IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 14, Issue 10 Ser. I (October 2021), PP 47-52
www.iosrjournals.org

Response of Broiler Chickens to Pineapple Waste-Rice Bran Diets

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Abstract
A feeding trial that lasted eight (8) weeks was conducted to evaluate the performance characteristics and haematological parameters of broiler chicken (starter and finisher phases) fed pineapple waste-rice bran diets. Fresh pineapple waste was mixed with rice bran in ratio 1.1 (w/w) to obtain pineapple waste-rice bran mixture. Two hundred day old broiler chicks were randomly allotted to five dietary treatments.Each treatment had forty birds which were replicated four times with 10 birds per replicate .Five diets were formulated such that 0, 10, 12.5, 15 and 17.5% of wheat branwas replaced with pineapple waste – rice bran mixture.At starter phase, results obtained showed that final live weight, daily weight gain, feed intake and feed to gain ratio were significantly affected (p<0.05). Broilersin starter phase fed 10% PW/RB level had better performance which was similar to those on the control. At finisher phase, birds fed 0, 10, and 12.5% PW/RB had better performance than others. Carcass and relative organ weights were not significantly (P>0.05) affected except the bled weight, carcass weight, dressing percentage. At finisher phase, all parameters were significantly affected (P<0.05) except the thigh, neck, wings, lungs and livers. Also, all haematogical parameters were significantly affected (P<0.05). It was therefore concluded that pineapple waste-rice brain mixture could be used to replace 10% and 12.5% wheat offal in the diets of broiler starter and finisher phases respectively.

Key Words: *Performance parameters, wheat bran, haematological parameters*

Date of Submission: 12-10-2021 Date of Acceptance: 27-10-2021

I. Introduction

The rate of expansion of poultry industry has been greatly affected by high cost of livestock feed in the developing nations. Therefore, the search for alternative livestock feeding especially non-ruminants has continued to attract the attention of researchers in different part of the world (Adeyemi and Ogazi, 1987).

Pineapple waste (PW) occurs as pineapple peel and core, making about 40-50% of the fresh fruit (Buckle, 1987) and contains mainly sucrose, fructose, glucose and other nutrients (Krueger *et al*., 1992). FAO (2004) ranked Nigeria among the leading pineapple producing countries with about 800,000 metric tons since 2001, therefore efforts at finding better use for the pineapple waste generated from such huge quantities may be important in terms of environmental pollution and waste of potential animal feed resource. Lamidi*et al.*, (2005) found that broiler chicken can tolerate up to 10% PW in the diets without deleterious effect. Olosunde (2010) reported that West African Dwarf sheep could tolerate up to 45% PW but 30% was superior even against 0% PW when substituted for corn bran. Babatunde (1988) classified PW as alternative feed ingredients to conventional wheat offal. This indicates its potentials use as animal feed.

II. Materials and Methods

2.1 Site of the experiment

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm, LadokeAkintola University of Technology, Ogbomoso, Oyo-State, Nigeria. The area is in the derived Savannah zone of Nigeria. It is located between latitudes $8^0$07'N and $8^0$12'N and longitudes 40^0 04'E and $4^0$15'E. The mean annual rainfall is 1247mm with a reclusive humidity of between 75 and 95%. It is situated at about 500m above sea level with a mean annual temperature of 26.2^0C (Oguntoyinbo, 1978).

2.2 Preparation of test ingredients

Fresh pineapple waste was collected from the Lafia canning factory of Fumman Agricultural Products Nigeria Limited, Moor Plantation, Ibadan, Oyo-State, Nigeria. The procured pineapple waste was mixed with rice brain in ratio 1:1(W/W). The mixture was sundried for about 5 days with regular turning, and was later milled using a hammer mill to obtain pineapple waste/rice bran (PW/RB).

