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Carcass Yield And Gut Characteristics Of Broiler Chickens Fed Agro Industrial By-Products

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Abstract: ***An experiment was conducted to evaluate the response of broiler chickens fed diet containing different agro industrial by-products. A total of 500 day old Amor Breed of broiler chicks were randomly allotted to five dietary treatments in a completely randomized design and each treatment was replicated five times. Feed and water were provided ad libitum and the feeding trial lasted for eight weeks. Carcass characteristics which include live weight, slaughter weight and plucked weight were not significantly different across the treatments, except dressed weight which showed significant (P<0.05) difference across the treatments. Most of the organs and gut characteristics were not affected by dietary levels except large intestine, abdominal fat and liver. The cut of parts were not significantly affected in all the treatments except thigh and breast weight. It can be concluded from the result of the study that MIO,SO,RO and MO are good alternatives to wheat offal as Agro industrial by-products in the diet of broiler chickens without adverse effect on carcass yield and gut characteristics of broiler chickens.***

Keywords: Broiler chickens, Maize offal, carcass yield, gut characteristics

I. INTRODUCTION

The ever increasing human population of about 140,903,542 National Population Commission [NPC] (2009) in Nigeria without a corresponding increase in food production index 104.00 Food and Agricultural Organization [FAO] (2011) has led to high pressure on the available food which resulted in a competition between human and animal for available feed resources and consequently high cost of animal production (Nworgu *et al.,* 1999). In poultry farming, feeding accounts for 65 – 80 % of the cost of production Makinde and Inuwa, (2015) and the poultry industry has suffered more than any other livestock industry as a result of the problems arising from inadequate supply of feed (Lepaideur, 2004). Energy and protein feedstuffs, which constitute about 80% of poultry feedstuff have been the major hindrances to effective poultry production in Nigeria (Uchegbu *et al*., 2004). Cereal grains constitute the major source of energy in poultry diet in the tropics (Oluyemi and Roberts, 2007). Maize has remained the chief source of energy in compounded diet and it constitutes about 50% of poultry ration (Ajaja *et al*., 2002). This trend has necessitated the use of agro-industrial by-products such as wheat offal, millet offal, sorghum offal and maize offal etc in formulating feed for the livestock. The aim of this study was to investigate the effect of inclusion of different types of Agro industrial by-products in the diet of broilers on their performance, carcass and gut characteristics of broiler chickens.

II. MATERIALS AND METHODS

EXPERIMENTAL SITE

This experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Aminu Saleh College of

Education, Azare Bauchi State, Nigeria. Azare is in Katagum local government area of Bauchi state. Katagum is situated on the northern part of Bauchi state, Nigeria. It is located between latitudes 11^0 42' and 11^0 40^0 and longitude 10^0 31' and 10^0 01' east. (Anon, 2009). It share common boundary with Itas/Gadau local government in the North west, Jamma're to the west, Danbam to the east, Misau to the Southwest Azare, I. M, (2013). It has a land mass of 1,120 square kilometers (NPC, 2009). The climate of the study area is controlled by the Inter Tropical Convergent Zone (ITCZ) which is marked by the rainy and dry season. The major climate elements that influence the climate of the study area and affecting the farming system are temperature and rainfall, the annual rainfall ranged between 22-33^0 C from April to May (Bashir *et al*., 2001).The study area is in the Sudan Savannah and the soil in the study area is aerosol with sandy and loamy sand texture and a high percolation rate.

SOURCES OF EXPERIMENTAL MATERIALS

The Agro industrial by-products used for the study were wheat offal, millet offal, sorghum offal, rice offal and maize offal which were purchased within Azare market in Katagum Local Government Area of Bauchi state.

EXPERIMENTAL DESIGN AND MANAGEMENT OF BIRDS

Five hundred day old Anak 2000 breed of broiler chicks were obtained from Amor Limited Ibadan, the chicks were brooded for the period of one week on deep litter. They were fed *ad libitum* on commercial diet throughout the brooding period. Water and feed were supplied *ad libitum* during the whole period of the trial. Routine management, vaccines and medications were administered according to the methods of (Oluyemi and Roberts, 2007). After brooding period of about one week the birds were randomly allotted to five dietary treatments with 100 birds per treatment and each treatment was replicated five times with 20 birds per replicate, in a completely randomized design (CRD). The birds were fed experimental diets for four weeks during the starter phase and four weeks during the finisher phase.

