed into six dietary treatments of which of forty (40) birds per treatment and ten (10) birds per replicate in a Completely Randomized Design experiment. The weight of birds, feed intake, and weight gain per bird were recorded weekly.

At the 8th week of the experiment, two birds per replicate, making eight (8) birds per treatment were selected randomly and bled by severing the jugular vein, it was weighed and tagged. The first set of blood samples were collected into bottles containing EDTA for haematological evaluation, while another set of blood samples were collected without anticoagulant, for blood chemistry evaluation. Data generated were subjected to one way analysis of variance (ANOVA), using SAS 2008 (version 9.2 model). Where there were significant differences, treatment means were compared using Duncan New multiple range test.

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3. RESULT AND DISCUSSION

From Table 1 and 2, the nutrient compositions of the diets were adequate to support the growth of broiler chicken both at starter and finishing phase. The performance characteristics for the broiler chickens at starter phase showed that the diets were rich in nutrients, and were available/accessible by the birds for muscle/tissue development. However, the FCR of birds fed 10 and 20% replacement levels of DBW performed significantly ($p<0.05$) better in terms of DWG (Table 3). At 20% DBW inclusion, the ADWG and FCR of birds fed, had the best performance compared to others. However, it is worthy of note that, the weight gain did not follow a particular trend (Table 4).

Table 5 shows the carcass characteristics of the sacrificed chicken after 8th week. Live-weight, dressed weight, eviscerated weight, thigh, drum stick and chest weight values were significantly ($p<0.05$) higher at 20% DBW inclusion level than those fed other diets, except the control (without DBW). There were significant ($P \leq 0.05$) differences at various levels across the parameters observed. The results showed that there were significant ($P \leq 0.05$) differences between the thighs, drumsticks, wings, shanks, heads, chests and backs. The necks were similar ($P \geq 0.05$) in all the inclusion levels. The relative organ weights of broiler chickens fed varied levels of dried bakery products. The organs show significant ($P \leq 0.05$) difference in the spleen, gizzard and proventriculus. However, the liver, heart, kidney, lungs and pancreas were not significant ($P \geq 0.05$).The haematological parameters of broilers finishers chicken fed with DBW at varying levels were presented in Table 6. Dietary treatment was the major source of variation for all the parameters considered in this project. From the results, it can be observed that there was no significant difference ($P \leq 0.05$) between treatments indicating that there was no much influence of DBW on the values of the parameter.

Considering DBW inclusion at 0% as control, birds placed on 30% DBW inclusion had the best performance in terms of EOS, PCV, RBC, HB, LYP and NEU, birds fed 10% DBW inclusion had the highest in terms of MON and birds on 50% DBW inclusion in terms of ESR and BAS. This implies that any of the diets could be selected as far as haematological parameters are concerned. However, birds on 30% DBW inclusion had slightly lower PCV (28.50 ± 0.71) than the normal range, which implies that including DBW on diets of broilers has little or no effect on the relative quantity of blood cells as compared with the total volume of blood (Health and Olusanya, 1985). This result did not agree with Iheukwumere et al. (2002), which reported significant difference ($P \leq 0.05$) in PCV arising from varying levels of feed restriction. Though there was no restriction of feed during this experiment.

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Table 1: Gross composition of varying level of dried bakery waste of based-starter diets

Parameters	Diet1	Diet 2	Diet 3	Diet 4	Diet 5	Diet 6
Maize	59.00	53.10	47.20	41.30	35.40	29.50
Dried bakery waste	0.00	5.90	11.80	17.70	23.60	29.50
Soy bean meal	10.00	10.00	10.00	10.00	10.00	10.00
Groundnut cake	18.00	18.00	18.00	18.00	18.00	18.00
Fish meal	6.00	6.00	6.00	6.00	6.00	6.00
Wheat offal	5.20	5.20	5.20	5.20	5.20	5.20
Bone meal	0.95	0.95	0.95	0.95	0.95	0.95
Lysine	0.05	0.05	0.05	0.05	0.05	0.05
Methionine	0.40	0.40	0.40	0.40	0.40	0.40
Broiler premix	0.20	0.20	0.20	0.20	0.20	0.20
Salt	0.20	0.20	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00	100.00	100.00
Nutrients Composition						
Metabolizable energy (kcal/kg)	3038.92	3046.59	3054.26	3061.93	3069.60	3077.27
Crude Protein	22.63	22.88	23.12	23.38	23.63	23.87
Fat	2.84	2.98	5.06	4.82	4.51	4.47
Ash	6.93	5.74	6.33	5.27	7.44	7.46
Moisture	8.72	9.69	9.51	9.06	12.78	7.32
Phosphorus	0.51	0.56	0.52	0.55	0.67	0.64
Calcium	0.43	0.38	0.38	0.33	1.12	0.79

Table 2: Gross composition of varying level of dried bakery waste of finisher diet (%)