2.3 Preparation of experimental diets

Five(5) experimental diets were prepared such that wheat offal was replaced with pineapple waste/rice brain mixture at 0, 10, 12.5, 15 and 17.5% levels (diets 1, 2, 3, 4 and 5 respectively). Gross composition of the experimental diets for both the starter and finisher phases are shown in Tables 1 and 2 respectively.

Table 1: Gross Composition of Experimental diets for broiler chickens in starter phase

Ingredients	**(0%PW/RB)**	**(10%PW/RB)**	**(12.5%PW/RB)**	**(15%PW/RB)**	**(17.5%PW/RB)**
Fixed ingredients (%)	89.00	89.00	89.00	89.00	89.00
Wheat bran (%)	11.00	9.90	9.63	9.35	9.08
PW/RB	0.00	1.10	1.37	1.65	1.92
Determined contents (%)					
Crude protein	22.75	23.50	21.20	20.50	21.10
Crude fibre	3.82	3.70	4.55	4.17	3.69
Ash	6.80	6.28	6.50	5.27	6.35
Ether Extract	3.60	3.20	3.40	3.85	3.52

Fixed ingredients contain (%): maize = 50.00, Fish meal = 18.00, Groundnut cake 12.70, Bone meal 2.50, Oyster shell 1.50, Lysine = 0.20, methionine 0.10, salt 0.25, premix 0.25.

Table 2: Gross composition of Experimental diets for broiler finisher chicken

Ingredients(%)	**Control (%)**	**10% PW/RB**	**12.5% PW/RB**	**15% PW/RB**	**17.5% PW/RB**
Fixed ingredients	83.00	83.00	83.00	83.00	83.00
Wheat bran	17.00	15.30	14.87	14.45	14.03
PW/RB	0.00	1.70	2.13	2.55	2.97
Determined nutrient (%)					
Crude protein	19.67	19.21	19.86	18.57	19.69
Crude fat	3.78	3.92	3.62	3.78	3.69
Crude fibre	5.38	5.98	4.58	4.69	4.47
Ash	6.89	7.11	5.92	6.05	6.11

Fixed ingredients %, Maize 50.00, Fish meal 2.50, soybean meal 15.70, Groundnut cake 10.00, Bone meal 2.50, Oyster shell 1.50, Lysine 0.20, Methonine 0.10, salt 0.25, Premix 0.25.

2.4 Experimental Animals and Management

A total of 200 day old (Marshal Strain) broiler chicks were randomly allotted to five dietary treatments. Each treatment was replicated four times with 10 birds each per replicate in a completely randomized design experiment. Chickens were kept in deep litter pens where wood shavings were used as bedding materials. Routine vaccinations, medication and other management practices were strictly adhered to. The birds were allowed free access to dietary treatments and fresh clean water*adlibitum*for a period of four weeks(starter phase).

A total of 120 4- week old chicks were redistributed on similar weight basis into the same number of treatments and replicates as observed in the starter phase. Similar management practices and procedures were followed and the study lasted for another 4 weeks(finisher phase).

2.5Data Collection

The following data were collected:
Feed intake (g) = Feed offered (g) – left over (g)
Daily Weight gain (g)= Total weight gain (g)/ Total number of days

Feed conversion ratio = Total feed intake (g)/Total weight gain (g)

2.6 Collection of blood samples

At the end of the experiment, four birds per replicate were randomly selected and bled through the wing veins. Two sets of blood samples were collected. Blood samples meant for haematological analysis were collected into bottles containing ethylene demine tetra-acetic acid (EDTA) as an anticoagulant while blood samples meant for serum biochemical analysis were collected into EDTA-free bottles.

2.7Carcass and relative organ weight evaluation

The same numbers of animals as used for blood samples collection were tagged and faster for 12 hours before slaughtering by severing the jugular veins. The birds were thendefeathered, and eviscerated. The following cots and organs were evaluated: back, thigh, drumstick, neck wings, head, shank, breast, heart, lungs, kidney, liver, gizzard and proventriculus. The weight of organs and carcass cots were expressed relative to carcass weight.