EXPERIMENTAL DIETS

Five diets containing different Agro industrial by-products with wheat offal as a control were formulated; other diets consist of millet offal, sorghum offal, rice offal and maize offal. The diets were designated as diets 1,2,3,4 and 5, respectively. The diets were formulated to supply approximately 3000Kcal/kg ME, 23 and 20% crude protein for both starter and finisher phases respectively. The ingredient, chemical composition and calculated analysis of the experimental diets for both starter and finisher phases are shown in Tables 1 and 2 respectively.

	Diets				
Ingredients	**T1 (WO)**	**T2(MIO)**	**T3(SO)**	**T4(RO)**	**T5(MO)**
Maize	43.60	43.27	42.06	39.65	42.03
Soybean	33.85	34.18	35.39	37.79	35.42
Fibre Type	12	12	12	12	12
Fishmeal	5.0	5.0	5.0	5.0	5.0
Limestone	1.5	1.5	1.5	1.5	1.5
Bonemeal	2.00	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix *	0.25	0.25	0.25	0.25	0.25
Lysine	1.25	1.25	1.25	1.20	1.20
Methionine	0.30	0.30	0.30	0.30	0.30
Total	100	100	100	100	100
Calculated analysis					
Crude protein	23.00	23.00	23.00	23.00	23.00
ME(Kcal/kg)	2907	3057	3151	2909	3021
Crude fibre	4.60	3.7	2.10	3.40	3.10
Ether Extracts	8.80	8.60	8.80	9.50	8.60
Calcium	1.55	1.50	1.54	1.56	1.54
Phosphorus	0.91	0.81	0.80	0.83	0.80
Lysine	1.23	1.20	1.21	1.24	1.21
Methionine	0.40	0.41	0.41	0.42	0.43

**Vitamin-Mineral premix (Bio-mix) provided per Kg the following: Vitamin A 12,000,000iu, Vitamin D_3 ,3,000,000iu; Vitamin E,30,000mg; Vitamin K_3,2,500mg; Vitamin B_1,2,000mg; Vitamin B_2, 5,000mg; Vitamin B_6, 3,500mg; Vitamin B_{12}. 20mg; Folic acid 1,000mg; Niacin, 40,000mg; Calpan,10,000mg; Biotin,80mg; Antioxidant, 125,000mg; Cobalt, 250mg; Selenum, 250mg; Iodine,1,200mg; Iron,40,000mg; Manganese, 70,000mg; Copper, 8,000mg; Zinc, 60,000mg; Choline chloride, 200,000mg*

Table 1: Ingredients Composition and Calculated Analysis of Broiler Starter Experimental Diets

	Diets				
Ingredients	**T1 (WO)**	**T2(MO)**	**T3(RO)**	**T4(SO)**	**T5(MIO)**
Maize	37.80	47.47	45.80	42.47	45.80
Soybean	36.80	27.13	28.80	32.13	28.80
Fibre Type	17	17	17	17	17
Fishmeal	3	3	3	3	3
Limestone	1.5	1.5	1.5	1.5	1.5
Bonemeal	2	2	2	2	2
Salt	0.25	0.25	0.25	0.25	0.25
Premix *	0.25	0.25	0.25	0.25	0.25
Lysine	1.10	1.10	1.10	1.10	1.10
Methionine	0.30	0.30	0.30	0.30	0.30
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
Crude protein	20	20.00	20.00	20.00	20.00
ME(Kcal/kg)	2810	3036	3170	2828	2986
Crude fibre	4.70	3.70	3.10	3.40	4.50
Ether Extracts	9.20	7.60	7.70	8.60	750
Calcium	1.50	1.47	1.47	1.49	1.47
Phosphorus	0.93	0.75	0.64	0.68	0.74
Lysine	1.02	0.95	0.95	1.03	0.98
Methionine	0.36	0.34	0.35	0.33	0.35

