Evaluation of Biodegraded and Undegraded Plantain Peels as Replacement to Wheat Offal in Broiler Production

F. Aderemi * O.Alabi and A. Awe
*Department of Animal Science and Fisheries management, Bowen University
Iwo Osun State Nigeria.
*Corresponding Author Email faaderemi@yahoo.co.uk

ABSTRACT

This study evaluated replacement of wheat offal with biodegraded and un-degraded plantain peel in raising broilers plantain peels was biodegraded using fungus. Three diets were formulated diet I with 12% wheat offal was the control and diets II and III wheat offal was replaced with undegraded and biodegraded plantain peels. Ninety day old broilers were randomly assigned to these diets replicated thrice and lasted for eight weeks Results revealed that body weight gain was similar across the diets at both starter and finisher phases Those on dietI had a similar feed intake to those on biodegraded diet, but higher than those on the undegraded plantain peel at the starter phase, while at the finisher phase the intake was similar across the diets Feed conversion ratio of those fed control was higher than others at both phases mortality was not be linked to dietary treatments. Serum metabolites were within normal range Morphological analysis of the birds revealed significant effect of treatments. In the main plantain peels could replace wheat offal without adverse effect on the broilers.

Keywords: Plantain peels, broilers, performance characteristics.

1 INTRODUCTION

The sub-optimal consumption of animal protein by a large percentage of Nigerian population has posed a challenge to livestock farmers, researchers and the government. The high cost of feed ingredients in most tropical countries clearly indicates there is need for utilization of unconventional materials [1]. Pressure from consumers for cheaper animal products have necessitated the assessment of local feed ingredients as sole diets in replacement of conventional ingredients during the periods of scarcity and soaring costs[2]. Plantain peels are agro-industrial-byproducts left behind after the edible portion of plantain has been processed into various food items by cooking, roasting or milling into flour Plantain peels, a waste from plantain is observed to have some nutritional values as it contains about 12% crude protein, 16% crude fibre and 1300kcal/kg energy on dry matter basis [3]. Utilization of micro-organisms in enhancing the bio-availability of nutrients in plant by-products has been in use for long[4].This study was embarked upon to evaluate the bioconversion of plantain peels and its utilization by broilers in order to solve problem of inadequate animal protein consumption.

2 MATERIALS AND METHODS

The study was carried out at the poultry section of the Teaching and Research farm Bowen University Iwo with the environmental temperature range of 15-28°C during the harmattan season and 20-36°C in the hot season. It receives an annual rainfall of 1400 mm.

2.1 Experimental diet

Solid state fermentation has been used tremendously to improve nutritive value of feed ingredients which otherwise was considered as a waste. *Rhizopus stolonifer* was *collected* from Microbiology and used for the biodegradation of Plantain peels. *Rhizopus* was introduced into the grated ripe plantain peel in conical flasks then sugar syrup was added to supply enough carbon for the growth of the Rhizopus. The conical flask was covered with cotton wool and foil paper after which the conical flasks were later incubated in a chamber. The larger quantity of grated plantain was poured in a sterilized polythene bag mixed with substrate from the flask and tied to avoid housefly contamination. It was left to biodegrade with frequent turning for ten (10) days after which it was oven dried at a temperature of 60°C. The dried sample is tagged biodegraded plantain peels other grated sample was oven dried and tagged undegraded. Three diets were formulated such that diet I with 12% wheat offal served as the control and in diets II and III the wheat offal was replaced with undegraded and biodegraded plantain peels respectively. This feeding trial lasted for eight weeks during which data on performance characteristic and blood parameters of the birds were taken.

2.2 Birds and their management

Ninety Anak day old broiler chicks were weighed and randomly allotted to three dietary treatments replicated thrice in a completely randomized design. Each replicate had ten chicks. Birds were brooded and reared in a deep

litter experimental poultry house. Routine medication and vaccination were carried out to ensure proper health of the birds.. Feed and water were given ad libitum. Blood samples were also taken at the eighth week for analysis all data generated were subjected to analysis.

3 RESULTS AND DISCUSSION

The gross composition of the experimental diets is as shown in Table 1 the diets were formulated to meet the nutrient requirement of the birds. Table 2 shows the performance characteristics of the broilers. The feed intake of chicks on control was similar to those on diet II but higher than undegraded peels at starter phase.The feed intake value of the chicks fed experimental diets may have to do with characteristics nature of the ingredients,its physic-chemical properties as observed by [1] It has been reported that at higher levels of inclusion of unconventional feedstuffs several properties of the feed may be altered the texture, colour, taste and odour[5].While at finisher phase the intake was similar across the diets. This perhaps suggest similarities between plantain peels(degraded or undegraded) and wheat offal. This could also be due to increased digestive capacity and gut motility of older birds. It has been reported that feed intake is a function of the dietary energy [6] Mortality that was recorded could not be traced to dietary treatment. The feed conversion ratio of those fed diet III were better than others.i.e convert feed to flesh at a minimum costs at starter phase whereas at finisher phase broilers on diet II had the best feed conversion ratio. The Carcass characteristics and organ weights of broilers fed experimental diets observed for this study is as shown in Table 3. The observed values for organ weight of broilers were all normal. Serum metabolites of broilers fed experimental diets is as shown in Table 4.The cholesterol of broilers fed diets I and II were significantly lower than diet III. This could be that recycling of bile acid is diminished thereby synthesis of more bile acids from cholesterol is stimulated. This then result again in lowering of serum cholesterol levels this is in agreement with the findings of [7].Total protein albumin and globulin values in this study indicated efficient protein utilization by the broilers similar to the findings of Tewe (1994).It also implied that the birds were not dehydrated. It could be observed that at the finisher phase plantain peels promoted muscle wastage as higher levels of creatinine were observed with birds fed these rations. The glucose level does not have a particular statistical trend. The observed enzymes transaminase (AST) and Aspartate transferase (ALT) were within normal range indicative of healthy broilers. This confirmed absence of liver diseases in the experimental birds similar to the findings of Aderemi et al [8].