Composition	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	Diet 6
Maize	60.00	54.00	48.00	42.00	36.00	30.00
Dried bakery waste	0.00	6.00	12.00	18.00	24.00	30.00
Soy bean meal	10.50	10.50	10.50	10.50	10.50	10.50
Groundnut cake	12.00	12.00	12.00	12.00	12.00	12.00
Palm oil	2.00	0.20	0.20	0.20	0.20	0.20
Fish meal	4.10	4.10	4.10	4.10	4.10	4.10
Wheat offal	8.00	8.00	8.00	8.00	8.00	8.00
Oyster shell	0.55	0.55	0.55	0.55	0.55	0.55
Lysine	0.05	0.05	0.05	0.05	0.05	0.05
Methionine	0.40	0.40	0.40	0.40	0.40	0.40
Broiler premix	0.20	0.20	0.20	0.20	0.20	0.20
Salt	0.20	0.20	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00	100.00	100.00
Nutrients Composition (%)						
Metabolizable energy (kcal/kg)	3089.16	3096.96	3104.76	3112.56	3120.36	3128.16
Crude Protein	19.99	20.04	20.08	20.14	20.19	20.25
Fat	4.59	5.08	5.65	5.95	6.63	7.54
Ash	6.88	13.65	7.28	7.78	6.42	7.59
Phosphorus	0.81	0.88	0.96	0.95	1.07	0.98
Calcium	1.65	1.12	1.32	0.76	1.01	0.99

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Table 3: Performance Characteristics of broiler starter chicken fed varied levels of dried bakery wastes.

Level of inclusion	Average initial weight (g/bird)	Average final weight (g/bird)	Average total weight (g/bird)	Average daily weight gain (g/bird/day)	Average total feed intake (g/bird)	Average daily feed intake (g/bird/day)	Feed conversion ratio (FCR)
0	60.00±0.00	797.50±28.10[a]	737.50±28.10[a]	26.34±1.00[a]	1511.25±6.57[a]	53.97±0.23[a]	2.06±0.07[b]
10	60.00±0.00	772.50±26.58[a]	712.50±26.58[a]	26.45±0.95[a]	1497.50±10.51[ab]	53.48±0.38[ab]	2.11±0.07[b]
20	60.00±0.00	770.00±17.80[a]	710.00±17.80[a]	25.36±0.64[a]	1478.75±8.26[abc]	52.81±0.30[abc]	2.09±0.05[b]
30	60.00±0.00	682.50±12.50[b]	622.50±12.50[b]	22.23±0.45[b]	1502.50±5.95[ab]	53.66±0.21[ab]	2.42±0.4[a]
40	60.00±0.00	665.00±11.90[b]	605.00±11.90[b]	21.61±0.43[b]	1455.50±23.05[c]	51.98±0.82[c]	2.14±0.07[a]
50	60.00±0.00	672.50±9.46[b]	612.50±9.46[b]	21.88±0.34[b]	1468.75±10.28[bc]	52.46±0.37[bc]	2.40±0.02[a]
Statistical Significance	NS	*	*	*	*	*	*

Mean± standard error

Means with the same superscripts are not statistically significant at P≥0.05

Means with difference superscripts are statistically significant at P≤0.05

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Table 4: Performance Characteristics of broiler finisher chicken fed varied levels of dried bakery wastes.

Level of inclusion	Average final weight (g/bird)	Average total weight (g/bird)	Average daily weight gain (g/bird/day)	Average total feed intake (g/bird)	Average daily feed intake (g/bird/day)	Feed conversion ratio (FCR)
0	2088.50 ±187.57[a]	2028.50±187.57[a]	36.23±3.35[a]	3405.00±12.58[a]	121.61±0.45[b]	3.47±0.41[b]
10	1596.50±29.85[b]	1536.50±29.85[b]	27.44±0.53[b]	3325.00±54.12.[a]	118.75±1.93[b]	4.33±0.09[b]
20	2021.25±67.06[a]	2010.35±24.11[a]	35.90±0.43[a]	3370.00±48.13[a]	120.36±1.72[b]	3.36±0.03[a]
30	1892.00±14.57[ab]	1832.00±14.57[a]	32.72±0.26[a]	3795.00±285.03[a]	145.54±8.17[a]	4.14±0.31[ab]
40	1805.50±85.41[ab]	1787.00±45.38[ab]	31.91±0.81[ab]	3620.00±222.15[a]	129.29±7.93[b]	4.05±0.22[ab]
50	1854.50±103.60[ab]	1794.50±103.60[ab]	32.05±1.85[ab]	3387.50±37.50[a]	120.98±1.34[b]	3.81±0.20[ab]
Statistical Significance	*	*	*	NS	*	*

Mean± standard error
Means with the same superscripts are not statistically significant at $P \geq 0.05$
Means with difference superscripts are statistically significant at $P \leq 0.05$

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Table 5: Carcass characteristics of broiler chickens fed varied levels of dried bakery wastes