2.8 Chemical analysis

Pineapple waste/rice brain mixture and experimental diets were analyzed for proximate content using AOAC (2000) methods.

Haematological assay was carried out as described by Davie and Lewis (1997) to determine packed cell volume (PCV), haemoglobin concentration (Hg), red blood cell count (RBC),white blood cells (WBC) and differential leucocyte count while serum biochemical indices assay was carried out using methods described by Litechelbawn, 1984, Roshian*et al*., 1974 and Reitman and Frankel (1957).

2.9 Statistical Analysis

Data generated were subjected to one-way analysis of variance (ANOVA) using SPSS 12.0 computer software. Duncan multiple range test of the same computer software was used to separate means with significant differences.

III. RESULTS AND DISCUSSION

Table 3: Performance of broiler chicks fed pineapple waste/rice bran diets

Parameter	(0%PW/RB)	(10%PW/RB)	(12.5%PW/RB)	(15%PW/RB)	(17.5%PW/RB)	Sem
Starter phase						
Initial weight (g)	47.50	47.50	47.50	48.00	48.0	0.70
Final live weight	959.50^{a}	936.50^{a}	877.25^{b}	764.75^{b}	764.75^{c}	25.27
Daily weight gain(g)	32.57^{a}	31.75^{a}	29.63^{ab}	28.79^{ab}	25.60^{b}	1.00
Daily feed intake(g)	85.48^{c}	84.03^{c}	87.98^{b}	89.85^{a}	90.05^{a}	0.53
Feed conversion ratio	2.65^{b}	2.82^{b}	2.85^{b}	2.11^{ab}	3.17^{a}	0.13
Finisher phase						
Initial weight (g)	950.0	950.50	950.50	950.55	950.55	0.22
Final live weight	232.750	2307.75^{a}	2290.00^{a}	2212.50^{b}	1930.00^{c}	52.22
Daily weight gain(g)	49.17^{a}	48.47^{a}	47.84^{ab}	45.07^{b}	34.98^{c}	1.70
Daily feed intake(g)	124.17^{b}	125.00^{b}	125.50^{b}	128.17^{b}	147.00^{a}	2.71
Feed conversion ratio	2.53^{c}	2.58^{c}	2.62b^{c}	2.84^{b}	4.20^{a}	0.20

a,b,c means without common super scripts in each row are significantly different (p<0.05)
sem = standard error of mean

Table 4: Carcass and relative organ weights of broiler chicken fed pineapple waste/rice bran diets

Parameters	(0%PW/RB)	(10%PW/RB)	(12.5%PW/RB)	(15%PW/R)	(17.5%PW/RB)	Sem
Starter phase						
Bled weight (g)	893.75^{a}	860.85^{a}	798.30^{b}	768.83^{b}	66.8.78^{c}	24.66
Carcass weight(g)	586.22^{a}	552.35^{a}	508.21^{b}	487.75^{b}	403.50^{c}	15.56
Dressing percentage	61.10^{a}	59.62^{ab}	57.93^{b}	57.10^{b}	52.76^{c}	0.85
Breast (%)	29.08	27.97	27.43	26.91	25.83	0.47
Thigh (%)	16.33^{a}	15.92^{a}	15.72^{ab}	14.48^{b}	14.17^{b}	0.16
Drumstick (%)	15.45	15.31	15.09	14.76	14.56	0.14
Neck (%)	8.60	8.46	8.01	6.84	6.92	0.11
Wings (%)	13.99	13.69	13.29	12.80	12.60	0.16
Relative Organ weights (%)						
Heart	1.09	0.95	0.82	0.75	0.74	0.05
Lungs	0.90	0.99	1.11	0.95	0.91	0.04
Kidney	1.00	1.06	1.14	1.52	1.41	0.72
Liver	3.96	4.07	4.55	4.64	4.72	0.13
Gizzard	6.50	6.52	7.31	7.21	7.25	0.15