4 CONCLUSION

In the main this study shows that biodegraded and /or undegraded plantain peels could replace wheat offal in the diet of broilers without adversely affecting the performance, the blood serum metabolites or even the morphological parameters of the broilers. These in turn promote the consumption of animal protein among the populace.

Table 1: Gross composition of experimental diets for Broiler.

	Starter Phase			Finisher Phase		
Ingredients	**I**	**II**	**III**	**I**	**II**	**III**
Maize	57.0	57.0	57.0	54.0	54.0	54.0
Soybean meal	11.0	11.0	11.0	11.0	11.0	11.0
Wheat offal	12.0	0.0	0.0	16.0	0.0	0.0
Un-degraded plantain peels	0.0	12.0	0.0	0.0	16.0	0.0
Degraded plantain peels	0.0	0.0	12.0	0.0	0.0	16.0
Palm kernel cake	3.5	3.5	3.5	3.5	3.5	3.5
Groundnut cake	9.0	9.0	9.0	4.0	4.0	4.0
Fish meal	3.0	3.0	3.0	3.0	3.0	3.0
Bone meal	2.0	2.0	2.0	3.0	3.0	3.0
Oyster shell	2.0	2.0	2.0	5.0	5.0	5.0
*Premix	.25	.25	.25	.25	.25	.25
Salt	.25	.25	.25	.25	.25	.25
Total	100	100	100	100	100	100
Calculated analysis						
Crude protein (%)	20.76	20.13	20.32	18.60	18.56	18.21
ME kcal/kg	3022	3045	3137	3018	3023	3029

*Vitamin/mineral premix provided the following vitamin and minerals per kg of diet: A, 10,000 I.U.; D_3, 300 I.U.; E. 8.0 I.U.; K, 2.0mg; B_1, 2.0mg; B_6, 1.2mg; B_{12}, 0.12mg; Nianin 1.0mg; Panthothenic acid, 7.0mg; Folic acid, 0.6mg; Cholic, 500mg; C, 10.0mg; Fe, 60mg; Mn, 80mg; Mg, 100mg; Cu, 8.0mg; Zn, 50mg; Co, 0.45mg; I, 2.0mg and Se, 0.1mg.ANUPCO, Anglican Nutrition Products Company, England

Table 2: Performance Characteristics of broilers fed experimental diets.

Starter phase	**I**	**II**	**III**	**SEM**
Weekly feed intake/bird(kg)	0.67 [a]	0.69 [a]	0.64 [b]	0.05
Final body weight gain/bird(kg)	0.37 [a]	0.39 [a]	0.38 [a]	0.001
Feed conversion ratio	2.03	1.97	1.88	-
Mortality (%)	3.0	3.0	2.5	0.01
Finisher phase				
Weekly feed intake/bird(kg)	2.21	2.16	2.16	0.01
Weekly weight gain/bird(kg)	0.82	0.84	0.82	0.01
Feed conversion ratio	2.70	2.57	2.63	-
Mortality (%)	0	0	0	-

abc Means with the same superscript along a row are not significantly different (P>0.05)

Table 3: Carcass characteristics and organ weights of broilers fed experimental diets.

Parameters	I	II	III	SEM
Liveweight (kg)	1.33	1.33	1.32	0.02
Shank (g)	12.38 [a]	10.90 [c]	11.41 [a]	0.40
Wing (g)	5.82 [a]	5.64 [b]	3.14 [c]	0.10
Back (g)	16.39[b]	18.03[a]	13.08[c]	0.05
Breast (g)	13.71[c]	18.86[a]	14.99[b]	0.50
Kidney (%)	0.54	0.56	0.53	0.21
Liver (%)	2.57 [a]	2.00[c]	2.17 [b]	0.10
Heart (%)	0.69 [a]	0.49[c]	0.58[b]	0.08

abc Means with the same superscript along a row are not significantly different (P>0.05)

Table 4: Serum metabolites of broilers fed experimental diets.

Parameters	I	II	III	SEM
Glucose (mg/dl)	156.68[a]	144.03[a]	166.04[a]	5.00
AST (i.µ/l)	1290 [a]	1268 [a]	1257 [a]	2.11
ALT (i.µ/l)	76.33 [a]	75.52 [a]	74.73 [a]	0.66
T.P (mg/dl)	4.48 [b]	4.86 [a]	4.32 [a]	0.04
Cholesterol (mg/dl)	89.35 [c]	107.73[b]	123.71[a]	5.00
Urea (mg/dl)	3.12 [b]	3.43 [a]	1.49 [c]	0.20
Creatinine (mg)	0.34 [b]	0.46 [a]	0.48 [a]	0.33

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