Trt	Live-wt	Dressed Wt	Eviscerated wt	Thigh	Drum Stick	Wing	Shank	Head	Chest	Back	Neck
0	2166.28 ±84.52^{a}	1988.75 ±77.34^{a}	1833.75 ±80.06^{a}	245.33 ±11.32^{a}	238.61 ±12.89^{a}	182.81 ±7.97^{a}	91.93 ±3.32^{a}	52.63 ±1.37^{a}	446.18 ±22.55^{a}	341.80 ±19.69^{a}	101.89±1.92
10	1717.50 ±42.25^{b}	1578.00 ±40.43^{b}	1451.25 ±41.145^{B}	203.53 ±7.68^{b}	183.95 ±7.21^{c}	147.05 ±4.78^{c}	74.55 ±0.93^{b}	46.00 ±0.72^{b}	317.11 ±13.37^{c}	271.49 ±12.37^{b}	83.39 ±3.63
20	2062.50 ±82.27^{a}	1905.00 ±77.81^{a}	1773.75 ±72.75^{a}	243.85 ±12.98^{a}	231.61 ±10.47^{ab}	167.99 ±7.10^{ab}	89.63 ±5.23^{a}	53.81 ±1.93^{a}	400.54 ±22.61^{ab}	342.46 ±12.26^{a}	93.46 ±16.95
30	2022.50 ±5681^{a}	1856.25 ±52.42^{a}	1716.25 ±45.06^{a}	232.71 ±10.65^{ab}	204.98 ±9.65b^{c}	158.25 ±5.39^{bc}	92.58 ±3.44^{a}	51.74 ±1.86^{a}	383.29 ±25.35^{b}	321.96 ±9.09^{a}	91.28 ±5.97
40	2012.50 ±49.90^{a}	1852.50 ±50.93^{a}	1711.25 ±52.81^{a}	224.96 ±9.85^{ab}	220.48 ±11.43^{ab}	162.58 ±3.97^{bc}	83.78 ±4.97^{ab}	49.76 ±1.92^{ab}	392.23 ±11.82^{ab}	339.30 ±23.37^{a}	65.58 ±5.14
50	2021.25 ±30.23^{a}	1858.75 ±31.71^{a}	1726.25 ±34.42^{a}	220.98 ±7.81^{ab}	221.26 ±6.04a^{b}	162.66 ±3.00^{bc}	48.79 ±1.19^{ab}	48.79 ±1.19^{ab}	413.40 ±15.83^{ab}	331.18 ±8.51^{a}	98.65 ±3.40
Statistical Significance		*	*	*	*	*	*	*	*	*	NS

Mean± standard error

Means with the same superscripts are not statistically significant at $P \geq 0.05$

Means with difference superscripts are statistically significant at $P \leq 0.05$

Table 6: Haematological profiles of broiler chickens fed varied levels of dried bakery wastes.

LEVEL OF INCLUSION (%)	EOS (%)	ESR (mm/hr)	PCV (g/100ml)	RBC (10^6mm^3)	HB (%)	LYM (%)	NEU (%)	MON (%)	BASO (%)
0	1.38±0.26	3.00±0.27	23.51±2.98	174.25±11.60	9.00±0.29	63.63±0.86	20.38±1.27	10.63±1.03	2.75±0.31
10	0.88±0.23	3.00±0.33	27.00±0.71	174.38±10.31	8.99±0.25	64.00±0.93	20.38±1.29	12.38±0.65	2.38±0.18
20	0.75±0.25	2.88±0.23	28.13±0.85	195.50±14.62	9.30±0.28	63.75±1.13	20.13±1.94	11.75±0.59	2.50±0.27
30	1.25±0.31	2.88±0.30	28.50±0.71	199.88±11.97	9.49±0.22	64.50±0.60	20.88±0.95	11.00±0.73	2.38±0.18
40	1.00±0.19	3.00±0.27	27.63±0.92	185.75±14.65	9.23±0.31	63.75±0.96	21.00±1.10	11.88±0.69	2.38±0.18
50	0.88±0.23	3.13±0.30	24.00±3.09	180.63±11.40	8.86±0.47	64.38±0.63	20.50±0.78	11.50±0.63	2.75±0.31

Mean ± Standard error, TRTS – Treatments, LYM – Lymphocyte, DBW – Dried bakery waste, NEU – Neutrophil, EOS – Eosinophil, Mon – Monocyte, ESR – Erythrocyte sedimentation rate, Bas – Basophil, PCV – Pack cell volume, RBC – Red blood cell, HB – Haemoglobin

4. CONCLUSION AND RECOMMENDATIONS

The use of dried bakery waste (DBW) in a broiler diets has resulted in a safe and cheaper way of feed production. This experiment has confirmed that chickens can self-select the diets when raised under choice situation; with evident improved weight gain and quality and quantity carcass cuts. Hence, DBW can easily substitute for maize in feed formulation without any harmful effect on the blood profiles of broiler chickens.

5. RECOMMENDATION

For a more cheap and value-oriented feed for broilers that would replace the use of maize because of its increasingly high cost, we recommend the use of dried bakery waste at 20%.

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