**Vitamin-Mineral premix (Bio-mix) provided per Kg the following: Vitamin A 12,000,000iu, Vitamin D3 ,3,000,000iu; Vitamin E,30,000mg; Vitamin K3,2,500mg; Vitamin B1,2,000mg; Vitamin B2, 5,000mg; Vitamin B6, 3,500mg; Vitamin B12. 20mg; Folic acid 1,000mg; Niacin, 40,000mg; Calpan,10,000mg; Biotin,80mg; Antioxidant, 125,000mg; Cobalt, 250mg; Selenum, 250mg; Iodine,1,200mg; Iron, 40,000mg; Manganese, 70,000mg; Copper, 8,000mg; Zinc, 60,000mg; Choline chloride, 200,000mg.*

Table 2: Ingredients Composition and Calculated Analysis of Broiler Finisher Experimental Diets

CARCASS AND WEIGHT DETERMINATION

At the end of the study, two broiler chickens per replicate were selected at random and starved for about 12h to empty their crops. They were then slaughtered, scalded, plucked and eviscerated. The carcass and internal organs (liver, heart, kidney, gizzard and intestines were removed, weighed and expressed as a percentage of live weight.

CHEMICAL ANALYSIS

Proximate composition of experimental diets was analyzed using the methods described by AOAC (2000).

STATISTICAL ANALYSIS: The data were analyzed using the analysis of variance (ANOVA) and means with significant differences were separated using Duncan Multiple Range Test (DMRT) of the SAS statistical package. Statistical significance was established when probability was less than 0.05 level of significance.

III. RESULTS

Table 3 shows the result of the Carcass characteristics of broiler chickens fed diet containing different agro industrial by-products. There were no significant differences in the live weight, slaughter weight and plucked weight, the values ranged from (2170.0 – 2410, 2090.0 – 2310.0 and 2010.0 - 2210.0 g) in parameters measured. However, there was significant (P<0.05) difference in dressing percentage. The highest value of (70.29 %) was recorded in T1 (WO) control, this is followed by T5 (MO) (67.62%) whereas T2 (MIO) and T4 (SO) values 65.09 and 65.11% were lowest across the dietary treatment.

	Diets					
Parameters	**TI (WO)**	**T2 (MIO)**	**T3 (SO)**	**T4 (RO)**	**T5 (MO)**	**SEM**
Live weight (g)	2300.0	2295.0	2410.0	2170.0	2285.0	65.97^{NS}
Slaughter weight (g)	2220.0	2210.0	2310.0	2090	2190	66.33^{NS}
Plucked weight (g)	2130	2100	2210	2010	2100	64.64^{NS}
Dressing percentage (%)	70.29^{a}	65.09^{c}	66.63^{bc}	65.11^{c}	67.62^{b}	1.44^{*}

abc= means with different superscripts wthin the same row are significantly (P<0.05) different. SEM = Standard error of means, NS = Not significant. WO=Wheat offal, MO=Millet offal, SO= Sorghum offal, RO= Rice offal, MO= Maize offal

Table 3: Carcass characteristics of broiler chickens fed different types of Agro industrial by-products

The result of the Gut characteristics is presented in Table 4. The result showed that there were no significant differences on gizzard, lungs, heart and small intestine. However, significant (P<0.01, P<0.001) differences were observed on the large intestine, abdominal fat and liver respectively. The highest value (1.91 %) was recorded on T1 (WO) whereas T3(WO) has the lowest value (1.30%). Highest abdominal fat value (0.35%) was recorded in the T5 (MO) diet, followed by T4 (SO) based diet, while T2 (MIO) has the lowest value (0.13%). Similarly, higher value of liver (1.33%) was obtained on birds fed diet1 (WO), followed by T5 (MO) (1.03%), while T2 (MIO) and T4 (RO) recorded similar values (0.99%) respectively. However, lowest values (0.97%) were obtained On T3 (SO) based diet.

	Diets					
Parameters	**TI (WO)**	**T2 (MIO)**	**T3 (SO)**	**T4 (RO)**	**T5 (MO)**	**SEM**
Gizzard, %	1.89	1.78	2.07	1.70	1.65	0.10^{NS}
Lungs, %	0.31	0.26	0.26	0.28	0.35	0.03^{NS}
Small intestine weight %	1.85	1.50	1.80	1.71	1.90	0.12^{NS}
Large intestine weight %	1.91^{a}	1.41^{b}	1.30^{d}	1.33^{c}	1.38^{bc}	0.24^{**}
Abdominal fat, %	0.20^{c}	0.13^{d}	0.16^{bc}	0.29^{b}	0.35^{a}	0.12^{***}
Heart, %	0.25	0.21	0.19	0.21	0.32	0.04^{NS}
Liver, %	1.33^{a}	0.99^{c}	0.97^{d}	0.99^{c}	1.03^{b}	0.15^{**}

abc= means with different superscripts wthin the same row are significantly (P<0.05) different. SEM = Standard error of means, NS = Not significant. WO=Wheat offal, MO=Millet offal, SO= Sorghum offal, RO= Rice offal, MO= Maize offal