Finisher phase						
Bled weight (g)	2240.00[a]	2219.75[a]	2214.50[a]	2133.00[a]	1859.00[b]	45.72
Carcass weight (g)	1607.75[a]	1572.00[a]	1557.75[a]	1523.25[a]	1269.75[b]	38.08
Dressing percentage	69.08[a]	68.12[a]	68.02[a]	68.84[a]	65.75[b]	0.10
Breast (%)	30.87[a]	29.91[a]	29.68[a]	28.01[a]	23.33[b]	1.00
Thigh (%)	18.38	18.23	17.23	16.99	16.29	0.47
Drum stick (%)	17.80[a]	17.71[a]	17.72[ab]	15.59[ab]	14.89[b]	0.40
Neck (%)	8.35	8.22	7.93	7.60	6.99	0.24
Wings (%)	13.91	12.95	11.89	11.62	11.62	2.35
Relative Organ weights (%)						
Heart	0.35[b]	0.48[ab]	0.56[a]	0.51[ab]	0.49[ab]	0.16
Lungs	0.72	0.80	1.14	0.88	1.01	0.70
Kidney	0.84[a]	1.01[ab]	1.15[a]	1.12[a]	1.07[a]	0.04
Liver	2.72	2.70	2.75	3.37	2.81	0.11
Gizzard	4.07[b]	4.44[ab]	4.97[ab]	5.37[a]	5.64[a]	0.23

a,b,c means without common super scripts in each row are significantly different (p<0.05)
sem = standard error of mean

Table 5: Haematological parameters of broiler finisher chicken fed pineapple waste/rice bran diets

Parameters	(0%PW/RB)	(10%PW/RB)	(12.5%PW/RB)	(15%PW/RB)	(17.5%PW/RB)	Sem
Packed cell volume (%)	29.00[a]	28.50	27.00[b]	27.00 [b]	25.00[c]	0.37
Haemoglobin (%/dl)	9.66 [a]	9.50 [a]	8.99[b]	8.87 [b]	8033[c]	0.12
Red blood cell (x 10^6/mm^3)	4.56 [a]	4.31[ab]	4.18[ab]	3.97[bc]	3.67[d]	0.18
White blood cells (x 10^6/mm^3)	20.48 [a]	19.13 [a]	18.38[b]	18.40 [b]	17.90[b]	0.62
Lymphocytes (%)	84.00 [a]	70.50[b]	61.50[b]	66.00[bc]	59.00[c]	2.28
Platelets (x 10^6/mm^3)	155.00 [a]	134.00 [a]	132.00[a]	106.50 [b]	106.00[b]	5.30

a,b,c means without common super scripts in each row are significantly different (p<0.05)
sem = standard error of mean

The performance characteristics of broiler chicken fed pineapple waste/rice bran mixture diets for starter and finisher phase are presented in Table 3.Final live weight, daily weight gain, daily feed intake and feed conversion ratio were significantly (p<0.05) affected among the dietary treatments.

At the starter phase, birds fed diets containing 0 and 10% PW/RB had significantly (p<0.05) higher final liveweight values while serious depression was observed in birds fed diet 5 (17.5% PW/RB). Then same trend was observed in the finisher phase. Daily weight gain significantly (p<0.05) decreased as PW/RB level increased across the treatment groups. Daily feed intake significantly (p<0.05) increased from birds fed diets 3 and birds fed diet 5 (17.5% PW/RB) had significantly (p<0.05) highest feed intake (90.05g). Feed conversion ratio was significantly (p<0.05) higher on birds fed diets 4 and 5 (3.11 and 3.17), although birds fed diets, 1, 2,3 and 4 had similar values (p>0.05). At the finisher phase, daily weight gain recorded for birds on 0, 10 and 12.5% showed similarity (p>0.05).