Table 4: Organ and gut characteristics (%) body weight of broiler chickens fed various levels of Agro industrial by-products

	Diets					
Parameters	**TI (WO)**	**T2 (MIO)**	**T3 (SO)**	**T4 (RO)**	**T5 (MO)**	**SEM**
Head and shank %	3.43	3.06	2.76	2.94	2.64	0.19^{NS}
Back %	4.41	4.11	4.16	3.99	5.15	0.33^{NS}
Chest %	2.59	2.75	2.63	3.04	3.21	0.19^{NS}
Thigh %	11.22^{a}	10.72^{ab}	9.56^{c}	9.97^{b}	9.35^{d}	0.72^{**}
Wings %	4.35	3.99	3.76	3.56	3.57	0.26^{NS}
Breast %	12.14^{a}	11.14^{b}	10.33^{bc}	8.93^{d}	9.12^{c}	1.98^{***}

abc= means with different superscripts wthin the same row are significantly (P<0.05) different. SEM = Standard error of means, NS = Not significant. WO=Wheat offal, MO=Millet offal, SO= Sorghum offal, RO= Rice offal, MO= Maize offal

Table 5: Cut of parts (%) body weight of broiler chickens fed various Agro industrial by-Products

The result of the cuts of parts is presented in Table 5. The values of cuts of parts expressed as percentage of body weight; head and shank (2.64 – 3.43%), back (3.99 – 5.15%), chest (2.59 – 3.21%), wings (3.56 – 4.35%) respectively and the difference between the values were not statistically significant. However, the thigh and breast were affected at (P<0.01 and P<0.001) respectively.

IV. DISCUSSION

The slaughter weight and plucked weight were not affected by the various levels of Agro industrial by-products. However, significant difference (P<0.05) was recorded in dressed weight, these values (65.09 – 70.29 %) are in agreement to those (65 – 70%) reported by (Oluyemi and Roberts, 2007) but contradicts those reported by Grace *et al.*,2007) when broiler chickens fed maize based diet replaced with wheat offal. Similar trends was observed on organs weights, when broiler chickens were fed various types of Agro industrial by-products except the liver, large intestine, and abdominal fat (P<0.01) and (P<0.001). The significant difference observed in this study are in agreement with the findings of (Rosa, 2010) when broiler chickens fed tomato waste as Agro industrial by-products, but at variance to the report of (Shaheen *et al.*, 2015) who observed no significant difference in liver weight and gizzard weight when broilers fed processed rice bran. The cut-up parts such as head and shank, back, chest and wings weight (expressed as percentage of live weight) of the broiler chickens fed agro industrial by-product followed the performance pattern of the body weight

development which shows no significant difference. However, thigh weight and breast weight showed significant difference ($P<0.01$ and $P<0.001$) respectively. These values (9.35 -11.22) and (8.93 – 12.14 %) are at variance to (212 -396.3) and (424.4 – 592.8%) those reported by Sanchez-Rogue *et al*., 2017; Abadiah and Wan Nooraida, 2017) when broilers chicken fed different agro industrial waste and enhanced quality palm kernel meal respectively. The values obtained in this study are in agreement with the findings of (Iyayi *et al*, 2005) when broiler chickens were fed corn bran, palm kernel cake and BDG as a source of fibres.

V. CONCLUSION

Based on the result of the study it can be concluded that millet offal, sorghum offal, rice offal and maize offal are good alternatives to wheat offal as agro industrial by-products in the diet of broiler chickens without deleterious effects on carcass yield and gut characteristics of broiler chickens.

VI. RECOMMENDATION

Maize offal, millet offal, sorghum offal and rice offal can be used as alternatives to wheat offal as agro industrial by-products in the diet of broiler chickens.

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