Daily feed intake was significantly (p<0.05) higher in birds fed diets 5 (17.5% PW/RB) while serious depression in feed intake was observed in birds fed diets. 1, 2,3 and 4 i.e. they showed no significant (P> 0.05) difference.

Carcass characteristics and relative organ weights of broiler chicken fed pineapple waste/ rice bran diets are presented in Table 4. The results indicated that bled weight, carcass weight, dressing percentage and thigh were significantly (p<0.05) affected by dietary treatments at starter phase while breast and drumstick were also affected at finisher phase. The highest (p<0.05) bled weight, carcass weight, dressing percentage, thigh breast and drumstick percentage were obtained in birds fed control diet at both starter and finisher phase. At the starter phase, the values of these parameters were similar to those birds that were fed 10% PW/RB diet while at the finisher phase, they compared to those birds fed diets with 17.5% PW/RB. Relative weights of organs at starter phase did not show any significant (p>0.05) difference across the dietary treatments. At finisher phase, relative weights of heart, kidney and lower showed significant (p< 0.05) differences. Relative weights of all organs showed higher values in all bids fed test ingredient (PW/RB) except for heart in starter phase that showed higher value (1.09%) although not significant (p>0.05).

Table 5 showed the haematological parameters of broiler chicken fed pineapple waste/rice bran diets. All haematological parameters in this study indicated significant (P<0.05) differences across dietary treatments. Packed cell volume, haemoglobin concentration, red blood cells and white blood cells showed similarity (p>0.05) between birds fed the control diet and those fed diet with 10% PW/RB diet. However, platelet value

showed similarity ($p>0.05$) up to 12.5% PW/RB. Least values were noticed in all parameters for birds fed diets containing 15 and 17.5% PW/RB.

Feed conversiongain ratio results showed that birds fed12.5% PW/RB had better feed conversion ratio because feed consumed were better translated to weight gain. Birds on 12.5% PW/RB based diets grow at faster rate than those on other diets as evidenced from their final live weight. Since performance is an indication of quality and utilization of the ration (Bamgbose and Niba, 1998). However, the decline in feed intake of birds on 12.5% PW/RB could be attributed to the presence of some anti-nutritional factors which are prevalent in most unconventional feed stuff (D'Mello, 1982). The depression of final live weight which resulted in high feed conversion ratio among the birds on 15% PW/RB and 17.5% PW/RB and the inconsistency in feed intake values of these treatments suggest poor utilization of these diets. It had been shown that at higher inclusion levels, unconventional feedstuff may alter the texture, colour, taste andodour of diets. Feed consumption and ultimately utilization may be affected by each of the above factors independently or in combination (Ander 1992, Nir*et al*., 1994 Odunsi*et al.*, 1996).

It would seem that birds fed with 12.5% PW/RB better utilized their feed as evidenced by the significantly higher defeathered weight, carcass weight, bled weight and drumstick. Significantly higher values were also observed for gut length, this could be due to additional bulk and greater volume of digester staying in the gastrointestinal tract during enzymatic digestion (Savory and Gentle ,1976, Longe and Fagbenro- Byron 1990, Ander *1992*). Furthermore it has been observed that structural carbohydrate in monogastric diets specifically have mechanical effect on intestinal wall and cause gastrointestinal tract to increase and thicken (Thorbon and Wilcox, 1985). All haematological parameters were within the normal ranges of healthy growing birds reported by Coles, (1996) and Similarities observed in the values were in the range reported by Mitruka and Rawnsley, 1977. These substantiate the nutritional adequacy of PW/RB mixture in the diets of broiler chicken.

IV. CONCLUSION:

It can be concluded that pineapple waste-rice bran mixture could be used to replace 10% and 12.5% wheat bran in the diets of broilersat starter and finisher phases without deleterious effects on growth, carcass characteristics and haematological parameters.

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Olayeni, TunjiBabatunde, et. al. "Response of Broiler Chickens to Pineapple Waste-Rice Bran Diets." *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 14(10), 2021, pp. 47-52.